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Examining Portfolio Diversification and Good Governance in Developed, Emerging and Frontier Markets for Australian Superannuation Funds

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Abstract

Australia's Superannuation Guarantee (SG) scheme has become the cornerstone of Australia's retirement income system. The main objective of this system is to enable a modest standard of living to employees in their years after retirement. Superannuation comprises of periodic contributions made by employers in to a nominated super fund on behalf of their employees. These contributions are invested and managed by fund managers. According to the Australian Prudential Regulation Authority (2019b), superannuation funds show preference towards domestic assets. Approximately, 68% of the total assets under superannuation are invested in Australian assets while only 23% are invested in international equities. Empirical research has also found that, in general, most Australian investors and fund managers lean heavily towards domestic assets, mainly due to franking credit benefits. International assets have also been evidenced in the international portfolio diversification literature to provide financial benefits in terms of risk reduction or higher returns but very little is known about these benefits for superannuation funds. Lack of research in this area reduces investment opportunities and optimal places for superannuation funds to diversify and gain from these opportunities. This thesis investigates whether Australia's superannuation contributions can be invested more effectively in international equity markets on behalf of future retirees.

The objective of this thesis is two-fold. The first study of the thesis examines and measures the benefits of international portfolio diversification for Australian superannuation investors in developed, emerging and frontier markets equities. For this purpose, the study uses stock market indices of 22 developed markets, 21 emerging markets, 17 frontier markets and Australian superannuation funds data for the period from 2006 to 2017. The second study of the thesis examines the impact of country-level good governance practices on the country-level performance of developed, emerging and frontier markets in order to understand the impact of international portfolio diversification of Australian

superannuation funds. For this purpose, the study uses country-level governance indicators from the World Bank and The Index of Economic Freedom for the same sample of developed, emerging and frontier markets that is employed in the first study. Both studies are analysed for the full study period, the global financial crisis (GFC) sub-period from 2006 to 2009, the post-GFC sub-period from 2010 to 2017, including by regional classification of the Americas, the Europe, Middle East and Africa (EMEA) and the Asia-Pacific.

The first study finds that developed and emerging markets equities, despite substantial globalisation since the 1980s, have the potential to offer financial gains in terms of lower risk or higher return. Frontier market equities are also found to offer substantial risk-return benefits. These financial gains are larger for superannuation funds, as compared to equities, due to low correlation between them and developed, emerging and frontier markets. Specifically, in the case of developed markets, correlations with superannuation funds are quite low but increasing over time. In the case of emerging markets, correlations between them and superannuation funds are low and negative on an average. Gains are larger from the Asia-Pacific region, in both markets, than the Americas or the EMEA. In the case of frontier markets, the results are in sync with the portfolio diversification literature for this classification. That is, correlation between frontier markets equities and superannuation funds are low and positive throughout all regions. Both, the EMEA and the Asia-Pacific regions have the potential to offer higher returns from international diversification to superannuation funds. GFC and post-GFC sub-periods show that average correlations are negative during the GFC sub-period but increase and become positive in the post-GFC sub-period.

The findings of the second study suggest that good governance matters. Good governance leads to good performance and vice-versa. Good governance improves the performance of stock markets; however, the extent of improvement differs among each market. In the case of developed markets, political stability and absence of violence/terrorism (PV) has a negative relationship with index returns and in the case of frontier markets, this relationship is positive. According to literature, equity markets of developed nations are expected to perform better; however, events of economic, financial and political distress that have occurred in the last few years have led to poor stock market performance. Frontier markets, on the other hand, generally score low in PV. The results of this study show that equity markets of these countries (with poor governance) perform poorly. The relationship between voice

and accountability (VA) and index returns is positive for both developed and frontier markets, implying that democratic governments attract more investor confidence as these countries are generally linked to higher economic growth, and thus is expected to show better stock market performance. On the other hand, trade freedom (TF) is negatively related to the index returns of both developed and frontier markets. The "Spaghetti Bowl" phenomenon of Bhagwati & Krueger (1995) evidences that an increase in TF can exert more pressure on developing nations, in particular, causing them to settle for unfavourable trade agreements. These findings are, therefore, partially in line with the literature.

This thesis makes several contributions to literature and knowledge. This thesis creates the Joint Country Classification Matrix (JCC). Due to differences in the country classification methodology of Morgan Stanley Capital International (MSCI), Financial Times Stock Exchange (FTSE) and Standard & Poor's (S&P) Dow Jones indices, this thesis creates its own country classification matrix. The creation of JCC brings consistency in the country classification matrix and ensures that the countries chosen in this thesis are classified in the same category across all three indices. This thesis adds new knowledge to the existing international portfolio diversification literature from the viewpoint of Australian superannuation funds. It does so by estimating risk-return benefits of diversifying in developed, emerging and frontier markets for superannuation funds. The thesis contributes to the governance-performance literature by empirically examining the impact of country-level governance variables on a country's stock index performance, which in turn can affect the performance of Australian superannuation funds. The thesis adds new knowledge to Australian superannuation literature. There is a lack of research on whether international portfolio diversification can add value to a superannuation portfolio, which is mostly due to a strong preference for domestic assets in Australia. Thus, this research will be valuable to researchers, fund managers and self-managed superannuation funds (SMSFs) as it creates awareness about the hidden prospects of developed, emerging and frontier markets and seeks to find optimal places for Australian superannuation funds to diversify.

Keywords: international diversification, portfolio diversification, good governance, superannuation fund, pension fund, frontier markets, Australia

Declaration

This thesis is submitted to Swinburne University of Technology in fulfilment of the requirements of the degree of Doctor of Philosophy.

This thesis represents my own original work towards this research degree and contains no material which has been previously submitted for a degree or diploma at this University or any other institution, except where due acknowledgement is made.

This thesis has been professionally copy edited by Dr Rachel Le Rossignol according to the Australian Standards for Editing Practice. Specifically the standards applied included D1, D3 to D5 and E1, E2 and E4. These standards relate to appropriate academic editing, including clarity of expression, spelling, punctuation and grammar, and ensuring the document meets the examining university's format, style and sequencing requirements.

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List of Acronyms

ADCC asymmetric dynamic conditional correlation
ADF Augmented Dickey-Fuller
AFS Australian financial services
AGDCC asymmetric generalized dynamic conditional correlation
AR auto-regressive
ARIMA auto-regressive integrated moving average
APRA Australian Prudential Regulatory Authority
ARCH autoregressive conditional heteroscedasticity
ASC Australian Securities Commission
ASEAN Association of Southeast Asian Nations
ASIC Australian Securities and Investments Commission
ASX Australian Securities Exchange
ATO Australian Taxation Office
AUD Australian Dollars
BEKK Baba, Engle, Kraft and Kroner
BFL Boot, Feibes and Lisman
BRICS Brazil, Russia, India, China and South Africa
CC control of corruption
CCC constant conditional correlation
CEO chief executive officer
CHESS Clearing House Electronic Subregister System
CIS Commonwealth of Independent States
DC Denton-Cholette
DCC dynamic conditional correlation
DF Dickey-Fuller
DMs developed markets
DSS Department of Social Services
EAFE Europe, Australasia and the Far East
EMs emerging markets
EGARCH exponential GARCH
EMA Europe, Middle East and Africa
EMEA Europe, Middle East and Africa
ERS Elliott, Rothenberg and Stock
ETF exchange traded funds
FDI foreign direct investment
FF financial freedom
FMs frontier markets
FTSE Financial Times Stock Exchange
G20 The Group of Twenty
GAAP Generally Accepted Accounting Principles
GARCH generalised autoregressive conditional heteroscedasticity
GCC Gulf Cooperation Council
GDP gross domestic product
GE government effectiveness

GCB	Global Corruption Barometer
GFC	global financial crisis
GJR-GARCH	Glosten-Jagannathan-Runkle GARCH
GNI	gross national income
GNP	gross national product
ICCPR	International Covenant on Civil and Political Rights
IF	investment freedom
IFC	International Finance Corporation
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
ISC	Insurance and Superannuation Commission
JB	Jarque-Bera
JCC	Joint Country Classification Matrix
KPSS	Kapetanios, Shin and Snell
LPM	lower partial moments
MA	moving average
MAR	minimum acceptable return
MENA	Middle East and North Africa
MPT	modern portfolio theory
MSCI	Morgan Stanley Capital International
MVO	mean-variance optimisation
NAFTA	The North American Free Trade Agreement
NASDAQ	National Association of Securities Dealers Automated Quotations
NYSE	New York Stock Exchange
OECD	Organisation for Economic Co-operation and Development
OLS	ordinary least squares
OPEC	The Organization of the Petroleum Exporting Countries
PP	Phillips-Perron
PPP	purchasing power parity
PV	political stability and absence of violence/terrorism
RAP	risk-adjusted performance
RBA	Reserve Bank of Australia
RL	rule of law
RQ	research question
RegQ	regulatory quality
RMSE	root mean square error
RSE	registrable superannuation entity
SEC	Securities and Exchange Commission
SG	Superannuation Guarantee
SGAA	Superannuation Guarantee (Administration) Act 1992
SGC	Superannuation Guarantee Charge
SIM	single-index model
SISA	Superannuation Industry (Supervision) Act 1993
SMSF	self-managed superannuation fund
S&P	Standard & Poor's
TF	trade freedom
TGARCH	Threshold GARCH
UDHR	Universal Declaration of Human Rights
UK	United Kingdom
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNHCR	The United Nations High Commissioner for Refugees
US	United States
USA	United States
USD	United States Dollars
VA	voice and accountability
VAR	vector autoregression
VECH	vectorised
VECM	vector equilibrium correction model
VIF	variance inflation factor
WGI	Worldwide Governance Indicators
WHO	World Health Organisation
WTO	World Trade Organisation

Country Codes

[1]

Developed Markets		Emerging Markets		Frontier Markets	
AUS	Australia	**BRA**	Brazil	**BGR**	Bulgaria
CAN	Canada	**CHL**	Chile	**HRV**	Croatia
USA	United States	**COL**	Colombia	**EST**	Estonia
AUT	Austria	**MEX**	Mexico	**LTU**	Lithuania
BEL	Belgium	**PER**	Peru	**ROM**	Romania
DNK	Denmark	**CZE**	Czech Republic	**KEN**	Kenya
FIN	Finland	**EGY**	Egypt	**MUS**	Mauritius
FRA	France	**GRC**	Greece	**NGA**	Nigeria
DEU	Germany	**HUN**	Hungary	**TUN**	Tunisia
IRL	Ireland	**POL**	Poland	**BWA**	Botswana
ISR	Israel	**RUS**	Russia	**BHR**	Bahrain
ITA	Italy	**ZAF**	South Africa	**JOR**	Jordan
NLD	Netherlands	**TUR**	Turkey	**OMN**	Oman
NOR	Norway	**ARE**	United Arab Emirates	**BGD**	Bangladesh
PRT	Portugal	**CHN**	China	**LKA**	Sri Lanka
ESP	Spain	**IND**	India	**VNM**	Vietnam
SWE	Sweden	**IDN**	Indonesia		
CHE	Switzerland	**MYS**	Malaysia		
GBR	United Kingdom	**PHL**	Philippines		
HKG	Hong Kong	**TWN**	Taiwan		
JPN	Japan	**THA**	Thailand		
NZL	New Zealand				
SGP	Singapore				

[1] The thesis follows International Organization for Standardization's ISO 3166-1 alpha-3 country codes. Refer to `https://www.iso.org/iso-3166-country-codes.html` for more information.

Chapter 1

Introduction

1.1 Background

Markowitz's (1952) modern portfolio theory (MPT) provides a framework for portfolio diversification which emphasises the importance of investing in a portfolio of assets such that it reduces risk for a given level of return or maximises return for a given level of risk. Despite the portfolio diversification framework, in Australia, more than 60% of total superannuation[2] assets is invested in the domestic market (Australian Prudential Regulation Authority 2019b). Even though this amount is invested across a wide-range of domestic assets such as equity, fixed income, cash, property and infrastructure, commodity and others, there are two concerning issues. First, the percentage of total assets that is invested in non-equity assets is very small, except for fixed income which accounts for 12.7% of the total assets. Second, 22.4% of the total assets that is invested in listed Australian equity is in a heavily concentrated domestic stock market (Australian Prudential Regulation Authority). The domestic stock market, represented by the S&P Australian Securities Exchange (ASX) 100 index, is not well-diversified, in that more than 50% of the stocks fall in the financials (33%) and materials (17.1%) sector (sectoral breakdown of the index is presented in Figure A.1). Out of the 100 largest stocks in this index, the top ten stocks account for 48.4% of the total and six of these top ten stocks belong to the financials and materials sector. This sectoral breakdown shows that the performance of the Australian equity market is heavily dependent on the performance of these top ten companies, which are the Commonwealth Bank of Australia, CSL Ltd, BHP

[2] Superannuation is also referred as super in this thesis.

Group Ltd, Westpac Banking Corp, ANZ Banking Group, National Australia Bank Ltd, Woolworths Group Ltd, Wesfarmers Ltd, Telstra Corp Ltd, and Macquarie Group Ltd. A superannuation fund investing in domestic equities is thus exposed to the performance and risk factors of these ten companies to a large extent. This view is also supported by Phillips et al. (2007), especially in the case of SMSFs.

A preference for the domestic market (also called the home market) is described as the home bias phenomenon. Investors and fund managers[3] have a preference for domestic equity and assets due to several reasons. For example, unfamiliarity with foreign markets is associated with the difficulty of predicting future returns with precision (Huberman 2001). Factors such as differential tax rates and transaction costs also lead to home bias (Black 1974; Stulz 1981). Investment barriers, asymmetric information, geographical proximity, and lack of transparency of international stock markets also contribute to the home bias phenomenon. Even individual characteristics such as education levels, job security, and confidence levels influence portfolio diversification decisions. For example, a higher level of job security, which can be found in public sector jobs, is found to reduce the need for portfolio diversification whereas a higher level of education and previous experience with risky investments increases confidence levels and as a result increases portfolio diversification (Karlsson & Norden 2007).

From an Australian viewpoint, in addition to the above-mentioned behavioural factors, it is the attraction of franking credits[4] that encourages investors to stay invested in the domestic market. The dividend imputation system of Australia, which was introduced in 1987 by the Hawke government, is designed in such a way that when investors receive dividend income from a domestic company, they also receive franking credits with it. These franking credits are of substantial value to residents and superannuation funds in particular as they can be used to offset their Australian personal tax obligations. However, franking credit refunds are more valuable to those who are exempt from domestic tax or are in the low-tax bracket because they can receive cash refunds instead of the otherwise unusable franking credits. In 2001, the Hawke government started permitting individuals and superannuation

[3]This thesis is written from the point of view of the members of superannuation funds. They are also termed as investors in this thesis. And, since fund managers make investment decisions on behalf of members of a superannuation fund, the term investors is used interchangeably to represent fund managers as well.

[4]When dividends, from company's profits, are distributed to the shareholders, the company paying the dividend also pays tax on it. This is known as franked dividend. The Australian Taxation Office (ATO) recognises that tax has already been paid on the dividend so to avoid double taxation by placing the tax burden on shareholders as well, for this it uses franking credits. Franking credits, also known as imputation credits, is given to shareholders who are in receipt of franked dividends, which is used to reduce their tax burden. Detailed information on franking credit is available on `https://www.ato.gov.au/non-profit/statements-and-returns/in-detail/franking-credit-refunds/refund-of-franking-credits-endorsed-entities-information/`

funds to claim "excess" franking credits in the form of cash. As a result of this policy change, according to the Parliamentary Budget Office (2018), a total of $5.9 billion franking credits was refunded in 2014 – 2015, out of which $700 million went to tax exempt entities and $2.3 billion to individuals. Among superannuation funds, SMSF have the largest benefit from the franking credit refund policy. In 2014 – 2015, superannuation funds claimed $300 million whereas SMSFs claimed $2.6 billion (Parliamentary Budget Office 2018). These numbers indicate that the benefit of refund is mainly to those in the zero- or low-tax bracket and not so much to others. Since the benefit is not of substantial significance to the remaining investors, the reason for a large home bias in a heavily concentrated domestic market is not justified.

1.2 Research Objectives

The objective of this thesis is two-fold. First, to examine and measure the benefits of international portfolio diversification for Australian superannuation investors in developed, emerging and frontier markets equities. Second, to examine the impact of country-level[5] good governance practices[6] in developed, emerging and frontier markets on their country-level performance and to identify specific governance variables that affect their performance. Both research objectives are conducted from the viewpoint of Australia's superannuation investors. This also defines the scope of this thesis. Each research objective is discussed in detail below.

1.2.1 What is the Importance of International Portfolio Diversification?

The main objective of portfolio diversification is to reduce portfolio risk. Portfolios can also be designed to maximise returns. Portfolio diversification has been extensively studied in academic literature since the introduction of MPT (Markowitz 1952, 1959). According to MPT, efficient diversification can be achieved by investing in assets such that they react differently to a given event so that a loss in one asset can be offset by a gain in another. It means that assets should be chosen after considering the effect of

[5]Review of literature in Section 6.5 explains the meaning of country-level governance. The country-level governance indicators used to address the second research objective are defined and discussed in Section 7.4.

[6]According to United Nations Development Programme (2014), good governance "promotes freedom from violence, fear and crime, and peaceful and secure societies that provide the stability needed for development investments to be sustained". More details in Section 6.2.1.

price change in one asset relative to the price change in another asset and not in a random manner. A portfolio constructed using this criterion will result in an efficient portfolio having the lowest risk for a given level of return or the highest return for a given level of risk. Portfolio diversification can be achieved by investing in different asset classes, countries and regions. An optimal mix can help investors improve the performance of their investment portfolios in the long-term.

Since the 1980s, when emerging markets opened their financial markets to cross-border investments, international portfolio diversification has widely been examined. According to Bekaert et al. (2003), financial liberalisation of equity markets was one of the most important policy decisions made by emerging markets 25 years ago. Permitting foreign investments in domestic equity markets has contributed to a significant increase in capital inflows, leading to tremendous growth and development of emerging markets (Broner & Ventura 2010). However, prior to the 1980s, developed markets were the only active participants of financial liberalisation. Several studies have examined the benefits of international portfolio diversification in developed markets (Grubel 1968; Levy & Sarnat 1970; Solnik 1974). The majority of this literature was successful in finding financial gains in terms of either superior returns or lower risk from investing in these markets. With time, as more and more countries opened up their financial markets to international investments, interest in this area has increased for researchers and practitioners. In the 1980s, many economies experienced financial liberalisation, giving more investment avenues to investors and fund managers. Research conducted around this time (Bergstrom et al. 1996; Divecha et al. 1992; Errunza & Padmanabhan 1988; Meric & Meric 1989; Solnik et al. 1996; Wheatley 1988) have conclusively found substantial diversification gains from developed and emerging markets. The said financial gains or benefits were mainly due to low correlation between the assets of home and foreign market(s). However, with increased liberalisation there was more political stability, infrastructural developments and rapid growth in trade and business in emerging markets (see Figure A.2). These advancements have brought emerging and developed markets closer to each other in terms of their levels of economic and financial development. The result of this union is that over time the level of correlation between developed and emerging markets has increased (Gilmore & McManus 2002; Gupta & Guidi 2012; de Santis & Gerard 1997; Speidell & Krohne 2007; Zhong et al. 2014). Higher levels of correlation between the assets of these markets are also evidenced in Figure A.3. A subsequent impact of higher correlation is that it reduces the amount of financial gains in terms of either risk reduction or higher returns from international portfolio diversification.

Reduction in gains from developed and emerging markets has led to a search for a new set of markets that are at a different level of development and integration than developed and emerging markets. The search for new markets led to the formation of frontier markets. Countries that are identified as frontier markets are those that are smaller and have less developed financial systems than emerging markets but are investable[7]. Investable means that these countries have financial systems which allow cross-border capital flows; however, they are characterised by lower market capitalisation and liquidity than developed and emerging markets. In the long run, these countries are expected to become more liquid and demonstrate risk-return characteristics similar to emerging markets. These countries are, therefore, also recognised as a subset of emerging markets because they are showing tremendous growth potential (see Figure A.4). From the figure it is evident that the annual gross domestic product (GDP) growth rate of frontier markets is substantially higher than developed markets and emerging markets. As a result of this optimistic outlook, portfolio diversification in frontier markets has gained substantial attention among academics and practitioners. One of the many reasons that this thesis focusses on frontier markets is the lower levels of correlation that the market as a whole continues to offer (Berger et al. 2013; Marshall et al. 2015; Speidell & Krohne 2007; Sukumaran et al. 2015). Speidell & Krohne (2007) and Speidell (2011) explain that many countries in frontier markets are abundant in natural resources, and favoured by a younger working population and cheap labour. For example, in terms of younger demographics, in Japan and Italy only 14% of the population is under the age of 15 whereas in the frontier markets of Zambia and Bangladesh between 35 – 45% of the population are under 15 years of age. Similar is the case of Australia, where a large percentage of the population are in the older age group (see Figure A.5). Having a younger population is an indication of higher employment capacity and higher levels of output. Frontier markets are also abundant in resources. Several frontier markets such as Botswana, Bulgaria, Kenya, Romania, and Vietnam, are rich in copper, diamond, nickel, barite, soda, diatomite, limonite, etc. All these examples show that frontier markets have a large capacity to grow and develop.

For an Australian superannuation investor, there is a possibility that diversification benefits from frontier markets may be pronounced as mentioned in Speidell & Krohne (2007) and Speidell (2011), due

[7] A detailed background of developed, emerging and frontier markets is provided in Chapter 2.

the uniqueness these market offer. Whether there is a possibility of gain or not can only be determined by measuring the benefits of portfolio diversification. Quarterly superannuation statistics, published by the Australian Prudential Regulation Authority, show that as of 30 June 2019, of the $2.9 trillion assets under superannuation, 61.6% of the total are invested in the domestic market in listed and unlisted equity, fixed income, cash, property and infrastructure, and commodities. A further 24.4% is invested in listed international equities, which accounts for $448,254 million of the total $2.9 trillion assets invested in superannuation. However, the constituents of this asset allocation are not known. That is, there is not enough information to determine the country or market this portion of superannuation assets is invested in and whether or not it is yielding financial gains in terms of risk reduction or higher returns. For the reasons cited above and in order to bring clarity and awareness, and provide insights into where gains and benefits lie for Australia's superannuation investors, the focus of the first study is to examine the benefits of portfolio diversification in frontier markets and compare the outcome with developed and emerging markets. The intention is to identify whether the current level of diversification is optimal or further diversification can lead to financial gains in terms of higher returns or lower risk.

1.2.2 Why Examine the Impact of Country-Level Good Governance Practices?

The research objective of the second study is to examine the impact of country-level good governance practices on country-level performance of developed, emerging and frontier markets, in that the primary research objective is to examine and understand the impact of adopting good governance practices, specifically for frontier markets. The secondary research objective is to identify specific country-level governance indicators that affect the performance of frontier markets and whether these are different to those affecting developed and emerging markets.

The objective of this study arises from the issues that frontier markets are criticised for. Despite strong potential, frontier markets are considered to be far behind developed and emerging markets. Media, at times, portray these countries as being plagued with wars, diseases, famine, and authoritarian governments, even though this is the case for only a few countries. Many of these countries do suffer from political tension, corruption, lack of freedom of speech and expression, less developed financial markets and such, but with time many are showing signs of improvement, growth and development. Also, since these markets are not integrated with developed and emerging markets, they exhibit low correlations and, thus, gains from international diversification are possible. In spite of these developments, investors and fund managers are generally sceptical about investing in these countries as sustainability of these gains is not known. According to Hall & Jones (1999) and de Brouwer (2003), sustainability of gains, at a country level, is possible if good governance practices are being adopted and practised. The Victorian Local Governance Association and Municipal Association of Victoria and Local Government Victoria and Local Government Professionals (2012) state that good governance is "not about making ‘correct’decisions, but about the best possible process for making those decisions". Good governance is said to result in good performance (Kronouer 2014) whereas bad or poor governance may lead to bad outcomes such as poor investor confidence. Hedberg (2014) found that companies that understand the significance of good governance are usually well managed and better positioned to provide attractive investment returns in the long-term. The same applies to country-level performance. According to Hedberg (2014), frontier markets are known for having less developed legal frameworks and weak rules and practices, which often discourages the inflow of foreign investment. However, according to the GDP growth forecast of CITI Bank (2014), presented in Figure A.4, frontier markets are expected to grow at a significantly higher rate than developed markets and also higher than emerging markets until 2051. These superior forecasts could mean significant financial gains for international investors, including Australia’s superannuation investors. However, this estimate is based on the premise that younger demographics, abundance of natural resources and low labour cost will prevail and continue to create a competitive advantage for frontier markets (CITI Bank 2014). The impact of governance issues and bad governance practices is yet to be linked to these estimates. Whether country-level governance issues will erode away these financial benefits from Australia’s superannuation investors in the long-term is not known. The second study seeks to understand these country-level governance issues of frontier markets and their impact on country-level performance, and also to identify specific governance variables that have a positive impact on their performance and those that affect negatively.

1.2.3 Why Australia’s Superannuation Investors?

Both studies, discussed in Sections 1.2.1 and 1.2.2, are conducted from the perspective of Australian superannuation investors for the following reasons. Superannuation is important to Australia and over time has become the cornerstone of Australia’s retirement income system. One of the reasons superannuation is extremely important to Australia is because it is the largest source of retirement income for Australia's entire workforce. Although the Age Pension is available, it is offered only to eligible individuals, which is discussed in detail in Chapter 2. The pension amount that is received under the Age Pension is often not sufficient to maintain the same lifestyle as prior to retirement. Superannuation, on the other hand, is considered to be an effective way of saving for the future and, therefore, in order to encourage voluntary contributions, the government offers tax concessions on contributions and earnings. Superannuation also offers insurance cover to members, which provides financial security to them and their family members in case of death or disability of the member.

Superannuation has been designed to reduce strain on the government in providing for its ageing population, which is a big concern for Australia. The objective of superannuation, therefore, is to provide supplementary income in addition to what is received by the Age Pension. Figure A.5 shows that there has been a significant change in Australia's age structure. It had a younger demographic in 1925 and from the figure it can be noted that the shift towards an older demographic has already started. By 2045, it is estimated that around 7 million Australians will be in the age group of 65 years or older (Productivity Commission 2005).

Another reason for choosing superannuation as the focus of this thesis is that this industry is experiencing sizeable growth each year. Over ten years from 2008 to 2018, superannuation assets have increased from \$1.1 trillion to \$2.7 trillion, which is a growth of 140.3%. Over the twelve months from June 2018 to June 2019, the industry saw an increase of 6.2% in total superannuation assets (Australian Prudential Regulation Authority). As superannuation funds invest nearly 1/4th of the total superannuation assets in international equities (Australian Prudential Regulation Authority 2019b), it becomes important for fund managers and members collectively to understand the impact of international markets and associated risk factors. Even though literature, as mentioned in Section 3.4, has found substantial gains from frontier markets in recent times, risk factors attached to these markets must not be overlooked. Also, as every superannuation member has a different risk appetite, understanding these markets has become more important. In saying that, every country in the frontier market is endowed differently, and as a result, has different financial benefits to offer. Not all countries are plagued by wars, droughts, dictatorship, etc. as media sometimes claims them to be. These markets, therefore, can be potential avenues for Australian superannuation funds to invest in, which could provide members with desired financial outcomes from diversification.

1.3 Research Questions and Hypotheses

Based on the research objectives discussed in Section 1.2 and review of literature and theories in Chapter 3 and Chapter 6, the following research questions (RQs) and hypotheses have been developed.

RQ 1: Does portfolio diversification in developed, emerging and frontier markets yield risk-returns benefits to Australia's superannuation funds?

H1: Portfolio diversification in developed, emerging and frontier markets provides risk-return benefits to Australian superannuation funds.

RQ 2a: Do country-level good governance practices improve country-level performance of developed, emerging and frontier markets?

$H2_a$: Country-level good governance practices improve country-level performance of developed, emerging and frontier markets.

RQ 2b: Which country-level good governance indicators impact the performance of developed, emerging and frontier markets?

$H2_b$: Country-level good governance indicators, voice and accountability (VA), political stability and absence of violence/terrorism (PV), government effectiveness (GE), regulatory quality (RegQ), rule of law (RL), control of corruption (CC), trade freedom (TF), investment freedom (IF), and financial freedom (FF) have positive impact on country-level stock market performance of developed, emerging and frontier markets.

1.4 Research Contributions

The first contribution of this thesis is the creation of the Joint Country Classification Matrix (JCC) (Table B.1). Different indices such as MSCI, FTSE and S&P Dow Jones follow different methodologies to classify countries into developed, emerging and frontier markets (methodology presented in Tables B.2 to B.4). There are commonalities in their methodologies but there are some vast differences in the criteria they use for country classification (for detailed discussion see Section 4.3.1.1). Also, the importance given to each criterion is different. For example, FTSE uses separate criterion for market and regulatory environment, custody and settlement, and dealing landscape, while as per MSCI's framework, all of them fall under one criterion called market accessibility. For this very reason, there are differences in their country classification matrix, particularly observed in the case of frontier markets. As shown in Table B.5, there are 28 countries that suffer as a result of different methodologies of these indices. Even in academic literature, although MSCI indexes have been used by many researchers, there is no discussion on the appropriateness or preference of a particular country classification matrix. To bring consistency in the country classification matrix and to ensure that the countries chosen in this thesis are classified in the same category across all three indices, this thesis creates the JCC.

The second contribution of this thesis is that it quantifies the benefits of international portfolio diversification for Australia's superannuation investors. As discussed in Section 1.2, examining the benefits for superannuation investors is important to Australia. Most literature has examined portfolio diversification benefits for domestic equity investors who invest in international equities. Theoretically, the outcome of these studies cannot be applied to superannuation funds because the nature and design of a superannuation fund is different to an equity stock. A superannuation fund invests in several asset classes and not just equity, so its exposure to risk factors of the domestic market is not 100%. Similarly, any risk factors or shocks of the international market are expected to have a lower impact on a superannuation fund than an equity stock because of its asset allocation structure.

"High risk, high return" has been the attraction point of frontier market for academics, fund managers and investors. Most literature suggests that diversification in frontier markets yields more rewards in the form of superior returns as compared to developed and emerging markets. This thesis adds new and up-to-date knowledge to existing literature about the risk-return benefits of frontier markets and provides a comprehensive view of the benefits derived from developed and emerging markets as well by using an extended sample of a total of 59 countries for a 12-year period from 2006 to 2017. This is the third contribution of this thesis.

High return may be the attraction point of frontier markets but sometimes media paints a very dark picture about these countries. They focus on violence, slave-like working conditions, autocratic governments, diseases, etc. which shakes the confidence of investors to diversify in them as these events are disturbing. There are obviously a few frontier markets which are suffering from these issues, but the problems of some countries cannot be applied to all countries in frontier markets. There are many countries in this market which are growing and prospering at a rate similar to emerging markets. For example, the 2017 annual GDP growth rate of some frontier markets is very close to that of China (6.90%) and India (6.62%), such as Bangladesh, which is growing at 7.28%, Vietnam at 6.81% and Romania at 6.95%. A few others, such as Kenya (4.90%) and Bahrain (3.89%) are also growing at a rate similar to emerging countries like Thailand (3.90%) and Taiwan (2.79%). Even in regard to country-level governance issues, many frontier markets are doing better than emerging markets in areas like PV and CC. According to World Bank's Worldwide Governance Indicators (WGI), in 2017, Romania ranked 49.05, Lithuania ranked 72.86 and Vietnam ranked 59.52 while emerging markets of Brazil ranked 19.05, India ranked 17.14 and Russia ranked 21.43. In terms of CC, the performance of frontier markets were not weak or better than that of emerging markets. That is, Romania ranked 55.29, Lithuania 70.19, Vietnam 31.73, Brazil 36.06, India 48.56 and Russia 17.31. These statistics show that even though emerging markets are at higher levels of economic and financial development than frontier markets, it does not imply that they have better country-level governance practices. This leads to the fourth contribution of this thesis. The second study examines these country-level governance issues with the intention of identifying governance variables that affect frontier markets positively and those that affect it negatively. This study also compares the results with developed and emerging markets.

Additionally, this thesis brings to light the issue of home bias which is dominant in the case of superannuation funds and even more among SMSF (Phillips et al. 2007). Home bias is easily visible in the superannuation asset allocation structure (Australian Prudential Regulation Authority 2019b). As discussed in Section 1.2, nearly 61.6% of total superannuation assets is invested in the domestic market, out of which 22.4% is invested in listed domestic equities. The remaining goes to domestic fixed income, property and infrastructure, commodities, and others. There are several reasons for home bias in general. Literature has found familiarity, geographical proximity (Coval & Moskowitz 1999), ease of access, exchange rate risk, cross-border capital control (Daly & Vo 2013), etc. as factors that affect investment decisions when it comes to foreign markets. However, in Australia, one of the main reasons for preferring the home market is its dividend imputation tax system. Access to franking credits is encouraging investors to invest in the domestic market as this benefit is not available when dividends are earned through foreign investments. The lure of franking credits is concerning because investors are overlooking the risk factor attached to investing in a heavily concentrated home market. 50.3% of the S&P ASX 100 index is made up of the financials and materials sector which is largely made up of banks, non-bank financial institutions, construction and mining companies (ASX 2019). Allocation to international equities can reduce the risk profile of the heavily concentrated superannuation portfolio without having to sacrifice returns. Also, franking credits earned on domestic dividends are particularly beneficial to investors who are in receipt of franking credit refunds because they fall in the zero-tax bracket, and not to those in higher tax brackets. This is the fifth and final contribution of this thesis.

1.5 Structure of the Thesis

This thesis is organised as follows. Chapter 2 provides a background on Australia's superannuation funds, a brief history and its current landscape. The chapter also provides background on the economic and financial performance of developed, emerging and frontier markets. The thesis is written in two parts from this point onward.

Study 1 is discussed in Chapters 3, 4, and 5. Chapter 3 reviews literature on portfolio diversification with an emphasis on international portfolio diversification. It also includes a review of the models used for estimating portfolio diversification benefits. Chapter 4 discusses the research design, data and its characteristics, sample and sample period, research questions and hypothesis development, DCC GARCH model and Markowitz's portfolio optimisation model. Chapter 5 discusses descriptive statistics and empirical findings from data analysis.

Study 2 is covered in Chapters 6, 7, and 8. Chapter 6 reviews literature on the relationship between governance and performance but prior to this, the chapter provides an introduction to governance and, in that, good and bad governance practices. The chapter also presents current governance practices of a few countries from a sample of developed, emerging and frontier markets. Chapter 7 describes panel data, its characteristics and limitations, sample selection and a description of performance and governance variables, research questions and hypothesis development, the base regression model and estimation methods for this data type. Chapter 8 discusses descriptive statistics and empirical findings from data analysis.

Chapter 9 discusses the major findings of both studies in light of the thesis' research objectives, research questions and limitations. It provides contribution for academics, practitioners, and policy-makers along with avenues for further research.

Chapter 2

Institutional Background

2.1 Overview

This chapter is divided into two parts. In the first part, Section 2.2 provides contextual background to the thesis by outlining the key aspects of the Australian superannuation industry. It gives an overview of the retirement income system that was in place before superannuation came into force, that is, the Age Pension. Then the section discusses the current landscape of superannuation, that the Superannuation Guarantee (SG) system, its structure, types of superannuation funds, asset allocation and the regulatory control of superannuation. In the second part, Section 2.3 provides a broad overview of the economic and financial background of countries in developed, emerging and frontier markets. It provides a discussion on their recent performance in areas such as annual GDP growth rate, foreign direct investment (FDI) inflows, inflation levels, international trade, public welfare system, infrastructure, labour market and unemployment rate.

2.2 Institutional Setting of the Australian Superannuation Industry

Australia's current retirement income system is built on three pillars: the Age Pension, the mandatory Superannuation Guarantee (SG), and voluntary retirement saving. Prior to the introduction of superannuation as a retirement benefit, provision for the welfare of the aged was elementary. The primary mode for aged care was by family members and relatives. Very few, especially those who did not receive family support, were dependent on institutional care, which was controlled by voluntary charitable institutions (Kewley 1973). The absence of poverty, employment options for the aged and having only 2.9% of the population over the age of 65 (Dixon 1977) made it possible for the welfare system, in the early 1890s, to prioritise those without family support. Unfortunately, this charitable welfare system of aged care bore the brunt of the 1890s economic depression. Deteriorating economic conditions increased reliance on the charitable welfare system for aged care. Between 1890 and 1897, aged care support provided by the Benevolent Society of New South Wales increased by nearly 150% (Dixon 1977). Similar pressure was experienced in Queensland, Victoria and Western Australia, particularly in the first half of the 1890s. A rapid increase in the aged population added to this distress. Between 1891 and 1901, Australia's population over the age of 65 rose from 92,550 to 150,789 (Dixon 1977). The average annual growth rate in the aged community during this period was 5% per annum with Western Australia (8.6%) experiencing the fastest growth. Queensland (7.9%), Victoria (5.3%) and New South Wales (5.1%) followed suit (Dixon 1977). The reasons for increased dependence on the charitable welfare system were: unemployment levels among the aged population increased during the economic depression as it became difficult to find work, the proportion of the aged population that received family support dropped, and those who had independent means lost their savings in the 1893 financial crisis. The charitable welfare system, however, was unable to cope with the increasing strain of meeting the needs of the aged community. These events led to a community-wide acceptance that providing support to the aged was not only the responsibility of an individual's family and charitable institutions but also of the entire community (Dixon 1977).

2.2.1 Pillar 1: Age Pension

From the many solutions[8] proposed to resolve the above-mentioned problem, a state-based Age Pension scheme for those of 65 years of age and above was introduced. This pension scheme was adapted from Germany and Denmark's model. Germany's pension scheme was compulsory and contributory, wherein both, employers and employees contributed for the employee's retirement and the state merely acted as the administrator of the scheme. On the other hand, Denmark's scheme was non-contributory. In 1900 when New South Wales first introduced a pension scheme in Australia, it was non-contributory and selective. Victoria also introduced a similar pension scheme in the same year, followed by Queensland in

[8]Refer to Dixon (1977), p. 41 for a detailed discussion on the several policy options that were put forth in the 1890s for dealing with the aged destitution problem.

1908 (Nielson 2010). This pension scheme, however, was not open to all sections of the aged population. Specifically, institutional inmates, Aborigines, Asians (except those born in Australia), Africans and natives of the Pacific Islands and New Zealand were excluded from the Age Pension scheme. Those included were required to evidence 25 years of residency in Australia and good character. These schemes were discontinued when the Commonwealth of Australia's Age Pension, under the Deakin government, came into force in July 1909 superseding state-based pension schemes (Nielson 2010).

The aim of the Age Pension is to provide an adequate safety net to employees after their retirement so that they can support themselves financially; however, the underlying assumption is that it should be used as a supplementary source of income. That is, pensioners should be able to support themselves using other means that serve as a primary source of support. The intention behind this is to minimise government expenditure and stimulate self-reliance among pensioners so that support can be provided to those who are identified as most deserving or most in need. To identify the most deserving and most in need candidates, pensioners are subject to age and residency requirements and the means test. Prior to 2013, the Age Pension was paid to men and women at different retirement ages, men at 65 and women at 60. At the time of writing this thesis, the qualifying age for the Age Pension is 66 and it is the same for men and women. The qualifying age will increase by six months every two years until it reaches 67 years on 1 July 2023 (Department of Social Services 2019). In 2014, the Federal Budget announced increasing the qualifying age to 70 years by 1 July 2035, however, this was later scrapped by Prime Minister Scott Morrison in 2018. Increasing the qualifying age was intended to reduce financial strain on the government and encourage pensioners to provide for their own retirement via superannuation, which is discussed in the section below. However, this intention was not well received by many sections of society, particularly those who work in physically demanding jobs and those who identify in disadvantaged groups (Klapdor 2014). The qualifying age, therefore, is expected to gradually increase only up to 67 years.

Pension payments, in the 1900s, were flat rate, cash payments, funded from the general revenue of the government at an affordable rate of $26 per year (Dixon 1977). In 1933, there was a major development in the mechanism of establishing pension rates. Pension rates were to be indexed to the consumer price index to keep pace with changes in the cost of living and wages. This change was repealed but re-established in 1940 (Department of Social Services 2019). In 1963, a standard rate of pension was introduced for a single person and a married couple. The rate for a single person was higher considering the economies of scale that a couple can avail themselves of due to shared living expenses (Australian Bureau of Statistics 1988). In 1975 pensions were set to 25% of average weekly earnings for a single person and 20% for a married couple, which was indexed once a year but from 1976 pensions were subject to indexation twice a year, on 20 March and 20 September. In 2009, following the Harmer review, singles pension rate was increased by $32.49 per week, that is up to $1,689 per annum. This brought the singles pension rate to 27.7% of male total average weekly earnings from the previous 25%. As of March 2018, the maximum basic pension rate for a single person is $826.20 per fortnight and for a couple $622.80 per fortnight (Rice 2018).

Pensioners are also subject to a means test which is a measure of their financial capability. Since only the most deserving and most in need are eligible for pension payments, a means tests enables identification of eligible candidates. Since the 1900s, the means test has undergone major revisions. In 1961 the means test, which included separate property (assets) and income tests, was merged together such that the personal earnings of the pensioner was added to 10% of the value of the property to determine means. This composite whole was called the merged means test (Australian Bureau of Statistics 1988). In 1969 a major change took place in the pensions means test. A tapered means test was introduced. The pension rate was cut by half of the amount by which means exceeded the permissible maximum means as assessed. This test was a restrictive measure designed to restrict the availability of the Pensioner Medical Service (known as Pensioner Health Benefits) (Australian Bureau of Statistics 1988). Further revisions in 1973 and 1975 saw the abolishment of the means test for pensioners aged 75 and 70 years. In 1976, the property test was abolished for all pensioners; thus the means test included only an income test. However, by the mid-1980s, changes made to both the means and property tests were reversed and were applicable to all pensioners (Australian Bureau of Statistics 1988). A few more changes took place in 2007 in regard to relaxation of the Age Pension assets tests. Under the new asset test rules, pensioners who were previously ineligible to receive the Age Pension became eligible to receive a part pension, due to which another 300,000 people came under the coverage of the Age Pension.

Today, the Age Pension is available to all residents subject to fulfilment of eligibility requirements of age, citizenship, income and assets tests. The number of people qualifying for the Age Pension has widely varied over the years. In 1978, nearly 90% of the old age community were eligible for full pension benefits, while in 1982 this number reduced to 64% when the means test was re-introduced. As of 2017, according to the pensioners' database available with Department of Social Services (DSS), 39% of those eligible receive full pension benefits and 24% receive part-pension benefits (Rice 2018). Since its introduction in the 1900s, the Age Pension has served two main purposes: one, it has contributed towards the welfare of the elderly, and, two, it has acted as a pillar and main source of income for retirees until the introduction of the second pillar of retirement income, which is Superannuation. Indexation of pension rates and the means test, together, have ensured that the needs of the pensioners dependent on the Age Pension are met in a timely manner.

2.2.2 Pillar 2: The Superannuation Guarantee (SG)

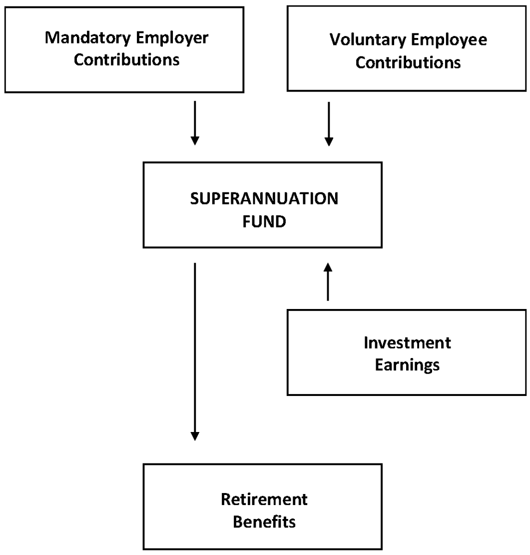
Over the years, superannuation has become the cornerstone of Australia's retirement income system. This is because the primary objective of superannuation is to provide income to individuals to enable them a reasonable standard of living in their retirement. Superannuation is also intended to reduce financial strain on the Australian government for financing its ageing population (see Figure A.5). It was introduced on 1 July 1992 by the Keating Government because of growing concerns for present and future problems associated with Australia's ageing population (see Figure A.5) accompanied by reduction in personal savings and increasing household debt. Superannuation is a British Commonwealth term used for describing retirement savings within the legal framework of taxes and decrees purposed to aid retirement financing (Kingston 2004). It is similar to the United States (US) Social Security System, an earnings based retirement income scheme, or a public pension. However, it is considered to be a private pension policy, an alternative to a public pension in Australia (Bateman & Piggott 1998).

In the Australian superannuation system, retirement savings are privately funded through a combination of mandatory employer contributions (also called the "SG"), voluntary employee contributions and investment earnings, which are together used for financing an employee's retirement benefits (see Figure 2.1). Mandatory employer and voluntary employee contributions[9] are the primary source of funding for superannuation funds. The SG mandates employers, defined under the Superannuation Guarantee (Administration) Act 1992 (SGAA), to make contributions on behalf of their

[9]Mandatory employer contributions and voluntary employee contributions will be collectively called super or superannuation contributions henceforth.

employees into a complying superannuation fund[10] in order to enable them a modest standard of living in their years after retirement. SG contributions are to be made at least quarterly by the 28th after the end of each quarter: 30 September, 31 December, 31 March and 30 June. Employers failing to do so are subject to a Superannuation Guarantee Charge (SGC)[11]. These pooled superannuation contributions are invested, on behalf of the employees, by fund managers', into different asset classes such as cash, fixed income, equity, property, infrastructure and commodities in both domestic and international markets, in order to make investment earnings. The success of investing via superannuation hinges on the fund managers' competence to maximise investment returns.

Figure 2.1: Australian Superannuation Scheme



Source: Adapted from Kingston (2004)

When the SG was introduced, minimum mandatory employer contributions were established to progressively increase from 3% to 9% between 1992 – 2002. However, from 1 July 2012 SG was set increase until it reaches 12% on 1 July 2025. As of 1 July 2019, the minimum employer contribution is at 9.5% of employee's ordinary time earnings, which is set to remain the same for two years. On 1 July 2021, the

[10] A complying superannuation fund must be a "resident regulated superannuation fund" as defined under Section 42 of the Superannuation Industry (Supervision) Act 1993 (SISA).

[11] SGC is a penalty which the employer is liable to pay in circumstances where the employer has failed to pay the minimum amount of SG for the employee by the due date. The amount of penalty is a sum of the amount of shortfall, interest of 10% per annum on the shortfall amount and an administrative fee of $20 per employee, in each quarter. Detailed information on SGC calculation is available at `https://www.ato.gov.au/Business/Super-for-employers/Missed-and-late-super-guarantee-payments/The-super-guarantee-charge/`

SG rate will increase to 10% and then 0.5% each year until 2025 (Hawkins et al. 2019). These mandatory employer contributions are paid in to the fund of the employee's choice. Only when an employee fails to nominate a superannuation fund is it paid in to a default MySuper fund or a fund that is designated through an industrial award or an enterprise agreement[12]. The objective of a MySuper fund is to provide a simplified and cost-effective option to employees by maintaining transparency and minimising fund management expenses. It replaces all other default funds that were in place prior to 1 January 2014. MySuper is a low cost superannuation product that offers either a single investment strategy or a lifecycle strategy to its members. Most MySuper products follow a balanced or growth strategy, wherein 70% of the assets are invested in growth stocks such as shares or property and the remaining 30% is invested in government bonds or cash[13]. That is, they have one risk–return target for all their members, which is why there is higher responsibility on the fund managers of a MySuper product to deliver good performance (Australian Treasury 2010). In a lifecycle strategy, investment objectives are established based on age group of their members. For example, the investment strategy is different for members who are in their 30s and different for those who are in their 40s and so on. There can be between 2 – 26 lifecycle stages in a MySuper fund.

As of September 2019, there are $779.20 billion assets in MySuper products, which is a 12.10% increase in the total MySuper assets since September 2018 (Australian Prudential Regulation Authority 2019a). Between 2014 and 2018, members' benefits have increased by 86.1%, which is an increase from $347.8 billion in 2014 to $647.5 billion in 2018 (Australian Prudential Regulation Authority 2019b). Out of the total Australians that hold a superannuation account, nearly 80% have their mandatory contributions paid in to a default superannuation fund. Lack of interest, information or expertise can be attributed to why employees find it difficult to choose a superannuation fund and thus allow their contributions to go in to a default fund. MySuper, therefore, has been established to cater to those members who do not wish to be actively involved in choosing a superannuation fund. Those who wish to take an active part have the option to select a superannuation fund or invest through an SMSF.

[12] MySuper is a part of the "Stronger Super" program that was launched by the 2007 – 2013 Labor Government as a response to the reforms arising from the Super System Review. If successfully implemented, the program is expected to lower fees by 40% such that, when estimated nation-wide, it is expected to add $60 billion to national savings by 2035 (Australian Treasury 2010).

[13] Refer to `https://moneysmart.gov.au/grow-your-super/super-investment-options`

2.2.2.1 Self-Managed Superannuation Funds (SMSF)

As the name implies, SMSFs are superannuation funds that are controlled and managed by the members of the fund and not by trustees and fund managers, as in the case of the Australian Prudential Regulatory Authoritys (APRAs) superannuation funds. That is, the members and trustees are the same in the case of SMSF. On 8 October 1999, the SISA made amendments to the regulatory provisions for small superannuation funds which led to the creation of a new category of superannuation funds called SMSF. Prior to this date, small superannuation funds were regulated by APRA but since this date SMSFs are regulated by the ATO.

SMSF is considered as an alternative to APRA's regulated superannuation funds. Out of the total $2.9 trillion assets under superannuation as of September 2019, $746.2 billion are invested in the ATO regulated SMSF (Australian Prudential Regulation Authority 2019a). It represents 27% of the total assets invested in Australia's superannuation industry (CCH Editors 2018). An SMSF can be established when there are less than five members in it. Since the members of an SMSF are also its trustees, the benefits an SMSF offers to its trustees are shared by its members, such as investment choice, control, investment flexibility, tax concessions, and cost savings. SMSFs are preferred when the trustees consider their investment decisions to be superior or better aligned to their needs than if taken by a professional fund manager. An SMSF provides its members with a choice to invest in securities, managed funds, real estate and other investment instruments directly. It allows them to mark-to-market based their better judgement. They can also time the purchase or sale of a real estate asset such that it provides them with tax benefits on capital gain(s).

SMSF also provides the opportunity for estate planning. It allows trustees to take control of their investments on account of their death. With SMSF, challenges of blended and step families can be managed to yield desired results. Upon death of a trustee, a death benefit can be passed on to their spouse and dependants directly or paid in to the estate. Death benefits can be paid as a lumpsum or pension. When paid as a pension, the SMSF can continue to exist, which may not be the case in a large superannuation fund. The SMSF trust deed can be amended to modify the terms of the death benefit from capital payout to the SMSF. If managed well an SMSF can offer excellent estate planning benefits. SMSF also provides protection from creditors.

Likewise, the issues that an SMSF brings to its trustees are also shared by its members, such as legal obligations imposed on the trustees, the time-consuming nature of fund management, and limited access to the Superannuation Complaints Tribunal (CCH Editors 2018). The costs of setting up an SMSF is also huge. As a rule of thumb, according to CCH Editors (2018), an investment of at least $200,000 goes in to establishing an SMSF.

Once the members decide to set up an SMSF, they must ensure that it complies with the ATO's regulations. Non-compliance can impose severe penalties on the trustees, including the possibility of disqualification. Non-compliance can also impose higher tax rates to the fund. Non-complying SMSFs were required to pay tax at the rate of 45% in 2018 – 19. Compliance, on the other hand, brings tax concessions to all superannuation funds, in that contributions and earnings made by the fund attract a low tax rate of 15% up to specific contribution limits (CCH Editors 2018).

2.2.3 Pillar 3: Voluntary Retirement Savings

Voluntary retirement savings can be in the form of additional pre-tax occupational superannuation contributions or post-tax personal contributions. According to Australian Bureau of Statistics (2007) data, post-tax contributions are more popular in comparison to pre-tax contributions. Less than $1/3^{rd}$ of the total employees make contribution via salary sacrifice, which is a pre-tax contribution. The amount of pre-tax contribution was found to be higher only in age groups of 45 – 54 but it was still lower in comparison to post-tax contributions, and this was despite the tax concessions offered in pre-tax contributions.

Employees can make additional superannuation pre-tax contributions via salary sacrifice. Salary sacrifice is where employers deduct contributions from the employees' salary which are paid in to the superannuation fund either of the employee's choice or in to a default fund as discussed in Section 2.2.2. To encourage employees to save more, the Australian government offers generous tax concessions to those who choose to forego their income in order to make superannuation contributions. Hence, contribution via salary sacrifice is also identified as concessional contribution.

The maximum amount of pre-tax concessional contribution permitted in 2019 – 20 is $25,000 per annum (Australian Taxation Office 2019b). This amount is taxed at 15% in the superannuation fund and if the contribution is more than $25,000 in a given financial year then additional tax is to be paid on the excess amount. Until 1 January 2020, salary sacrifice was counted towards employer SG. That is, if salary sacrifice was 9.5% of an employee's ordinary time earnings then the employer was not required to contribute anything more. However, from 1 January 2020, salary sacrifice will not reduce an employee's ordinary time earnings that are used by employers to calculate superannuation entitlement, and it will not count towards an employer's SG. Further, since the amount of voluntary superannuation contribution will not be counted as a part of assessable income, the pay as you go withholding tax will not apply on it (Australian Taxation Office 2019b).

After-tax income contributions are non-concessional contributions because tax has already been paid on it. These personal superannuation contributions have an upper limit of \$100,000 per year (Australian Taxation Office 2019b). Those under the age of 65 can bring forward the cap for up to three times the single year limit which allows them to contribute up to \$300,000 at a time in a single year. Any contribution over this amount attracts additional tax. The bring forward provision, however, is not accessible to those who are 65 years or older on 1 July of a given financial year (Australian Taxation Office 2019b). For those whose assessable income is lower than the income threshold for a given financial year, a government co-contribution of \$500 per annum may also be accessible.

Besides occupational and personal superannuation contributions, individuals also have non-superannuation saving alternatives such as long-term savings in property, home ownership, equity and managed funds. Australians have always had a preference for investment in property, especially home ownership. According to the Australian Census Longitudinal Dataset: Tenure and Landlord Type (Australian Bureau of Statistics 2011), between 2006 – 2011, nearly 71.59% Australians were home-owners, either through outright purchase or using a mortgage. Within this, nearly 95.15% of retirees had purchased a home outright or using a mortgage.

2.2.4 Types of Superannuation Funds

Australia's superannuation funds offer a diverse range of investment options to their members. These funds are designed to offer defined or accumulation benefits. Most superannuation funds are accumulation funds. An accumulation fund, also called a defined contribution fund, is a fund in which member contributions, employer contributions and investment earnings are credited and fees, taxes, death and insurance premiums are debited. The net amount that is accumulated over time is paid to the member on retirement. Defined benefit funds, on the other hand, are not as common as accumulation funds. And, unlike accumulation funds, defined benefits are not impacted by market performance. Defined benefit funds are mainly public sector or corporate funds that provide defined retirement or death benefits to their members. A defined benefit is based on an employee's final salary. It is calculated as a multiple times final salary.The multiple is determined on the basis of the rate of employer and employee contributions and the number of years during which those contributions are made.

Superannuation funds can also be profit or non-for-profit funds, public offer funds or non-public offer funds, small (Do-It-Yourself) funds, or institutional funds. Public offer funds are those where membership is open to the public while non-public funds are funds that are industry specific or open to employees of a particular employer only. Do-It-Yourself funds are essentially small superannuation funds with less than five members. Such a fund is usually exempt from some prudential requirements placed by SISA on other funds due to its size. SMSF is one type of small superannuation fund which is discussed in detail in Section 2.2.2.1. Any other fund that is not an SMSF but has less than five members and is regulated by APRA is also identified as a small superannuation fund. There are 1,783 small APRA funds as of September 2019 with $2.1 billion assets under management. Institutional funds are governed by the trustees and regulated by APRA, unlike SMSF. These funds are categorised into public sector, corporate, retail and industry funds. Each type of superannuation fund came in to existence as a response to historical and policy considerations.

1. Public Sector Funds: Public sector funds were the first type of superannuation funds to come into force. This was in the mid-nineteenth century, when they were established for the purpose of providing retirement benefits to government employees. Historically, public sector funds were set up to provide defined benefits but slowly most funds moved towards accumulation. Contributions of new members go in to an accumulation fund now, although older long-term members still have the option to have theirs paid in to a defined benefit fund. Many public sector employers are known to contribute more than the minimum SG, that is, more than 9.5%. Like industry funds, since public sector funds are designed for the benefit of their members, profits are ploughed back in to the fund. Also, these are low cost funds. As of September 2019, there are 18 public sector funds with $528.5 billion of assets under management (Australian Prudential Regulation Authority 2019a).

2. Corporate Funds: Corporate funds were set up after public sector funds. These funds are set up by an employer for its employees such that it may be conducted as an industry fund or a retail fund. These funds are largely non-public funds, only open to employees and their spouses. Similar to public sector funds, corporate funds were defined benefit funds set up for private sector white-collared employees (Bateman 2003) for the purpose of rewarding them for long-service and loyalty. The move towards accumulation funds saw a decline in defined benefit funds and a rise in accumulation or hybrid funds that offer both defined and accumulation benefits to their members. Defined benefits, however, are not available to new members. When the employer is also one of the trustees of the funds, then these corporate funds are called employer-sponsored funds. As of September 2019, there are 18 corporate funds with $59.7 billion of assets under management (Australian Prudential Regulation Authority 2019a). These numbers have declined sharply in recent years. According to the (Australian Prudential Regulation Authority 2007), in 1996 there were 4,100 corporate funds but by 2011 there were only 143. Increasing administrative and legal requirements imposed by APRA made these funds complex to administer and costly to manage. As a result, many small corporate funds closed down and moved their employees and assets to a larger retail or industry fund.

3. Retail Funds: Retail super funds were introduced after corporate funds. These funds are public offer and for-profit funds that are offered by large banks, life insurance and investment companies. It is generally the one fund type to offer a wide range of investment options as compared to other types of superannuation schemes. Retail funds are typically accumulation funds. They are primarily used for investing and saving for retirement and their main objective is to generate revenue and profits for the provider. Retail funds offer a range of insurance products through the fund, as well as investment advice and personal service to their clients. Since these type of funds are offered by large providers, they are in the range of mid to high cost; MySuper is a low cost alternative to most retail funds. As of September 2019, there are 114 retail funds with $632.4 billion of assets under management (Australian Prudential Regulation Authority 2019a).

4. Industry Funds: Industry funds saw rapid growth especially after the introduction of the SG. These type of funds were originally developed as an agreement between trade unions and industry

bodies with the intention of providing retirement income to their members (Bateman 2003). However, in recent years, these funds have been offered as public offer funds which are open to the public for investments and savings. They are offered by banks, insurance and investment companies. However, unlike retail funds, these funds are not-for-profit. As a result, they charge lower administration fees than other funds, offer discounted rates for group insurance and the profits are invested back in to the fund in order to maximise the benefits to members. In order to keep the costs low, industry funds offer fewer investment options than retail funds. As of September 2019, there are 37 industry funds with $747.4 billion of assets under management (Australian Prudential Regulation Authority 2019a).

According to APRAs "The Annual Fund-Level Superannuation Statistics", issued on 20 March 2018, the following data on the number of funds for each fund type for the period 2004 – 2017 has been gathered.

Table 2.1: Number of Superannuation Funds by Fund Type

Year	Corporate	Industry	Public Sector	Retail
2004	232	68	23	225
2005	252	71	23	213
2006	140	67	22	210
2007	97	66	20	208
2008	77	61	21	201
2009	59	58	22	178
2010	48	57	21	152
2011	36	53	22	137
2012	32	50	21	127
2013	29	46	20	121
2014	27	43	19	113
2015	23	42	19	114
2016	18	41	19	105
2017	17	40	18	95

Source: Australian Prudential Regulation Authority (2018)

2.2.5 Asset Allocation of Superannuation Funds

Superannuation funds typically invest in a range of asset classes such as Australian listed equity, international listed equity, unlisted equity, Australian fixed income, international fixed income, cash, listed property, unlisted property, infrastructure, hedge funds, commodities and others. The asset allocation structure of superannuation funds with more than five members, as of September 2019 is as follows. Out of the total $2.9 trillion assets under superannuation, 50.9% was invested in equities, 21.8% in fixed income, 9.6% in cash, 14.2% in property and infrastructure and 3.5% in hedge funds and commodities. Equities is split into international listed equities (24.5%), domestic listed equities (22.2%) and unlisted equities (4.1%) (Australian Prudential Regulation Authority 2019a). There has been an increase of 2.3% in the total assets under superannuation over the September 2019 quarter and a 7.1% increase since September 2018 (Australian Prudential Regulation Authority 2019a).

In the case of MySuper funds, the asset allocation structure is similar to other superannuation funds for a single investment strategy, except that a small percentage of the total assets are invested in non-investment assets such as receivables. Also, investment in international shares is found to be slightly higher in the case of MySuper funds. For example, as of June 2019, superannuation funds allocated 24% to international shares while MySuper funds allocated 28% (The Association of Superannuation Funds of Australia Limited 2019). This trend has been observed over longer periods of time. In spite of this difference, the proportion of assets allocated to total equity is approximately the same for both type of funds, that is, approximately 50%. The asset allocation for the lifecycle investment strategy, however, differs according to age groups. For example, from Figure A.7 it can be observed that the proportion of investment in Australian and international listed equities decreases from approximately 50% to 35% in age groups of 60 and above while that of fixed income and cash increases from approximately 20% to 50%. This is to do with the risk taking ability or preference of younger versus older age groups. The proportion of investments in unlisted equity, property, infrastructure and commodity does not change much.

The asset allocation structure of SMSFs is difficult to observe from the ATO's data set as it is classified differently to APRA's regulated superannuation funds. As a result, it is also difficult to compare SMSFs to superannuation funds and MySuper products. Some highlights of SMSFs as seen in Table 2.2 include: the total estimated SMSF assets are worth $747,560 million, and the top asset types held are listed shares (30.96%), cash and term deposits (21.06%), and unlisted trusts (11.52%). The Australian Taxation Office (2019a) data also provides that the total number of SMSFs as on June 2019 is 599,678 and the total number of SMSF members are 1,125,201, member contributions amounted to $11,622 million while employer contributions were $\$5,733$ million, and around 85% of the SMSF members are 45 years or older.

Table 2.2: Asset Allocation of Self-Managed Superannuation Funds (SMSFs) as on June 2019

Asset Category	In million dollars	% of total SMSF assets
Listed trusts	37,595	5.03%
Unlisted trusts	86,101	11.52%
Insurance policies	120	0.02%
Other managed investments	37,672	5.04%
Cash and term deposits	157,455	21.06%
Debt securities	11,563	1.55%
Loans	4,952	0.66%
Listed shares	231,453	30.96%
Unlisted shares	8,186	1.10%
Limited recourse borrowing arrangements	41,310	5.53%
Non-residential real property	64,023	8.56%
Residential real property	34,493	4.61%
Collectables and personal use assets	335	0.04%
Other assets	19,380	2.59%
International shares	8,471	1.13%
International non-residential real property	129	0.02%
International residential real property	288	0.04%
International managed investments	1,150	0.15%
Other international assets	2,883	0.39%
Total Australian and overseas assets	747,560	100.00%

Source: Australian Taxation Office (2019a)

2.2.6 Structure of Superannuation Funds

Superannuation funds operate under a trust[14] structure in which the trustees of the superannuation fund have legal rights over the assets of the fund. Trustees administer the fund for the sole purpose of providing retirement, death and disability benefits to its members or their beneficiaries. A trust is established using a trust deed, which is a legal document that lays down rules for establishing and operating a superannuation fund. It also sets out the objectives of the fund, membership requirements and mode of payment for retirement benefits. A superannuation fund is, thus, governed by the trust deed and superannuation laws laid down in SISA.

The trust is usually established as a trust company and the directors of the trust company are the

[14] "A trust is an arrangement where a person or company (the trustee) holds assets (trust property) in trust for the benefit of others (the beneficiaries)." (Australian Taxation Office 2019b)

actual trustees of the superannuation fund. It is the responsibility of the board of trustee directors to run the superannuation fund. The trustee board can be composed of the main stakeholders of the fund, that is, the employer-sponsor and fund members, or professional (corporate) directors (Bateman 2009). For-profit retail funds require the appointment of a professional board of directors wherein there is no relationship between the directors and the employers or members of the fund, while not-for-profit (public sector, corporate, and industry) funds require equal representation of employer and members in the board of trustee directors (Bateman 2009).

Irrespective of the type of board structure, the duties and responsibilities of the trustees are the same. The trustees have common law fiduciary duties and statutory responsibilities towards their fund's members. According to SISA, trustees have the sole responsibility of operating and managing a superannuation fund and failure to meet their obligations can make trustees personally liable for any loss or damage caused as a result. However, to become a trustee, one has to meet the requirements or tests presented in the SISA legislation. Passing of the "fit and proper person" test[15] is essential for the appointment of a trustee. The standard APRA guidelines discuss "fit" requirements of education and technical qualifications, knowledge and skill set, and "proper" requirements of character, diligence, competence, experience, honesty, integrity, and judgement. However, there is no strict rule about these requirements; that is, the trustees have the authority to determine their own internal policies about these based on the size of the fund.

All trustees, whether a professional body or group of individuals, in order to be recognised as a regulated superannuation fund, must hold a registrable superannuation entity (RSE) license[16]. The trustee and the associated superannuation fund is then considered to be registered with APRA. Once licensed, the trustee must comply with conditions of section 29E of the SISA and the RSE license law. It is advised by the Australian Securities and Investments Commission (ASIC) that the trustee should also hold an Australian financial services (AFS) license. The AFS license gives authority to the trustees to deal with financial products, in that these licenses make trustees responsible for formulating and implementing investment strategies, determining the fund's asset allocation structure and selection of an investment manager. It also gives the right to provide financial advice.

[15] See APRA Prudential Standard SPS 520 for a detailed information Australian Prudential Regulation Authority (2013).
[16] Part 2B of the Superannuation Industry (Supervision) Act 1993 (SISA) discusses about registration of RSEs

2.2.7 Regulatory Control of Superannuation Funds

The superannuation industry was predominantly self-regulated prior to the mid-1980s. Following the introduction of the 1987 Occupational and Superannuation Standards Act (and Regulations), the Insurance and Superannuation Commission (ISC) was appointed as the regulator of superannuation funds (Bateman 2003). However, as the Australian constitution did not have powers to establish laws governing superannuation, the constitutional rights of the Income Tax Assessment Act were utilised. The only consequence of not adhering to the regulatory requirements was the removal of the tax concessional status. In 1994, the existing framework was revised to incorporate the regulations of SISA. The revised framework extended ISC's jurisdiction and regulated the duties of the trustees and all service providers attached to a superannuation fund. Changes made to the framework also enabled the imposition of civil and criminal charges on failing to meet the regulatory requirements.

1998 saw more changes to the regulatory landscape. One of the major changes suggested in the Wallis report was the establishment of a single "prudential" regulator for the entire Australian financial system, APRA. The Wallis report gave APRA the majority of the powers of the ISC, Reserve Bank of Australia (RBA) and other state and territory regulators (Bateman 2003). As stated in the Wallis report, the benefits of a single prudential regulator are several. A single authority can provide greater efficiency, improve responsiveness, use economies of scale, and increase flexibility in the management of future financial circumstances (Hanratty 1997). APRA adopts a principle-based approach instead of a rule-driven approach, which means that it focuses on the behaviours of superannuation funds in order to ensure that the trustees comply with the regulatory requirements and operational standards. This is done with the intention of promoting best practices. In addition to this, as discussed in Section 2.2.6, APRA puts forth licensing requirements for trustees, although these are non-binding.

Another outcome of the Wallis Inquiry was the establishment of ASIC. It is an independent government body which acts as the "conduct" regulator of financial services, financial markets and consumer credit market. It is set up under the Australian Securities and Investments Commission (ASIC) Act 2001 which gave it all the powers of the former Australian Securities Commission (ASC). It is also responsible for some parts of the Superannuation (Resolution of Complaints) Act 1993 and Superannuation Industry (Supervision) Act 1993 (SISA). With respect to superannuation, ASIC provides license to and monitors the conduct of superannuation funds. It is responsible for consumer protection, including disclosure, conduct and complaints, of superannuation funds. It is also in charge of issuing AFS licenses to the trustees, as discussed previously in Section 2.2.6.

The ATO also shares the supervisory responsibility of Australia's superannuation funds but only of SMSFs[17]. This is also the outcome of the Wallis Inquiry. The ATO's role, however, is limited to ensuring the compliance of SISA and other relevant regulations by SMSFs. It is not concerned with the overall soundness of SMSFs. The ATO also plays the role of providing tax concessions to complying superannuation funds under the Income Tax Assessment Act 1997. Any non-complying superannuation fund is penalised at the highest marginal tax rate and is not granted tax concessions. ATO also administers the SGAA wherein employers not providing SG contributions are penalised with the SG charge, discussed in Section 2.2.2.

2.3 Background on Developed, Emerging and Frontier Markets

There is no established convention for classifying countries into developed, emerging and frontier markets. Different organisations use different methodologies and indicators for this purpose[18]. For example, the World Trade Organisation (WTO) allows member countries to identify themselves as developed or developing. In the case of least-developing countries, it follows the United Nations (UN) classification. According to the UN, least developed countries are low-income countries that are facing severe hurdles to sustainable growth and development. They are classified in this category on the basis of gross national income (GNI) per capita according to the Human Assets Index and Economic Vulnerability (United Nations 2019b). The World Bank, on the other hand, uses income group categories such as low, lower middle, upper middle and high-income to classify countries. Companies like MSCI, FTSE, and S&P classify countries into developed, emerging and frontier markets based on their level of economic and financial development; however, there is no unified methodology among them. Their country classification methodologies are discussed in Chapter 4 and presented in Table B.2, Table B.3,

[17] Section 2.2.2.1 discusses self-managed superannuation funds (SMSFs).

[18] Since there is no consensus on how countries are classified, there are situations where a country can be classified as an emerging market by one organisation and frontier market by another. Naming conventions also vary due to this reason. Emerging markets are also called developing countries or economies, and frontier markets can be referred to as least-developing or under-developed countries. Some countries are identified as transition economies. These are countries that have characteristics that allow them to be placed in either category. The words "countries" and "economies" are also used interchangeably.

and Table B.4. They use different indicators such as GDP per capita, openness of financial markets, operational efficiency, regulatory environment, trading and settlement mechanism, market size, etc. to identify the level of development of countries and accordingly categorise them.

For the purpose of this thesis, a joint country classification, based on the country classifications of Table B.2, Table B.3, and Table B.4 is used. A detailed discussion of the JCC is presented in Section 4.3. From the JCC table, 22 developed, 21 emerging and 17 frontier markets countries were selected for this thesis. These markets are further sub-categorised based on their regional location into Americas, EMEA and Asia-Pacific. A regional country classification of the countries used in this thesis is presented in Table B.6. The following sub-sections outline the broad economic and financial characteristics of developed, emerging and frontier markets, performance of stock markets, and country-level governance performance to set the scene for empirical analysis in upcoming chapters.

2.3.1 Gross Domestic Product (GDP)

The average annual GDP growth rate of countries classified as emerging and frontier markets are higher than those classified as developed markets. According to the World Bank's database (World Bank 2018), the world GDP growth rate for 2018 is 3.0%. Within that, North America[19] is growing at 2.8%, the European Union[20] at 2.0%, Central Europe[21] at 4.3%, the Middle East and North Africa (excluding high income countries)[22] at 3.0%, East Asia and the Pacific (excluding high income nations)[23] at 6.3%, and South Asia[24] at 6.8%.

On comparing the 2018 individual annual GDP growth rate of some countries in developed, emerging and frontier markets, it can be noted that the growth rate of developed countries such as the United

[19] Includes the United States and Canada.

[20] This includes Sweden, Slovenia, Slovak Republic, Romania, Portugal, Poland, the Netherlands, Malta, Latvia, Luxembourg, Lithuania, Italy, Ireland, Hungary, Croatia, Greece, the United Kingdom, France, Finland, Estonia, Spain, Denmark, Germany, the Czech Republic, Cyprus, Bulgaria, Belgium, and Austria.

[21] Based on World Bank's classification, Central Europe includes Slovenia, the Slovak Republic, Romania, Poland, Latvia, Lithuania, Hungary, Croatia, Estonia, the Czech Republic and Bulgaria. Based on JCC, these are identified as frontier markets in this thesis.

[22] Middle East and North Africa includes Yemen, Tunisia, the West Bank and Ghana, Morocco, Libya, Lebanon, Jordan, Iraq, Egypt, Algeria, Djibouti, Iran and the Syrian Arab Republic. According to JCC, these countries are either emerging or frontier markets in this thesis.

[23] Includes Samoa, Vanuatu, Vietnam, Tuvalu, Tonga, Timor-Leste, Thailand, the Solomon Islands, Papua New Guinea, the Philippines, Nauru, Malaysia, Mongolia, Myanmar, the Marshall Islands, Lao PDR, Kiribati, Cambodia, Indonesia, Micronesia, Fiji, China, American Samoa, and Korea.

[24] South Asia includes Pakistan, Nepal, the Maldives, Sri Lanka, India, Bhutan, Bangladesh and Afghanistan.

States (2.9%), Canada (1.9%), Sweden (2.4%), the Netherlands (2.6%), the United Kingdom (1.4%), France (1.7%), Germany (1.4%), and Austria (2.7%) are substantially lower than emerging and frontier markets. Some emerging markets are growing at: India (7.0%), Thailand (4.1%), the Philippines (6.2%), Malaysia (4.7%), Indonesia (5.2%), China (6.6%), Hungary (4.9%), and the Czech Republic (3.0%). A few frontier markets are growing at: Bangladesh (7.9%), Sri Lanka (3.2%), Vietnam (7.1%), Bulgaria (3.1%), Estonia (3.9%), and Romania (4.1%).

Historically, however, the average GDP growth rate between 1980 – 2005, prior to the GFC, of North America was 3.1%, the European Union was 2.3%, Central Europe was 2.5%, the Middle East and North Africa (excluding high income countries) was 3.03%, East Asia and the Pacific (excluding high income nations) was 7.8%, and South Asia was 5.6%. Post-GFC, that is, after 2009, the average GDP growth rate of developed economies has fallen while emerging and frontier economies are either the same as before the GFC or have increased. The average GDP growth rate from 2010 to 2018 for North America is 2.2%, the European Union is 1.6%, Central Europe is 2.9%, the Middle East and North Africa (excluding high income countries) is 2.8%, East Asia and the Pacific (excluding high income nations) is 7.3%, and South Asia is 6.7%.

The 2020 projections, according to the UNs International Monetary Fund (2019b), in regard to global GDP growth rate is 3.5%, which is 0.3% higher than the previous year. Within that, developed markets are expected grow at 1.7% and emerging markets at 4.7%. However, this projected growth largely depends on the stability and recovery of stressed economies. It is expected that around 70% of this projected growth will come if stressed economies of Argentina, Turkey, Iran and Venezuela manage to remain stable. Argentina's annual growth rate for 2018 stood at −2.5% and Venezuela at −3.9%. Although Argentina is showing signs of recovery, the expectation for 2020 is a modest recovery, whilst the scene for Venezuela is not positive. Venezuela's economy shrunk around 35% in 2019 due to a humanitarian crisis and economic implosion, and signs of recovery are not visible. Iran's growth rate stands at a modest 3.8%; however, stringent sanctions imposed by the US are damaging the economy.

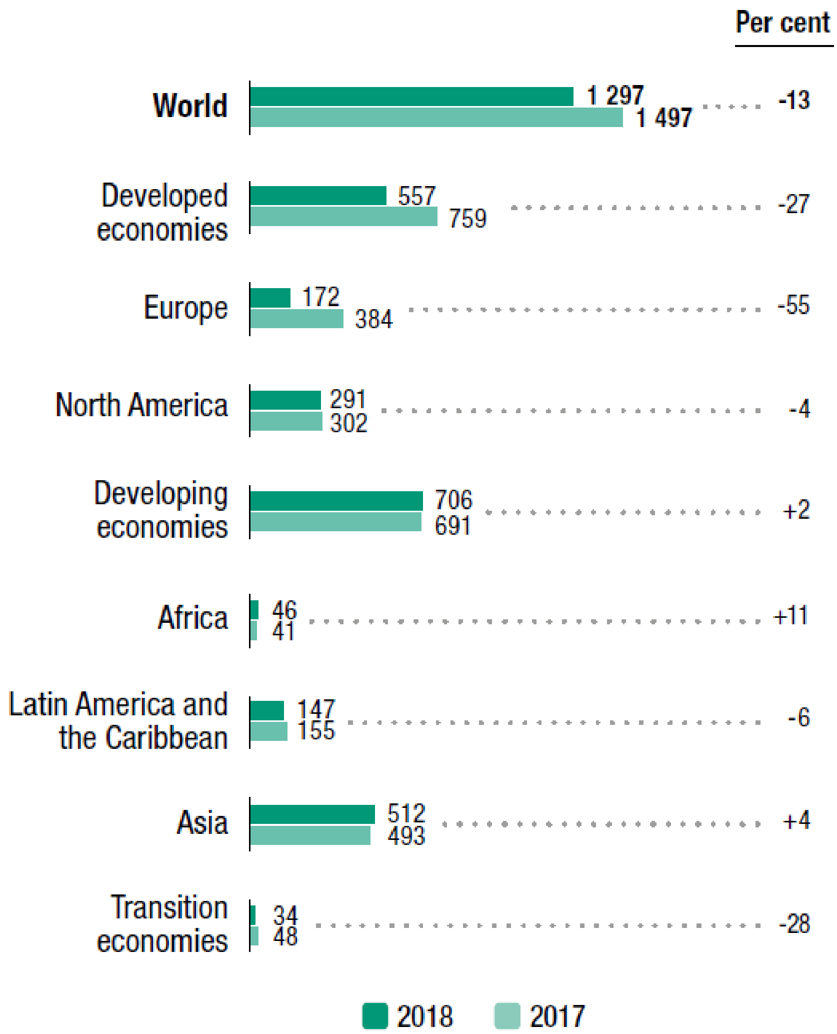
2.3.2 Foreign Direct Investment (FDI) Inflows

According to the United Nations Conference on Trade and Developments (UNCTADs) United Nations Conference on Trade and Development (2019), global FDI inflows fell by 13% in 2018. The decline, however, had started in 2015 when the total global FDI inflows were approximately $2.0 trillion. In 2017, it fell to $1.5 trillion and then took a further 13% fall in 2018, see Figure 2.2. Downfall in global inflows was primarily due to a huge 27% decline in developed markets. One of the main reasons for this decline was the change in tax reforms in the US at the end of 2017 which led to large-scale repatriations by US multinational companies in the first half of 2018. Both the United Kingdom (UK) and Europe, experienced a sizeable decline in FDI inflows, though mergers and acquisitions rose by 21% in value. Flows to the US, however, declined only marginally, by 9%, which was largely due to decline in sales of international mergers and acquisitions.

Developing markets, on the other hand, experienced an increase in inflows. Inflows to developing countries in Asia increased by 4%. Of these, China received $139 billion dollars, making it the largest recipient (United Nations Conference on Trade and Development 2019). Greenfield investment projects saw a brief pause in 2017 but have nearly doubled since then, especially in the Asian region to $212 billion. FDI to African markets has increased to $46 billion, an increase of 11%, by those seeking resources or for diversification. Latin America and the Caribbean, on the other hand, experienced a 6% decline in FDI inflows. Flows to Brazil and Colombia, in particular, were impacted. With regard to transition economies, Russia was the largest country affected. Inflows dropped from $26 billion in 2017 to $13 billion in 2018 (United Nations Conference on Trade and Development 2019).

According to the United Nations Conference on Trade and Development (2019), short-term FDI projections for 2019 look positive. There is expected to be a 10% growth in global FDI. This is mainly due to a 41% increase in greenfield project announcements. The projected increase is the highest for developed markets, particularly Europe, which is expecting 60% increase in FDI inflows. Inflows to developing countries are also favourable but do not show a significant increase, approximately 5%. Africa, in particular, is expected to receive inflows in view of expected acceleration of economic growth. Outlook for South-East Asia is favourable too, however, the view for Latin America and the Caribbean is not optimistic. In spite of this positive outlook, long-term FDI inflow projections remain weak. A declining trend in FDI due to decrease in rate of return on investment is one reason why there is a global slowdown in FDI inflows. Geopolitical risks, trade tensions, a move towards protectionist policies, and restrictions on foreign ownership either due to security concerns or strategic technologies are other factors that are likely to affect inflows in the long-term (United Nations Conference on Trade and Development 2019).

Figure 2.2: Foreign Direct Investment Inflows, by Region, 2017-2018



Source: United Nations Conference on Trade and Development (2019)

2.3.3 Inflation

The rate of inflation affects a country's growth rate. A decrease in inflation is associated with an increase in the GDP growth rate and vice-versa. The steep year-on-year rise in energy prices impacted several countries in the first half of 2017. However, this was only a transitory change which lasted until mid-year 2017. Long-term inflationary expectations for developed markets hinted towards an upward rise. Japan saw a rise in inflation level to above zero, and the US and UK inflation levels exceeded the central bank's target level of 2%. Average inflation levels in developed markets were 1.5%, higher than 2016 but still lower than central banks' targets (United Nations 2018). In developing countries and those in transition, inflation pressures were easing. Due to this, several countries in South America, Africa and the Commonwealth of Independent States (CIS) were able to reduce interest rates and, thus, boost economic activity. South Africa and the Russian Federation also saw a recovery in their exchange rates, which were facing severe depreciation in the previous years of 2015 – 2016. Lower inflation levels also lowered food price levels in many African countries; however, droughts and agricultural deficits drove the prices up in the first half of 2017. Despite an overall decline in inflationary pressures in developing countries, inflation levels in several countries of Africa and the CIS, in particular, were much above the target levels of their central banks.

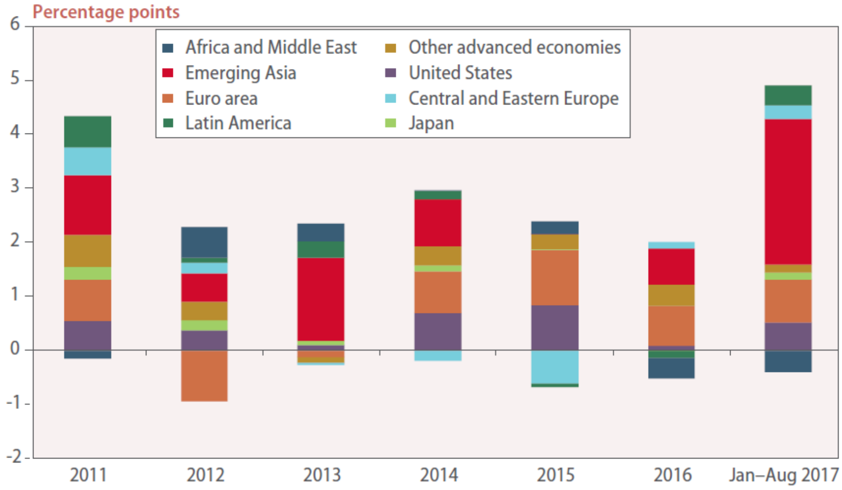
Inflation forecast for developed markets for 2018 – 2019 was benign. As a result, in March 2019, the US Federal Reserve did not proceed with the previously intended interest rate hike. Members of the Federal Open Market Committee voted to put off the next interest rate hike until 2020 (United Nations 2019c). However, as US inflation rates are sensitive to movements in oil prices, there is a possibility that an increase in oil prices will trigger the inflation rate. Should this happen, the US Federal Reserve will have to reconsider the appropriate level of interest rate. Japan also continued its quantitative easing programme, which it had introduced in 2012, with the intention of meeting its target inflation rate of 2% by 2019. Despite the effort, Japan's inflation rate stood merely at 0.5% in March 2019 (United Nations 2019c). The European Central Bank, also with the intention of increasing credit in the market, introduced longer-term refinancing operations and delayed interest rate hikes until 2020.

In developing East Asian countries, monetary policies are likely to stay geared to easing. In China, the People's Bank of China reduced reserve requirements for banks in order to create more liquidity in the market. Indonesia and the Philippines also maintained interest rates at the same level as it was in early 2018. Many policy-makers are finding the task of supporting growth in economic activity in the short-term extremely challenging. They are being very cautious in their monetary policy decisions as keeping interest rates low is increasing the levels of corporate debt and risk of un-leveraging in the future. Similar actions were taken by developing countries like India, Egypt, Latin America and Africa. Inflation levels in India rose by 4.7% due to which the Reserve Bank of India reduced interest rates by 0.25% in February and April 2019 (United Nations 2019c). However, this is not likely to create a significant impact on the Indian economy as a large share of loans are sanctioned by non-bank institutions. The 2019 inflation growth in Pakistan is 7.3% while Iran is expected to surpass 20%. The average growth rate in inflation in South Asia is expected to be 4% in 2019 (United Nations 2019c). In 2019, many countries in Africa, such as Ghana, Egypt and Nigeria, have also lowered interest rates in order to increase economic activity. This decision comes from the overall low risk of inflation within the region and with the intention of bringing more stability in exchange rate movements. Despite these actions, the level of inflation of some countries in the region remains at a much higher level than the central bank's target levels. For example, in Zimbabwe the inflation rate in March 2019 was 66.8%: the highest since 2008. Introduction of the new currency did not help Zimbabwe in resolving issues related to food inflation as staple items such as sugar, rice and cooking oil were costlier by 60% (United Nations 2019c). Similar inflation levels were experienced by Sudan and South Sudan. Likewise, developing countries of Latin America, such as Brazil, Colombia and Chile, also experienced ease of inflationary pressure, which led to stable exchange rates and improved agricultural production. However, in Argentina and Venezuela, the situation is very severe. Both countries are facing hyperinflation, food shortages, fiscal deficits and accelerated currency depreciation. Inflation in Argentina increased by 51.4% over the previous year up to early 2019 (United Nations 2019c).

2.3.4 International Trade

World trade volume grew by 3.7% in 2017 after sluggish flows in 2016 (United Nations 2018). This growth was largely due to emerging Asia's substantial 60% contribution to global merchandise imports which was prompted by increased demand within the region and policy stimulus measures to increase imports, see Figure 2.3.

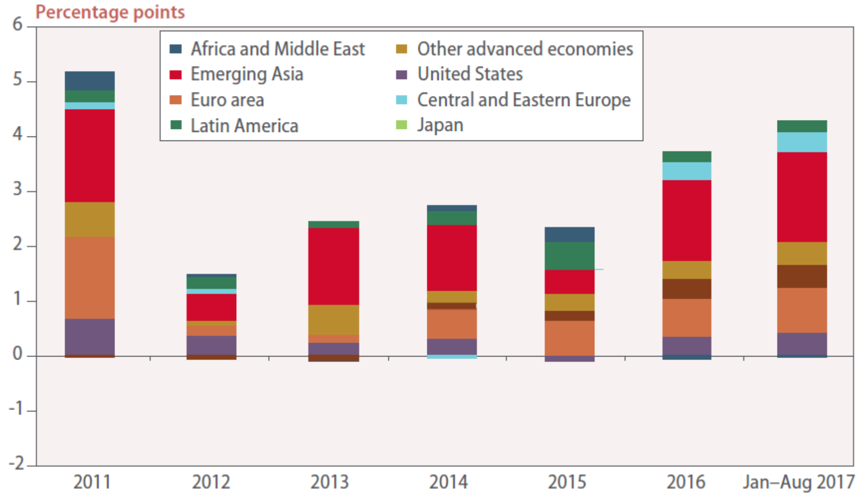
Figure 2.3: Global Merchandise Imports Volume by Region



Source: United Nations (2018)

Import demand also increased in Latin America especially when Argentina and Brazil started emerging out of recession. The Middle East and Africa, on the other hand, faced loss of demand for their commodity-related imports. Investment prospects in The Organization of the Petroleum Exporting Countries (OPEC) also weakened. Political uncertainty was one the main factors affecting this entire region's investment activity. The Euro area also contributed to the total increase in world imports. In terms of exports, emerging Asia, Latin America, the US and the Euro area were the largest contributors to world export growth (refer to Figure 2.4).

Figure 2.4: Global Merchandise Exports Volume by Region



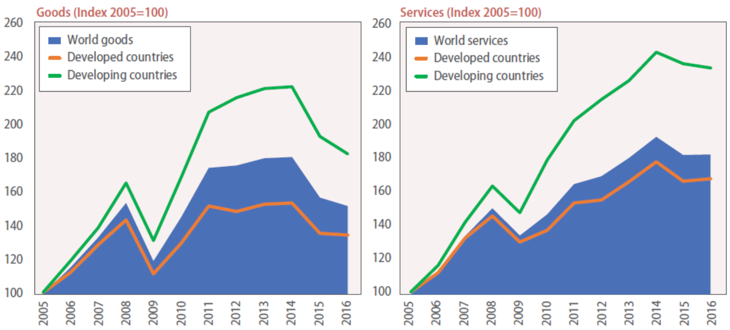
Source: United Nations (2018)

In emerging Asia, the largest exports were related to electrical and electronic products. Contribution to world exports from the US came due to weakening of the US dollar. Recovery in world trade led to an increase in the world industrial output and the Global Manufacturing Purchasing Managers' Index[25] in 2017.

Trade in services, on the other hand, was found to boost overall international trade. Between 2005 – 2016, the total value of services exports surpassed the total value of goods exports, both in developed and developing countries. From Figure 2.5, it is also evident that trade in services bounced back quickly after the 2015 slow down, while trade in goods declined further. In terms of value as well, trade in services is higher than trade in goods. Developing countries are a large contributor to services exports. Their share of global services export has grown by 6% between 2005 – 2016, mainly in construction, travel, transport, telecom, information and communications technology, and financial services (see Figure 2.6). Developed countries, on the other hand, have contributed less to total services exports. Their average annual growth rate between 2008 – 2016 has been close to 2% mainly in telecom, information and communications technology, and other business services, see Figure 2.7.

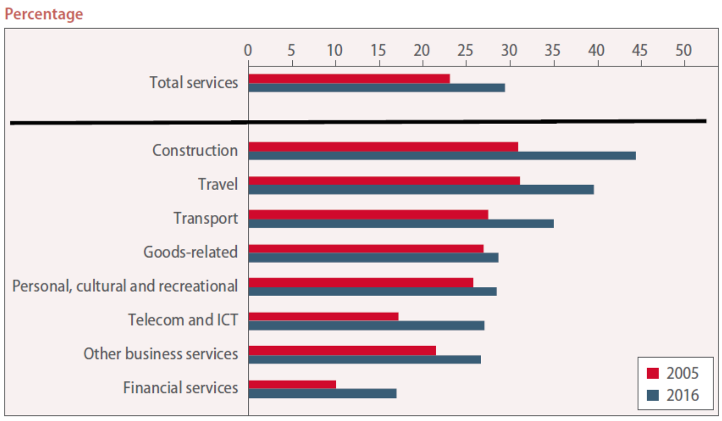
[25]The Global Manufacturing Purchasing Mangers' Index is an economic indicator that measures the direction of economic trends in the manufacturing and services sectors. It is designed to indicate the view of purchasing managers on market conditions: whether the market is expanding, contracting or staying the same. A reading of 50 indicates that market conditions will stay the same, higher than 50 indicates improvement, that is, expansion, and lower than 50 indicates a decline, that is, contraction of the market.

Figure 2.5: Goods and Services Exports (values) by Country Groupings



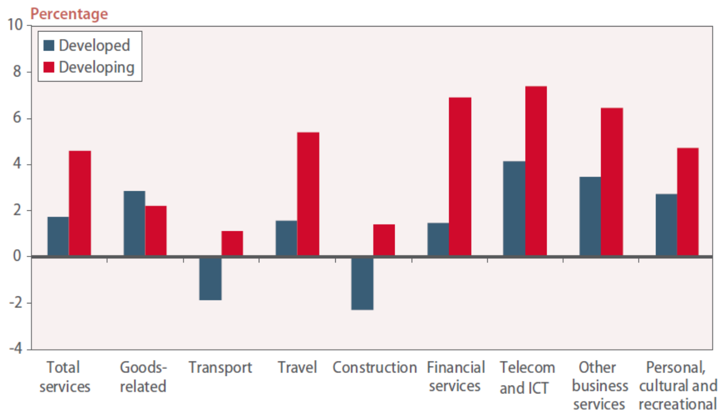
Source: United Nations (2018)

Figure 2.6: Global Services Exports by Category: Developing Markets



Source: United Nations (2018)

Figure 2.7: Annual Growth Rate of Global Services Exports by Category: Developed Markets

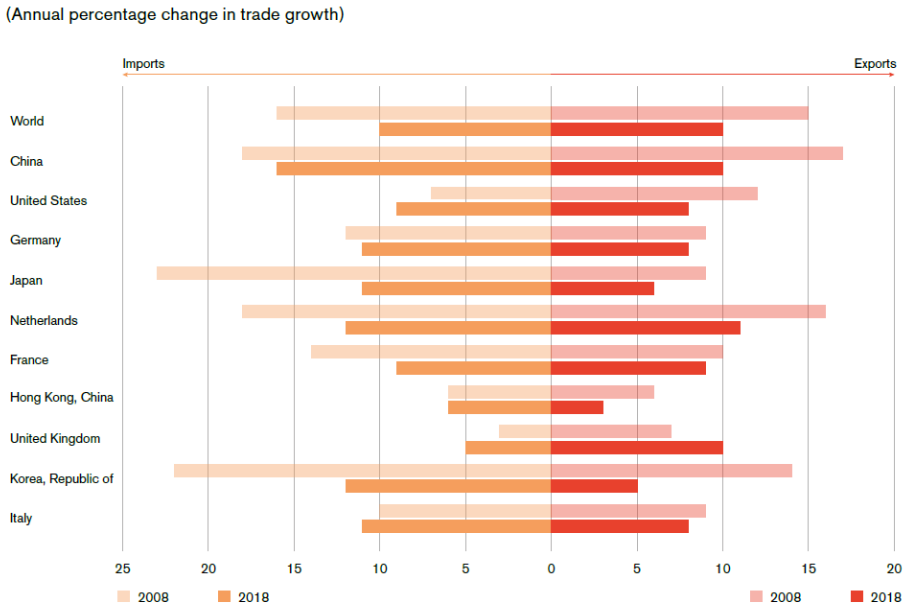


Source: United Nations (2018)

According to the International Monetary Fund (2019b), future prospects of growth in world trade rely to a large extent on the US's tariff imposition, retaliation of China and other trading partners, and the UK's withdrawal from the European Union. In May 2019, the US imposed a tariff on China's technology companies aggravating trade tensions between the two nations. It also threatened Mexico with the likelihood of imposing higher taxes if it failed to take measures to reduce cross-border migration. Talks about renegotiating The North American Free Trade Agreement (NAFTA) and trade agreements with other trading partners raised concerns about the retaliatory measures and acceleration in trade barriers. Similarly, the UK's decision to exit the European Union can deteriorate business and investment activity within Europe. Situations like these weakens confidence and dampens investment prospects which creates a slow down in international trade. This is exactly what was observed in 2018. World trade and GDP growth rate slowed down in 2018 due to trade tensions. Volume of world merchandise trade dropped from 3.9% in the first six months of 2018 to 2.7% in the second six months (The World Trade Organization 2019). The slow down became evident with each quarter. Trade tensions, as mentioned earlier, was the main factor contributing to this slow down; however, shutdown in the US, and issues with production in Germany's automobile sector, etc. added to the slowdown. The largest contributors to the 2018 merchandise trade were from China, the US and Germany; together they represented 53.3% of the total world trade. The top five accounted for 38.1% while the remaining five accounted for 15% (The World Trade Organization 2019). China was the world's leading merchandise trader. Its share of total exports was 13%, amounting to US$2.49 trillion and imports was 11%, amounting to US$2.14 trillion. The US was the top importer of merchandise trade with total imports worth US$2.61 trillion, an increase of 8.5% in 2018. Its exports increased by 8%, amounting to US$1.66 trillion. Germany was the top third merchandise trader with exports worth US$1.65 trillion, up by 8%. Japan, the Netherlands, France, Hong Kong, the UK, Korea and Italy took the remaining seven positions in global ranking, see Figure 2.8.

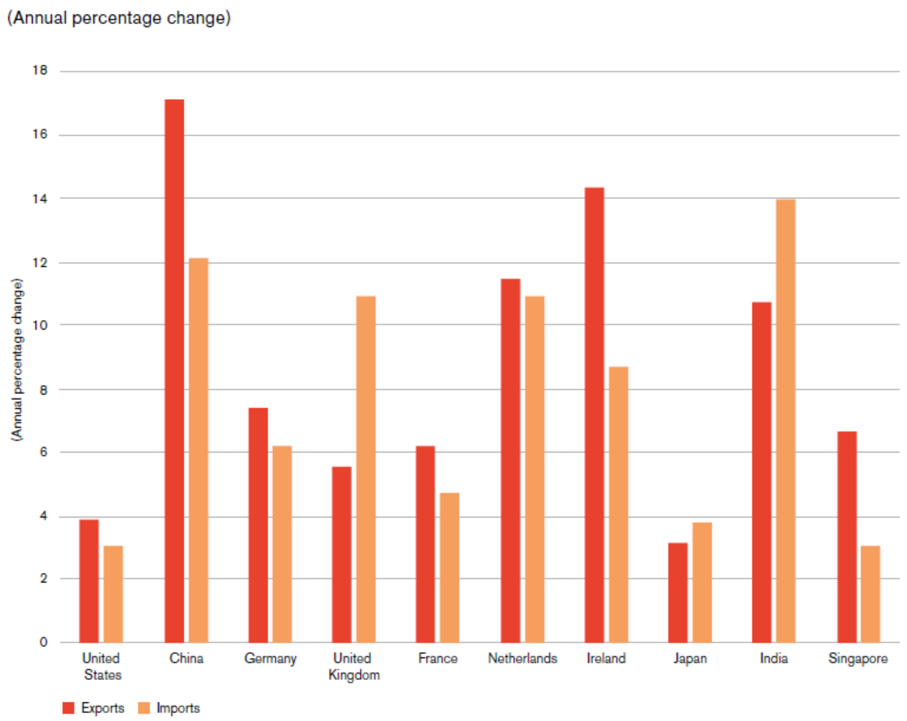
Trade in commercial services, on the other hand, rose by 8%, valued at US$5.63 trillion (The World Trade Organization 2019). The US was the leading commercial services trader in 2008 and 2018. Its total share in world services exports was 14% and 9.8% in imports in 2018. Since it has been a net exporter since 2008, its trade surplus has doubled from US$13.4 billion to US$27.2 billion. China came in as the second largest commercial services trader, surpassing Germany, the UK, France, the Netherlands and Japan from 2008. Its exports recorded the strongest growth by 17% and imports rose by 9.5%, see

Figure 2.8: Leading Merchandise Traders, 2008 and 2018



Source: The World Trade Organization (2019)

Figure 2.9: Leading Commercial Services Traders, 2018



Source: The World Trade Organization (2019)

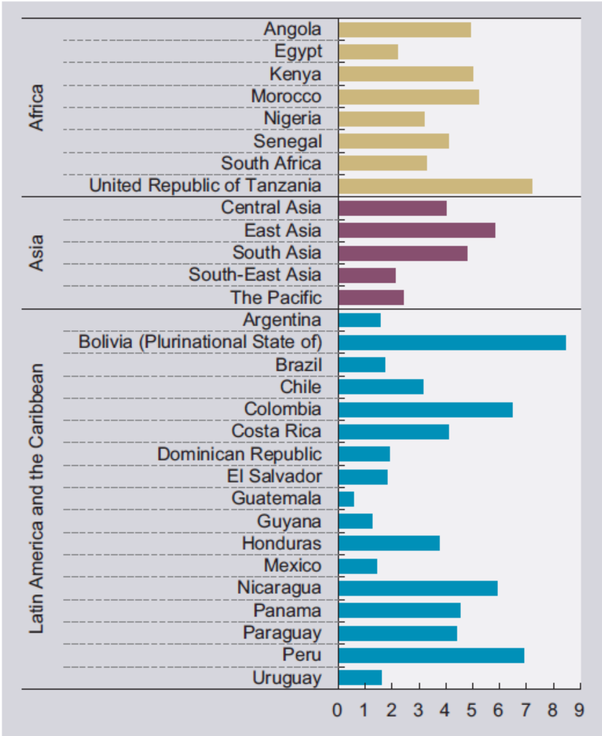
Figure 2.9. Germany maintained third position; however, its exports have declined since 2008. India is another developing country which was among the top ten commercial services traders in 2018. India took the eighth position as the largest services exporter and tenth as the largest services importer. It recorded 9% growth in business related services exports and 7% in telecom, computer and information services (The World Trade Organization 2019).

2.3.5 Infrastructure and Public Welfare

Building resilient and sustainable infrastructure is goal number 9 from the 17 Sustainable Development Goals of the UN. This is because infrastructure development is directly linked to economic growth. It has been long recognised by economists that infrastructure brings transformative shifts in the economy. This has been evidenced with the development of the canal network in England. Deng (2013) found that a 10% increase in infrastructure investment led to a 4% increase in productivity. He also found that when infrastructure investment declines, output per capita of a country also declines. Infrastructure development is also linked to social development and climate action. Despite being a necessity, a few emerging and several frontier markets do not have access to roads, information technology, communication, sanitation, electricity and water. According to the United Nations (2019a), around 3 billion people do not have access to sanitation facilities, approximately 16% of the world population do not have an internet connection, and for every 10 people, 3 people do not have access to safe drinking water.

According to the The Group of Twenty (G20) estimates, developing countries will be required to shell out US$1.5 trillion per year until 2030 to achieve the above-mentioned UN goals (United Nations 2019a). However, the investment needs may vary from country to country. As of 2015, the investment needs as a percentage of GDP are presented in Figure 2.10. In Africa, except Egypt, most countries spent more than 2% of their GDP on infrastructure development in 2015. In Latin America, however, countries like Argentina, Brazil, and Mexico do not spend more than 2% of GDP while Bolivia, Colombia and Peru spend at least 7% of GDP. In the Asian region, on one hand, East Asia spends a reasonable percentage of their GDP on infrastructure and in that China is the dominant country, spending around 6.8%. On the other hand, South-East Asia spends just around 2% mainly because many of these countries have still not fully recovered from the 1997 Asian financial crisis.

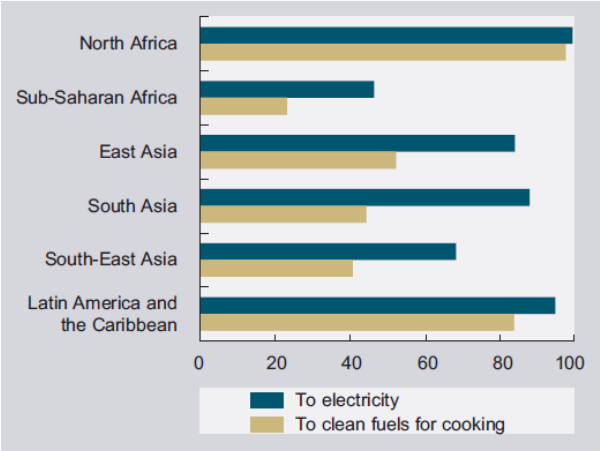
Figure 2.10: Infrastructure Investment as a Percentage of GDP



Source: United Nations Conference on Trade and Development (2018)

According to the Global Infrastructure Hub (2017), Latin American countries will require more investment, especially, in transportation as it has been largely overlooked. In Africa, both the transport and energy sectors require large scale investments to bring improvements. Asia's financing needs lie mainly in the energy sector, followed by the transport sector. From Figure 2.11, it can be noted that in order to provide access to energy and clean cooking fuel to the entire population, most regions are required to invest heavily.

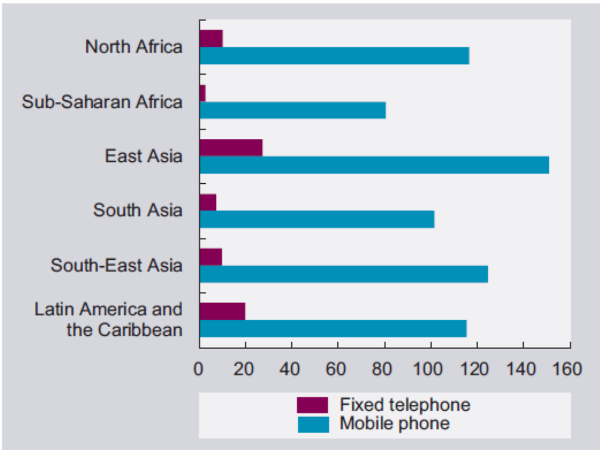
Figure 2.11: Energy Access as a Percentage of Total Population



Source: United Nations Conference on Trade and Development (2018)

From Figure 2.12 it is evident that, even though telephone connectivity has become essential in today's times to take advantage of digital technologies, many regions still do not have access to fixed phone lines. There has been significant growth in terms of mobile phone subscriptions but it has still not reached the entire developing region.

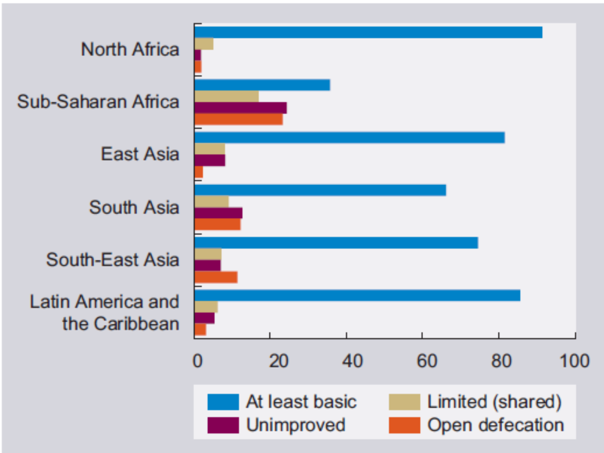
Figure 2.12: Telephone Access, 2016 (subscriptions per 100 people)



Source: United Nations Conference on Trade and Development (2018)

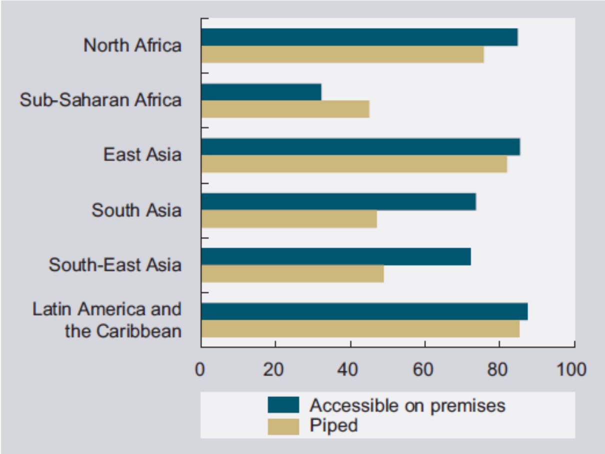
The 2010 UN General Assembly recognised sanitation and access to clean drinking water as a human right and called for efforts from around the world to provide this. Provision of clean water and sanitation is also a part of the UN Sustainable Development Goals for 2030. In 2012, the World Health Organisation (2019) found that for every US$1 that was invested in improving sanitation facilities, there was a US$5 return in the form of reduced health costs and improved productivity. As of 2015, around 70% of the world's population have access to at least basic sanitation facilities, see Figure 2.13. And, as of 2017, 45% have access to safely managed sanitation facilities (United Nations 2019a). The challenge, however, is that even today nearly 2 billion people do not receive even basic sanitation and 60% of total diarrhoeal deaths in low and middle income countries is due to lack of these facilities. For example, in Nigeria, around 60% of the rural population do not have easy access to a water source. They have to travel for approximately 30 minutes or more to reach a source. In Ecuador, drinking water is accessible but the water is contaminated. A similar situation is experienced in Indonesia, where only 5% of the urban water is safe for consumption. Figure 2.14 shows that regions of Sub-Saharan Africa, South Asia and South-East Asia do not have access to piped drinking water in their homes. According to the United Nations (2019a), universal provision of clean and safe drinking water seems plausible; however, sanitation may require additional effort.

Figure 2.13: Sanitation Facilities Access, 2015 (percentage of total population)



Source: United Nations Conference on Trade and Development (2018)

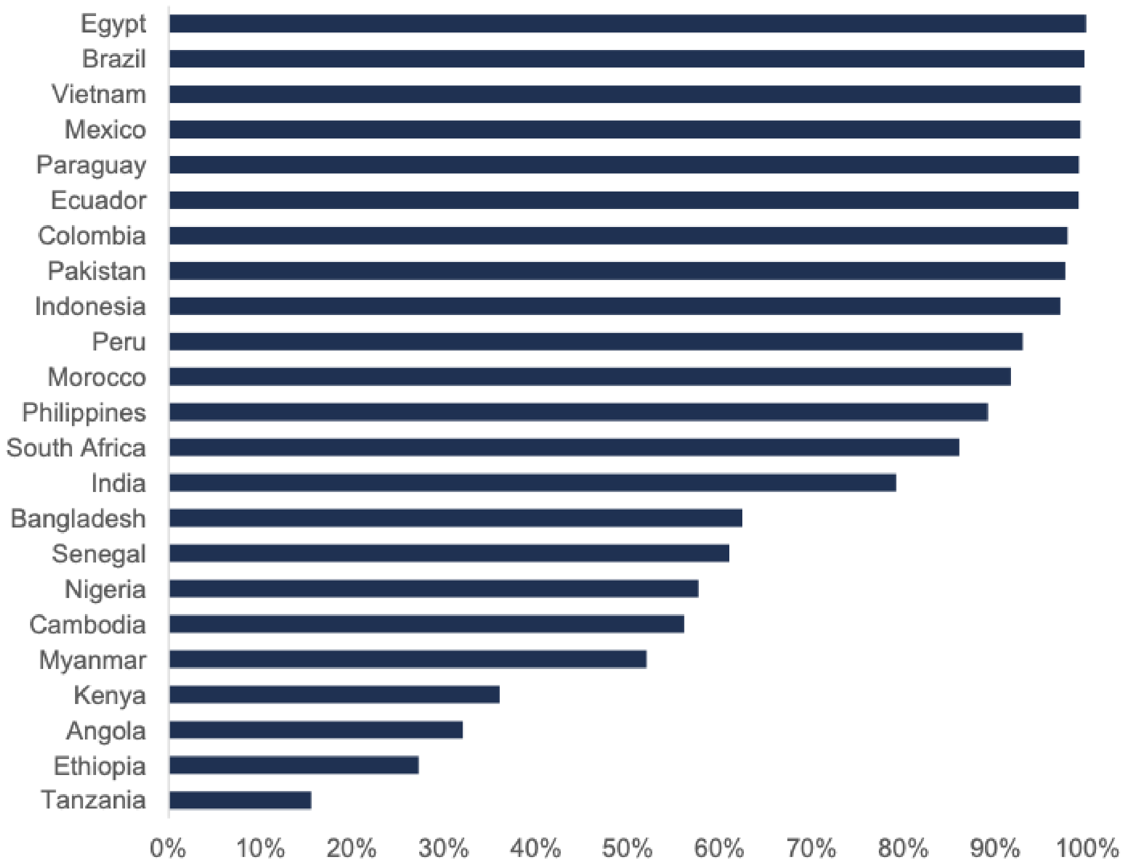
Figure 2.14: Safely Managed Water Supply Access, 2015 (percentage of total population)



Source: United Nations Conference on Trade and Development (2018)

In terms of electricity, from Figure 2.15 it can be noted that in low income and less developed nations access to electricity is lower. While most of these countries will require between 0.4% – 3% of their GDP to obtain electricity access for their entire population, countries like Kenya (5.9%), Tanzania (6.2%) and Ethiopia (16%) have much higher investment requirements as a percentage of their GDP (Global Infrastructure Hub 2017).

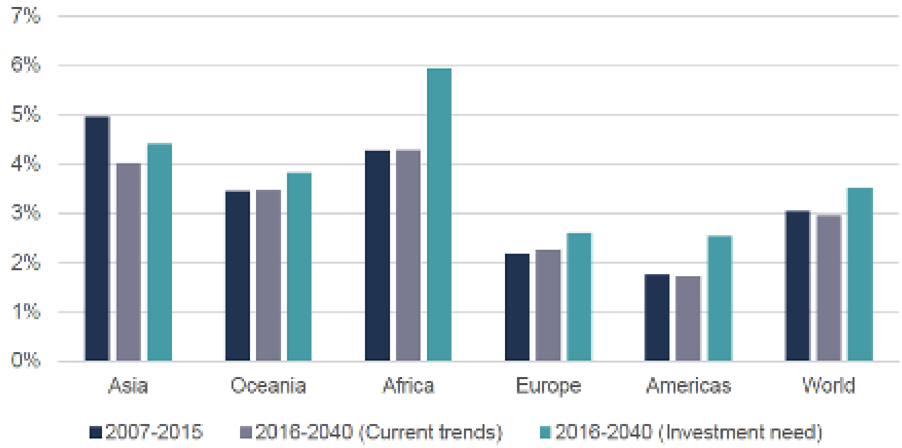
Figure 2.15: Population with Electricity Access, 2014



Source: United Nations Conference on Trade and Development (2018)

The projected needs of most of the above-mentioned economies are higher that their current spending. According to the Economic Commission for Latin America and the Caribbean (2017), an average of 6.2% of the annual GDP will be required by the Latin American region against the 2015 average of 3.2%. Africa will need 5.9% of their regional GDP (African Development Bank 2018) and Asia will require 5% of their regional GDP over the years 2016 – 2030 (Asian Development Bank 2017). Within Asia, China spends heavily on infrastructure so it may not be required to invest at the same rate in the coming years. Infrastructure needs of Europe are much lower as a percentage of its GDP, less than 3% (see Figure 2.16), as it is a well-developed region and infrastructure investment is required for upgrade and maintenance rather than new development. Oceania, comprising the developed countries of Australia and New Zealand, already invests strongly in infrastructure, more than 3% of their GDP, so their future investment needs are similar to the present and also mainly for maintenance and upgrades.

Figure 2.16: Global Infrastructure Spending by Region (percentage of GDP)



Source: Global Infrastructure Hub (2017)

In dollar amounts, if countries want to compete with their best performing peers and match their infrastructure performance, then an annual investment of US$3.7 trillion will be needed (Global Infrastructure Hub 2017). However, many of these developing and under-developed countries are in infrastructure deficits. In order to meet their future investment needs, money will have to flow in from private sources, both domestic and international. Private sector engagement in infrastructure investment was approximately US$160 million in 2009 and has been growing since but only in some regions. In Africa, between 2001 – 2006, 38% of the infrastructure funding came from the private sector and based on its current investment needs, discussed above, more private funding is required. In Asia, however, private funding plays a large role, especially, in the telecom and energy sectors (Asian Development Bank 2017). Within Asia, India and South Asia receive large sums of private funding while East Asia relies heavily on public funding (Asian Development Bank 2017).

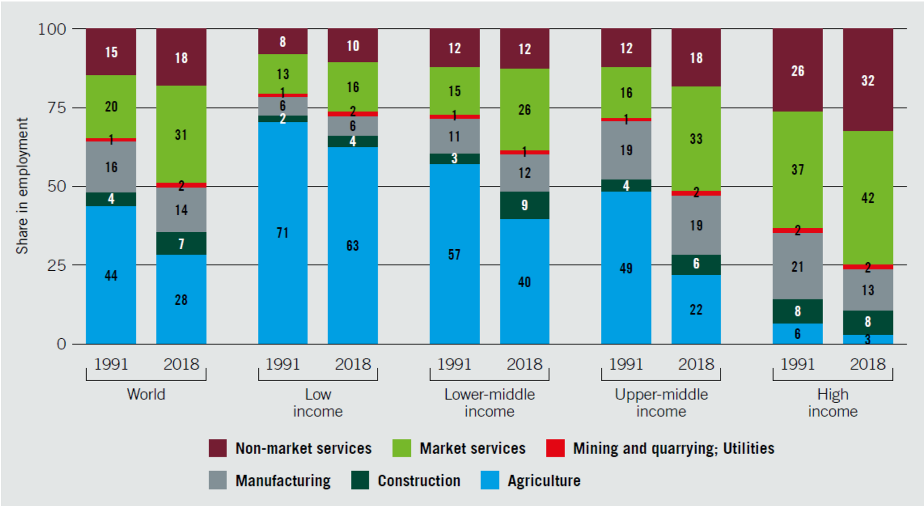
2.3.6 Labour Market and Unemployment Rate

In 2018, according to the International Labour Organization (2019), the working age population was 5.7 billion people, out of which 3.3 billion were employed and the remaining 172 million were unemployed. The global unemployment rate corresponds to 5%. The remaining 2.2 billion people were either engaged in education, retirement or unpaid care work. Within this group were 140 million people who were identified as underutilised labour or potential labour force. This includes people who were not available for employment but looking for a job or those who were available but not looking for a job. This category includes 85 million women and 55 million men. The labour force participation rate among adults aged 15 – 24 is experiencing a noticeable decline of 42% in 2018. Increased emphasis on education, greater retirement opportunities and increased life expectancy are some of the possible reasons for this decline. Participation in both secondary and tertiary education has increased between 1993 and 2017. Secondary education rose from 55% to 77% in 2017 while tertiary education rose from 14% to 38%.

Increased participation in education, however, cannot be directly related to a decrease in youth participation. Categorisation of countries by income level shows that in high-income and upper-middle-income countries, the participation of youth in employment has decreased since 1993. The youth labour force participation rate is between 44 – 45% in both groups of countries as of 2018 whereas tertiary education stands at 77% in high-income countries and at 52% in upper-middle-income countries (International Labour Organization 2019). In low-income countries the youth labour force participation rate is the highest at 57% while in lower-middle-income countries, it is the lowest at 36% even though tertiary education participation is only 24% (International Labour Organization 2019). These statistics show that across income groups the impact of educational involvement is limited on youth labour force participation, although these results may be different for different countries. Decrease in labour force participation is a concern as it is creating increased dependency on society, which is posing challenges to the government in fair distribution of resources such as the Age Pension and superannuation.

A decrease in global employment can also be due to a shift from agriculture to other sectors, especially in upper-middle-income and high-income countries, see Figure 2.17. Low-income countries continue to focus on agriculture. As of 2018, 63% of the work force is employed in the agricultural sector and this has not changed much since 1991. Around 40% of the work force of the lower-middle income countries works in the agricultural sector. These countries have seen a slight drop since 1991 when 57% of the work force was employed in this sector. For these countries, the emphasis has shifted to construction and market services. A big shift from agriculture to market services is seen for high-income and upper-middle-income countries between 1991 and 2018.

Figure 2.17: Employment by Aggregate Sectors, 1991 and 2018 (percentages)

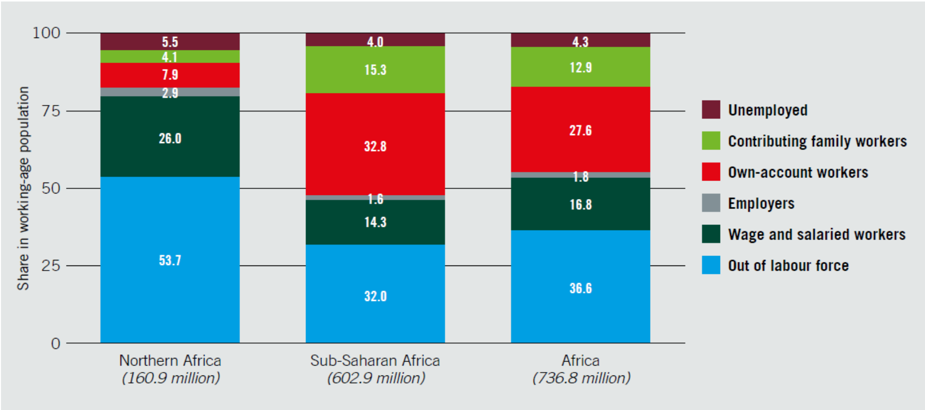


Source: International Labour Organization (2019)

2.3.6.1 Africa

Regional and country level employment levels are varied and depend on the level of development and employment opportunities available. Africa accounts for 17% of the world's total population. 59% of the total population falls into the working age group, which corresponds to 764 million. The labour force participation from this group ranges from 46 – 68% across Africa. In spite of having a high percentage of labour force participation, the economy is struggling. A high level of employment is not necessarily a sign of a well-functioning economy, especially in the case of Africa, as unemployment is not an option for them, see Figure 2.18. As discussed earlier, although the economy of many African countries is growing at a faster rate, their focus on low-productivity sectors, commodity exports and less access to private investment is damaging Africa's labour output growth. Slow labour productivity growth alongside high population growth is making it difficult for Africa to reduce poverty or increase wage rates. In 2018, nearly 32% of its working population was in acute poverty and 22% in moderate poverty, which accounts for 250 million workers. Given the rate at which Africa's population is growing, another 5 million people are likely to face acute or moderate poverty by 2020.

Figure 2.18: Working-age population in the labour market of Africa, 2018 (percentages)



Source: International Labour Organization (2019)

2.3.6.2 Americas

In North America, economic growth is projected to slow down in 2018 and 2019 but expected to pick up in 2020 for both the US and Canada. As economic activity declines, employment growth is also expected to decline. However, unemployment levels vary among groups with different levels of education. Those with basic education are more than twice as likely to remain unemployed as those with an advanced degree. This is evident among youth workers in the US. Labour force participation of youth workers with lower secondary education or less has declined from nearly 33% in 2008 to 25% in 2017 (International Labour Organization 2019). The lower participation rate, especially in North America, is also due to an increase in educational participation. The 2017 enrolment rate in secondary education has reached up to 82.5% in the US and 78.4% in Canada among 15 – 9 year olds (International Labour Organization 2019). Expectation is that the current low labour force participation will translate into a better skilled work force in the future. A lower participation rate has also been observed among prime-age workers, that is, those aged 25 – 54, particularly in the US. Participation by older workers, on the other hand, has been increasing since 2000. Participation by women workers is also increasing and stood at the highest since 2014; 57% in the US and 61% in Canada (International Labour Organization 2019).

In Latin America and the Caribbean, the employment rate is expected to increase by 1.4% in 2019 and 2020, which is expected to bring down the unemployment rate from 8% in 2018 to 7.8% in 2020 (International Labour Organization 2019). Most of this improvement is due to an increase in economic activity in Brazil. Chile, Peru, Colombia and Mexico are also expected to stay strong in the next few years, although Argentina, Venezuela and Nicaragua are projected to stay in recession. On an average around 63% of the workers are wage and salaried workers, 28.3% are own-account workers, and 4.3% are contributing family workers. However, this varies depending on the level of economic development of countries in Latin America and the Caribbean. For example, in 2018, in lower-middle countries the proportion of own-account workers was 32.3% while in high-income countries it was 20.1%. The majority of the workers work in informal employment; around 45% consist of wage and salaried workers. The situation is worse in Central America with 55% of the informal employment coming from wage and salaried workers. This is a big issue. In high-income countries, informality rates are less than 30% while they are more than 72% among the world's poorest populations. A high level of informal employment reflects the hard fact that in many countries and for many people informal jobs are the only way to escape unemployment and poverty; however, it also adds to poverty as informal employment means lower than minimum pay, negligible social benefits and limited access to financing.

2.3.6.3 The Middle East

The overall employment growth rate is on a downward trend since 2017 but it is expected to remain at current levels of 2.4% in 2020 (International Labour Organization 2019). The main reason for this decline is attributed to slowdown in the non-Gulf Cooperation Council (GCC) countries. The current unemployment rate of the entire region is 7.3% and in that, non-GCC countries were at 10.8% in 2018 (International Labour Organization 2019). Although, economic activity in the non-GCC countries is expected to pick-up in 2020, the region remains afflicted with conflicts and security risks. An important thing to note in regard to the employment rate in the Middle East is that it is largely influenced by migrant workers. In the Arab states, 41% of the total workers are from overseas. More than 50% of the workers are migrants when all GCC countries are combined. The labour force participation rate of migrant workers is also very high, 75.4% in 2017 compared to the natives at 42.2% (International Labour Organization 2018b). Gender gap is another issue that is faced by this region. The unemployment rate among women in this region is very high. In 2018, the unemployment rate was 15.6%, three times higher than that men, 5.7%. Unemployment among the younger working-age population is also very high in this region. In 2018, the youth unemployment rate was 20.1%, four times higher than the average adult unemployment rate. In regard to poverty, there is a wide disparity between GCC and non-GCC countries. While poverty is almost negligible in the GCC countries, more than 33% of workers, in 2018, in the non-GCC countries were working in extreme poverty (International Labour Organization 2019).

2.3.6.4 Asia and the Pacific

The employment growth rate of this region was only 0.7% in 2018, a decline of 0.5% since 2017. This decline is largely attributed to the slowdown in East Asia, where the employment rate has reached negative territory, −0.3%, mainly due to a decrease in the working-age population and an increase in educational enrolments (International Labour Organization 2018a). The overall unemployment rate of the entire region is expected to stay below the world average of 3.6% in 2019 and 2020 (International Labour Organization 2019). However, as the number linked to employment creation exceed labour work force participation, the unemployment rate is expected to rise in the future. In the Asian region, the unemployment rate is the highest for East Asia (4.2%) and is expected to remain at higher levels. Within this, Japan is at 2.4% and Korea at 3.7% in 2019. In the South East and Pacific regions, Australia's unemployment level is the highest at 5.3% and Indonesia is at 4.4% in 2019.

This region has seen a structural shift from agriculture to market services and manufacturing, which are considered to be more value adding (International Labour Organization 2019). This trend has affected East Asia to a large extent; the region has seen a drop of 20% points since 2000. The share of total employment in agriculture went down from 45% in 2000 to 24.6% in 2018 while market services increased from 21.3% in 2000 to 31.6% in 2018. A similar trend is observed in South-East Asia and the Pacific with respect to agriculture and market services. Share of agriculture dropped from 47.6% in 2000 to 30.9% in 2018 and market services picked-up from 23.1% in 2000 to 32.3% in 2018. South Asia, on the other hand, has not experienced a significant drop in agriculture; the region still heavily depends on agriculture for employment. The current share of agricultural employment is 43.2%. Share of market services has also increased but only by 5.6% in the last 18 years. Construction is another area where employment levels have increased from 4.7% in 2000 to 10.8% in 2018.

A concern affecting the majority of this region is the informal work environment which is affecting 70% of the total workers. Informal employment is the largest in Southern Asia, affecting 90% of the workers in this region who work in the agriculture sector. Informality is also present in South-East Asia and the Pacific, particularly Myanmar, Cambodia, and Indonesia, where three-fourths of the work force are impacted (International Labour Organization 2018c). Poverty, on the other hand, is present but improved substantially all over the region. Over 22% of the workers are still impacted by extreme or moderate poverty, with 12% in extreme poverty in South Asia. However, on the positive side, extreme poverty has been completely eliminated in East Asia. Worth noting are the efforts of countries like China, Thailand and Mongolia to provide social security to the self-employed and those working in the informal environment. Universal pension and health benefits provided by China and Thailand and universal child benefit schemes offered by Mongolia are some examples of the efforts that are reducing poverty levels in most parts of this region (International Labour Organization 2017).

2.3.6.5 Europe and Central Asia

According to the International Labour Organization (2019), employment levels in Northern, Southern and Western Europe are expected to rise but only by 0.4% in 2019 and 0.1% in 2020. This indicates that an additional 1.1 million people will have employment by 2020. Unemployment levels in countries like Greece and Italy are very high due to weak economic activity and growth; however, a slight improvement is expected in 2020. In 2019, the unemployment rates dropped from 2017 and 2018. The overall 2019 unemployment rate of the region was 7.3%. Within that, Italy was at 9.2%, France was at 9.1%, Germany was at 3.2%, and the UK was at 3.8%. Although unemployment has reduced since 2018, long-term trends indicate an increase. In the sub-regions of France and Germany, more than 40% of the population were unemployed in 2017. The share of unemployment was very high in Greece (72.8%), Slovakia (62.4%) and Italy (58%).

Although unemployment is decreasing overall, a main concern is about the poor quality of jobs created. Temporary employment is on the rise in many countries in this region. In 2017, in Spain, the share of temporary workers was the highest since 2008, 26.8% (International Labour Organization 2019). Netherlands, Greece, Portugal, Slovenia, France, and Italy also suffer from high levels of temporary employment. In Belgium, Finland, Italy and Spain, more than 50% of the temporary contracts are for six months or less. Such short-term contracts increase insecurity among temporary workers as it not only affects career development but also increases income uncertainty and volatility. Due to this reason, temporary employment is also linked to higher poverty. Short-term contracts gives rise to involuntary temporary employment as unemployment is not an option for many. More than 85% of the workers in Spain are in temporary employment due to this reason. A similar situation persists in Belgium, Greece and Italy, whereas in Austria, Germany and the Netherlands, the share of temporary employment ranges between 10 – 30%. Workers in such forms of employment are also at risk of receiving social security benefits. Those who are self-employed may not be eligible for compulsory insurance contributions and others may not meet the eligibility criteria for voluntary insurance benefits (International Labour Organization 2017). The region also suffers from under-utilisation of the labour force. In 2018, only 57.7% of the total working-age population participated in the labour force. Within that 43.6% youth and 51.8% women engaged in employment. There is a large pool of people who are looking for a job but unable to start in a short period of time or available but not looking for a job. There were 10.2 million people in 2018 who fell in this category, of which 56% were women (International Labour Organization 2019).

In Eastern Europe, even though economic growth has remained strong, employment growth is negative, −0.8% in 2019 (International Labour Organization 2019). The labour force is also expected to decline by 1% each year until 2020. The overall unemployment rate of the region has been declining since 2017. The current unemployment rate is 5% and is projected to reduce to 4.8% in 2020. Most of the decline is expected to come from Bulgaria, Hungary, Poland, and Slovakia. Romania and the Russian Federation are also expected to contribute to better levels of employment. In Central and Western Asia, Turkey presents a weakening outlook which can impact the entire region's economic prospects. The growth in oil-exporting nations, however, may offset the impact partly. According to the International Labour Organization (2019), employment growth in this region is expected to fall from 1.3% in 2018 to 0.6% in 2019 but is projected to pick-up in 2020. The unemployment rate of this region in 2019 is 8.7% and is expected to increase to 9% in 2020. Turkey is the main country contributing to an increase in unemployment levels. The 2019 unemployment rate of Turkey is 11.9% and will increase to 12.1% in 2020.

Creation of jobs for wage and salaried workers, however, is slowing down, especially in the private sector, as most of the jobs in this region are in oil and gas and construction sectors (International Monetary Fund 2018). Informality is an issue in this region, particularly in Central Asian countries like Tajikistan, Kyrgyzstan and Turkey. It is also prevalent more among women (47%) than men (41%) (International Labour Organization 2018c). Poverty levels are also high in this region with 12.5% of the employed living in moderate or extreme poverty (International Labour Organization 2019). Informal employment is relatively less in Eastern Europe, 30%, but it is still high in comparison to remaining parts of Europe (International Labour Organization 2018c). Poverty, on the other hand, has been almost eradicated from this region.

2.4 Summary

The primary objective of this thesis is to examine international portfolio diversification benefits for Australia's superannuation members. Given this objective, this chapter provided a contextual background to superannuation funds. That is, the chapter provided a background to the retirement income system that was in force before SG was introduced, factors that led to the growth and development of superannuation, the SG scheme, its current landscape and regulatory control. In order to examine international portfolio diversification, this chapter also provided a brief background on the economic and financial landscape of developed, emerging and frontier markets with facts and recent developments.

Part I

Study 1: Portfolio Diversification

Chapter 3

Review of Literature and Models in Portfolio Diversification

3.1 Overview

The objective of this chapter is to provide a synthesis of literature relating to portfolio diversification. Sections 3.2 and 3.3 discusses the concept of diversification and Markowitz's MPT. Section 3.4 reviews literature on the benefits that international portfolio diversification can bring. These benefits can come in the form of increased portfolio returns or reduced portfolio risk or both. Sometimes diversification can also lead to losses. This section reviews key literature pertaining to portfolio diversification in developed, emerging and frontier markets and Section 3.5 reviews models used in the empirical examination of portfolio diversification.

3.2 What is Diversification?

Investors attempt to diversify their portfolio in order to minimise portfolio risk without compromising on expected returns. This is achieved by including a wide variety of assets of different asset classes in their portfolio. Earlier, diversification was understood as randomly adding more assets in the portfolio, without even studying their investment characteristics. This practice was popular because different companies react differently to market information, thus making it possible to reduce portfolio risk. This idea was conceptualised by Markowitz (1952, 1959) in his works on portfolio selection and the MPT. He demonstrated that diversification is not just about randomly adding more assets in a portfolio but about selecting the right combination of assets from the entire basket of assets that is available for investment. But Markowitz was not the first to consider diversification of investments. He has himself pointed out in Markowitz (1999) that diversification was appreciated and practised since long before his work. For example, in William Shakespeare's *The Merchant of Venice*, a merchant named Antonio says:

"My ventures are not in one bottom trusted,
Nor to one place; nor in my whole estate
Upon the fortune of this present year;
Therefore, my merchandise makes me not sad."

The Merchant of Venice, Act I, Scene I

From this quote, it can be observed that Shakespeare not only understood diversification but was also aware of the concept of covariance. However, a theory that explained reasons for and impact of diversification did not exist at that time. It was Markowitz (1952) that introduced MPT, which explained the role of correlation and covariance in examining diversification and the distinction between efficient and inefficient portfolios. This gave a whole new perspective to diversification of financial investments. Several papers (Grubel 1968; Levy & Sarnat 1970; Solnik 1974) argued the benefits of international diversification, which is discussed in detail in the upcoming sections. In recent times, the tools of modern finance have created awareness among investors that it is not diversification but correlation between the assets that determines the percentage of risk reduction. Less correlated assets reduce portfolio risk and, consequently, improve portfolio performance. Low correlation and co-movement between assets, thus, provides an opportunity to gain from diversification.

Investors can diversify their portfolio by investing in assets in domestic and international markets. International diversification is known to offer more benefits than domestic diversification because of larger differences in countries' economic, financial, political and legal frameworks. Australian investors can benefit too from diversifying in international assets and markets as many studies have found significant differences in Australia's economic and financial markets as compared to other major markets (Allen & MacDonald 1995; Narayan & Smyth 2005).

3.3 Markowitz's Modern Portfolio Theory (MPT)

Although the concept of diversification had existed since long before, Markowitz (1952) was the first to provide a mathematical formula for the concept of diversification of investments in his paper titled "Portfolio Selection". He was awarded the Nobel Prize in 1990 for this work.

MPT explains that through diversification, portfolio risk can be reduced without impacting expected return. It explains that risk can only be reduced and not eliminated. However, the theory hypothesises that one must maximise expected return while minimising risk. A portfolio that achieves this combination is called an optimal portfolio. However, it is not diversification that leads to higher return or lower risk, rather selective diversification. Selective diversification involves examining the impact of one asset on the variance of the entire portfolio. That is, an asset must be assessed on the basis of how much it contributes to the overall return and risk of the portfolio rather than only on the basis of its expected return and risk. One must consider the covariance between the assets that the investor wants to hold in their portfolio. Markowitz (1952) thus brings together the concepts of risk, return, variance and covariance into a quantitative model called mean-variance optimisation (MVO). MVO, explained in Section 4.6.3, allows a quantitative assessment of the portfolio theory.

The theory has received a fair share of criticism, some of which stems from its assumptions. For example, the theory assumes that all investors are rational. However, it is well-known that investors do not behave rationally, especially when the market is bullish and bearish as their decisions are influenced by price. Investors react to speculation and hunches. Investors also react more strongly to a loss than a gain. This is called loss aversion. This concept is attached to the prospect theory (Kahneman & Tversky 1979) which states that investors are more affected by losses than profits of the same value due to which they hold on to assets longer than they should. Psychological biases such as judgement and decision bias, and heuristics such as anchoring, halo effect etc. play an important role in investors' decision-making (Hirshleifer 2001; Tversky & Kahneman 1974). The theory also assumes that the market is efficient. That is, investors have access to all information about the assets they want to invest in. This assumption is based on the efficient market hypothesis. It believes that all information about an asset or company is reflected in the price of the company. That is, the market is always fairly priced and, therefore, it is impossible to beat the market. However, from Fama (1970) we know that market efficiency takes three forms: weak-form, semi-strong-form and strong-form. Additionally, the strong-form, wherein investors have monopolistic access to all information that is required in estimating price of an asset, is clearly rejected, both theoretically and empirically. Behavioural finance and economics researchers (Barberis & Thaler 2003; Kahneman & Tversky 1979; Tversky & Kahneman 1974; Werner & Thaler 1985) clearly attribute several psychological biases, such as overconfidence, information bias, overreaction etc., to market imperfections.

Despite these criticisms Markowitz's (1952) MPT is a commonplace among academics and institutional investors to manage and measure portfolio performance. Several studies (reviewed in Section 3.4) have explored the construction of an optimal portfolio that maximises returns and minimises risk with and without imposing restrictions on how much is invested in each asset class, and whether the approach is beneficial or not.

3.4 Review of Portfolio Diversification Literature

This section reviews literature on international portfolio diversification in particular. It presents a synthesis of studies exploring international developed, emerging and frontier markets for the purpose of portfolio diversification. The section presents the past and current landscape of diversification benefits from developed markets. Then, it looks at the financial gains that emerging markets bring. The section also examines changing trends of developed and emerging markets and leads to a discussion on a new set of markets called frontier markets and their benefits for portfolio diversification.

3.4.1 International Diversification: Developed and Emerging Markets

Empirical research on the benefits of international diversification began in the late 1960s and continued into the 1970s with Grubel (1968), Levy & Sarnat (1970), and Solnik (1974). These researchers focused on examining diversification benefits in developed markets with the intent of finding out whether any benefits exist and, if they do, whether these benefits were in terms of risk reduction or superior returns. Grubel (1968) took the idea of portfolio diversification that was proposed by Markowitz (1952), Markowitz (1959), and Tobin (1958) a step forward. He did this by including foreign assets in a portfolio along with domestic assets in order to establish whether international diversification could lead to greater financial benefits in terms of risk reduction. The foreign assets that he chose were from 11 major stock markets around the world, namely, the US, Canada, the UK, West Germany, France, Italy, Belgium, the Netherlands, Japan, Australia and South Africa. Diversification benefits that he examined were from the perspective of American investors over the period 1959 – 1966. His research showed that American investors could have earned 12.6% returns from investing in foreign stocks as against the 7.5% by investing in Moody's index[26], thereby gaining a total of 68% in annual returns. Grubel's discovery was supported by Levy & Sarnat (1970), who also analysed international diversification benefits for American investors. Unlike Grubel (1968), their dataset was more comprehensive since it covered 28 developed and developing countries for a longer time frame, from 1951 to 1967. They constructed mean-variance efficient portfolios of different proportions and demonstrated that portfolios containing a mix of developed and developing countries offered higher risk-return benefits than portfolios of developed or developing countries alone. A similar result was emphasised by Solnik (1974). He showed that there were larger risk reduction benefits from investing in international markets relative to domestic markets; however, these benefits were larger for European investors than American investors due to less investment alternatives in the European markets.

The key ingredient of gains from international diversification is the low covariance, low correlation or absence of co-integration between stock returns of domestic and international markets where diversification is intended. Lessard (1976) highlighted that low covariance among international equities is one of the factors that differentiates international equity markets from domestic equity markets. This is because world events have a lower impact on security returns than national events. For example, investing strategies in domestic markets differ from those used in international markets because of higher covariance among domestic assets, taxation policies, customs and exchange rate variations. After restriction on foreign investments was relaxed by the Australian Federal Government in 1972, Watson & Dickinson's (1981) investigation on international diversification benefits for Australian investors found the presence of low correlation between Australia and other international markets. Using Pearson's correlation on eight developed markets, on both an ex-post and ex-ante basis, they asserted that Australian investors were better-off after the relaxation of exchange controls on foreign investments. Their ex-post results showed that diversification in developed markets, particularly in the Japanese

[26]Moody's industrial average of common stocks is the share price index for the US.

equity market, would have been substantially beneficial to Australian investors. Specifically, Australian investors could have lowered their portfolio risk from 5.24% to 4.78% or earned a monthly return of 1.18% by diversification rather than −0.31% returns due to no diversification. Their ex-ante analysis result also found substantial support for international diversification. Bergstrom et al. (1996), Errunza & Padmanabhan (1988), Meric & Meric (1989), and Wheatley (1988) have also conclusively shown that diversification in developed markets can offer substantial gains. Recent studies have also found support for diversification in developed markets (Gilmore & McManus 2002; Solnik & Roulet 2000). Gilmore & McManus (2002) examined short-term and long-term diversification benefits for US investors in Central European markets of the Czech Republic, Hungary and Poland for the period 1995 – 2001. Their correlation estimates indicate that short-term diversification benefits to US investors are possible, which is also consistent with previous studies. Conforming to their correlation estimates is the result of their Johansen co-integration test which reveals that there are short- and long-run benefits to US investors from investing in the three Central European markets.

Interestingly, a study conducted by Solnik et al. (1996) who examined diversification benefits from 1958 to 1995, concluded that although the fairly low correlations between international stock markets are good news for international diversification, it is recommended to include emerging markets equities or bonds in the portfolio in order to enhance diversification gains. Their recommendation was affirmed by Gupta & Donleavy (2009) who examined international diversification benefits in emerging markets. They examined diversification benefits for a portfolio comprising international equities from seven emerging markets, namely, Brazil, China, Greece, India, Korea, Malaysia, and the Philippines for the period 1988−2005 from the view point of an Australian investor. Since the significance of diversification gains can be tested by establishing various portfolio constraints, Gupta & Donleavy (2009) constructed portfolios with differing levels of restrictions in emerging markets to identify these proposed benefits. They constructed an unrestricted portfolio, which has no restriction on the percentage allocated to emerging markets, another portfolio with 50% in emerging markets but no more than 10% in a single emerging market, and another portfolio with 50% in emerging markets but no more than 20% in a single emerging market. Their estimates of Pearson's correlation and asymmetric dynamic conditional correlation (ADCC) generalised autoregressive conditional heteroscedasticity (GARCH) correlation, which were found to be similar, showed substantial gains from the portfolio with 50% in emerging markets but no more than 10%

in a single emerging market. In that, they found that Australian investors can earn annual mean returns of 14.16% from diversification as against 8.16% from an Australia-only portfolio. In the same vein, Cha & Jithendranathan (2009) found that unrestricted diversification in emerging markets provides the highest diversification benefit in comparison to a restricted portfolio, but at the same time a portfolio with only 20% in emerging markets also yields significant benefits. Restrictions of 10% and 2% were not beneficial.

Bouslama & Ouda (2014), on the other hand, found that although unrestricted international diversification is found to provide higher returns, restricted portfolios offer benefits in terms of lower volatility and risk. They found that by restricting portfolios to 50% in international markets, a reduction in minimum loss and volatility can be attained. They also found that higher proportions in emerging equities can offer more gains than portfolios dominant in developed markets. The view that emerging markets provide significant gains in terms of risk reduction is also supported by Mionel & Moraru (2013), who argue that even though emerging markets are characterised as smaller countries with limited capital, they exhibit low correlation with mature economies. These markets are believed to offer a "free lunch" to investors. They found that the other factor that has made emerging markets attractive to international investors is the promotion of financial stability in their economic policies, which makes them appear reliable. One of the early studies that provided strong evidence about risk reduction benefits of emerging markets was by Divecha et al. (1992). They showed that 20% investment in an emerging markets index fund could decrease the annual portfolio risk from 18.3% to 17.5% while increasing annual returns from 12.6% to 14.7% at the same time. In general, allocating around 20 – 30% of the portfolio to long-term international equity investments is expected to result in gain from international diversification (Clarke & Tullis 1999). However, these gains differ from country to country as each country brings different risk to the portfolio. Hence, it is advisable to pay attention to risk management strategies. For example, Wilcox & Cavaglia (1997) found that Dutch investors can experience larger gains from international diversification just by employing better currency risk management strategies. A Dutch portfolio typically has 25 – 30% exposure in international equities at any given point in time and although higher gains can be achieved by selecting the right mix of assets, currency risk hedging can also enhance their international diversification gains.

3.4.2 Changing Trends in Developed and Emerging Markets

While the above studies have shown that international diversification is beneficial even today, they have also emphasised the changing nature of diversification benefits. It has been observed that correlation between international markets, both developed and emerging, has started increasing. Increased correlations reduce diversification benefits. This increase is attributed to dominance of world factors over national factors. Though such dominance is usually observed during periods of stock market crisis, oil crisis and war like situations (Longin & Solnik 1995), which are usually transitory in nature, it is mainly integration[27] of international financial markets that has caused correlations to increase. So even though Gilmore & McManus (2002) found diversification benefits over the short and long run, they caution investors about increasing market integration which will increase long-run co-movements between international markets and, thus, reduce diversification benefits. Correlation between developed markets has increased from 66% at the beginning of 1971 to 75% in September 1998 (Solnik & Roulet 2000). One of the early studies which also found increasing correlations between international markets was by Longin & Solnik (1995). They studied seven major stock markets around the world and over the period 1960 – 1990, which covered several business cycles, market cycles, the oil crisis and the 1987 stock market crash. Their study evidenced that covariance and correlations between international markets have increased over their 30-year study period.

There is another set of literature that has found that gains from international diversification exist despite increasing correlations but only in the long run and not in the short run. This is because over the long-run country-specific factors take dominance over world factors, which eliminates the chances of markets crashing at the same time, whereas in the short-term, since returns are influenced by short-term risk aversion, all markets are impacted at the same time (Asness et al. 2011). For example, de Santis & Gerard (1997) examined the impact of holding an internationally diversified portfolio during severe US market decline. They found that there are more benefits in the long term than the short term. Although short-term benefits in terms of protection from market downturn are available, long-term gains are steady and more attractive. Investors can gain on an average 2.11% returns per year on their investment

[27] The rationale behind simultaneous increase in correlation and market integration is explained by Bekaert & Harvey (2002). When a country transitions from a segmented state to an integrated state, its assets, which were previously priced in terms of local beta and local risk premium, are now priced in terms of world beta and world risk premium. If the volatility of local returns is high, the expected returns are also high. However, this changes when a country reaches an integrated state-the price of assets rise while their expected returns fall.

if invested for a longer period. Similarly, Ibrahim (2006) assures long-term gains in the Association of Southeast Asian Nations (ASEAN) markets. Short-term gains, on the other hand, are limited, especially for US investors, due to high integration between ASEAN markets and the US. Conclusively, both studies affirm the existence of long-term gains from international diversification.

Another study that found support for long-term diversification gains is by Kanas (1998). He examined the benefits of diversification for Canadian investors in eight international markets, namely, the US, Japan, the UK, Germany, France, Switzerland, Italy and the Netherlands from 1983 to 1996, which includes the pre- and post-October 1987 crash period. Results of Johansen co-integration show that Canadian investors can benefit from long-term international investments as there is no evidence of long-run linkages between Canada and those international markets. The results were also significant for pre- and post-October 1987 crash periods. Likewise, Gupta & Guidi (2012) found long-term international diversification gains for India, Hong Kong, Japan, US and Singapore but their pre- and post-crisis results are contradictory. They found that correlation between international markets has increased after the crisis but not prior to it. Their examination included the Twin Tower attacks on September 11, 2001 and the US sub-prime mortgage crisis (2006 – 2008) periods. Correlations were lower before the crises and higher after the crises. In the same vein, Zhang et al. (2013) found that correlations between Brazil, Russia, India, China and South Africa (BRICS) and developed markets of the US and Europe have increased permanently after the 2007 GFC. Although the crisis is in the past, Zhang et al. (2013) insist that correlations are not likely to revert to their original paths in the short or long term. These results suggest that catastrophic shocks tend to cause structural changes in the long-run behaviour of markets.

Contradictory to the above discussion, the following literature claims negligible benefits from international diversification owing to increased integration. Speidell & Krohne (2007) point out that correlations between emerging markets and the S&P 500 index, and emerging markets and the MSCI Europe, Australasia and the Far East (EAFE) index were approximately 0.50 in the 1980s and 1990s. However, by 2010 these correlation coefficients had increased to 0.93 and 0.87, respectively. Zhong et al. (2014) also dismissed gains from international diversification between the US and BRICS nations. Their examination from 1997 to 2012 found no long-run benefits to any of the countries studied, which could be due to increased trade-ties. Using a 25 year data set, Christophe (2017) examined the performance of a US domestic index with three investment strategies. The first strategy is to remain invested in the home market, that is, the US, the second strategy is to allocate 40% of the portfolio to international equities of Europe, Asia Pacific, Latin America and Canada, and the third strategy is to invest 100% in the MSCI World Index. The paper found that, over the past 25 years, the domestic portfolio performed better compared to the remaining two portfolios, suggesting that benefits from international diversification may no longer exist for US investors. From an Australian context, the results are not favourable either. Allen & MacDonald (1995) examined international diversification benefits in 16 financial markets for the period 1970 – 1992 using two co-integration methods. The Johansen method evidenced co-integration between Australia and France, Germany, Hong Kong, Switzerland, the UK and Canada implying negligible diversification benefits. However, the Engle-Granger method showed clear evidence of co-integration only with Hong Kong, the UK and Canada. There is no evidence to ascertain diversification benefits from the remaining countries. Their results are consistent with those of Taylor & Tonks (1989), which found negligible risk reduction benefits in the long run for the UK due to higher correlations with West Germany, the Netherlands, Japan and the US.

Based on the above discussion, it appears that developed and emerging markets are becoming increasingly co-integrated and correlated with world markets, and emerging markets are rapidly evolving to become a part of developed markets. Though there are benefits still to be extracted from diversification in these markets, those benefits are gradually declining.

3.4.3 Seeking New International Markets: Frontier Markets

From the above discussion it is apparent that with increased market integration it has become difficult to reduce portfolio risk or earn superior returns by diversifying in developed or emerging markets. Shocks, such as the GFC, has caused permanent increase in correlations in the developed markets of US and Europe, and also in emerging markets, particularly in BRICS nations, and they are not expected to return to their original paths (Zhang et al. 2013). Despite these circumstances, there are other markets that are still not correlated or co-integrated with world markets and have the potential of offering greater diversification gains. They are called "frontier markets". This term was coined by Farida Khambata of the International Finance Corporation (IFC) in 1992. Countries that are classified under this category are a subset of emerging markets and, thus, are called "pre-emerging markets". These countries are at very early stages of economic development as compared to emerging markets and require major developments in terms of their size, investment barriers, infrastructure and political stability. They are characterised by low market capitalisation, low annual turnover, limited market accessibility and low level of liquidity, which prevents them from being included under the classification of emerging markets. Despite these dismissing attributes, CITI Bank's (2014) Investment Research and Analysis report shows promising prospects for frontier markets. According to CITI's growth forecasts, frontier markets are expected to grow above 6% per annum of GDP until 2022, outperforming developed and emerging markets. According to Speidell & Krohne (2007), frontier markets have strong growth potential for production, consumption and investment. Along with a high GDP growth rate, they are showing decline in corruption rates and better performance during periods of turmoil. These markets have gained recognition only in the last decade with the launch of the S&P/IFCG Extended Frontier 150 Index in August 2007 and the S&P Select Frontier Index in October 2007. The former index comprises 150 companies from the S&P Emerging Markets database that are not included in S&P emerging market indexes, whereas the latter comprises the 40 largest and most liquid stocks from countries that are excluded from the emerging markets classification. Since then several frontier market indexes have launched such as the MSCI Frontier Markets Index in December 2007, the FTSE Frontier 50 Index in July 2008, and the MSCI Frontier Markets 100 Index in April 2012 (Gaeta 2013). The development of these benchmarks has aided the promotion of frontier markets as an attractive investment destination.

Research in frontier markets is limited because it is only recently that these markets have opened up for foreign investments. Of the few studies on international diversification benefits from frontier markets, all of them have encouraged these markets as an investment choice. Speidell & Krohne (2007) believe that the challenges that frontier markets put forth are opportunities for investors to discover the unnoticed but healthy and rapidly growing companies and stocks that have been neglected by the investment community at large. In the long run, investment in these markets will be rewarded. This view is supported by Berger et al. (2011), who found that frontier markets have a low level of integration with other financial markets and that it has not increased over time. Even after allowing for structural breaks in the model, where breakpoints reflected change in the level of integration, the study found significant gains from diversification in these markets. In their recent study, Berger et al. (2013) asserted the possibility of making economic gains and realisable diversification benefits by investing in frontier exchange traded funds (ETF). They found that adding frontier markets investable funds to an already diversified global portfolio results in further gains from that portfolio in terms of reduced volatility. Specific to countries in the GCC, Yu & Hassan (2008) found that there is no evidence of long-run co-integration between the US and GCC countries, suggesting substantial gains from international diversification in GCC countries. They also indicate the potential for Middle East and North Africa (MENA) stocks in particular to provide even more significant gains to US investors. From an Australian perspective, Sukumaran et al. (2015) examined diversification benefits by imposing portfolio restrictions on the level of investment in frontier markets. Their unrestricted Australian portfolio gave mean annual returns of 13.70% whereas the restricted portfolio with 20% in frontier markets gave 14.39% annual returns. Adding frontier market stocks to their Australian portfolio thus increased their portfolio returns. Gains from diversification in frontier markets are further asserted by Marshall et al. (2015), who found relatively low correlations between the US market and 19 frontier markets. This study also noted that frontier markets have become more accessible to international investors in recent times, thus making them even more attractive.

Recent studies also affirm that frontier markets have the potential to offer more gains from international diversification. A study conducted by Mensi et al. (2017), over the period 2002 – 2016, found long-term gains from Asian emerging and frontier markets. China offered the largest risk reduction gains in periods prior to and during the GFC while Sri Lanka offered the best gain during and after the Eurozone sovereign debt crisis. In the short-term, diversification in Pakistan resulted in the highest gain prior and during the GFC, while Sri Lanka yielded more gains after the GFC. Except China, none of the BRICS nations yielded benefit to developed markets, possibly due to trade linkages. Similarly, Pätäri et al. (2019) found that developed and emerging markets are converging, due to which benefits from diversifying in them are declining. If given a choice between developed, emerging and frontier markets, they recommend adding frontier market assets to equity-based portfolios for higher gains, although they suggest this with caution as risks attached to frontier markets should not be overlooked.

From the above discussion it can be inferred that correlation between world markets has increased after the GFC and is not expected to revert to lower levels. It can also be understood that emerging markets have become more mature to the point where they are converging with developed markets. However, this is not the case with frontier markets. Frontier markets have the ability to offer higher returns to developed market investors. This benefit could be due to the different characteristics, as discussed in Speidell & Krohne (2007), that frontier markets possess. Therefore, it is in the interest of the investors, especially those in the developed markets, to diversify in frontier markets.

3.4.4 International Portfolio Diversification of Superannuation or Pension Funds

Asset allocation in pension funds is generally found to be sub-optimal. Prior to the 1970s, in the US, pension funds were not permitted to allocate funds to international assets. After a few studies established a strong case for international diversification, restrictions on pension funds were lifted. Odier & Solnik (1993) found that US pension funds were heavily under-diversified even after international diversification was permitted. That is, only 7% of funds were invested in foreign markets. Jorion (1989) and Leibowitz & Kogelman (1991) also found strong home bias among US pension funds even though the benefits of international portfolio diversification were known by this time. In his research, Jorion (1989) supports the view that international diversification for US pensions funds, especially in international bonds, will yield larger benefits. Leibowitz & Kogelman (1991) also support this point of view. Using a shortfall approach, their study explains that for the same amount of risk as a domestic benchmark, a portfolio formed by international portfolio diversification can yield 55% higher returns. Griffin (1997) argues that heavy concentration in the domestic market is justified when international assets carry higher risk or do not yield substantial return for the amount of risk attached. From the perspective of MPT, home bias in such instances is appropriate. However, their conventional risk analysis shows that there is sufficient allocation to international equities and bonds. In fact, the percentage of allocation to domestic and international bonds is the same while allocation to international equity is equal to $20-30\%$ of the total equity. A further examination using tracking error shows that as the tracking error of a portfolio increases, the focus on domestic assets also increases. Under-diversification extends to some other developed markets too. For example, in Canada pension funds cannot invest more than 20% in international assets while in France and Germany the restriction is up to less than 5%. Italy, South Africa, Singapore and Malaysia, on the other hand, have no allocation to any international asset (Davis 2005; Griffin 1998).

In the UK, on the other hand, pension funds are generally known to have higher levels of diversification, but according to Jackwerth & Slavutskaya (2016), diversification in alternative asset classes such as hedge funds is not preferred. International stocks and bonds, on the other hand, are more commonly preferred. Pfau (2011) found low correlations between local stocks and world stocks (0.28), local stocks and world bonds (-0.11), local bank deposits and work stocks (0.30), and local bank deposits and world bonds (0.39). Low correlation is an indication of higher diversification benefits. Their asset allocation results show that, for a conservative investor, at least 50% of the portfolio should be invested in international markets: around 11.44% in international stocks and 38.79% in international bonds. In particular, emerging markets of Chile, Mexico and Russia can benefit in terms of both risk reduction and higher returns from international diversification. On average, emerging market pension funds can benefit by up to a 21.3% increment in portfolio returns if international diversification is permitted. China, on the other hand, would benefit by approximately 60% lower risk if invested in international markets. Kumara & Pfau (2011) also found low correlations among 25 countries. Local stocks and world stocks are correlated at 0.31 while local stocks and world bonds are correlated at -0.26. Similarly, local bank deposits and world stocks are correlated at 0.30 and local bank deposits and world bonds are correlated at 0.17.

Despite the aforementioned benefits, financial crises like the GFC have shown that long-term equity investments fail too. Due to this reason, interest in alternative investments is gaining importance. According to Towers Watson (2013), in 1995 pension funds in the UK, US, Canada, Australia, Japan, Switzerland and the Netherlands invested around 5% of their portfolio in alternative investments. By 2014, this number grew to 29% for US pension funds. In their study, Jackwerth & Slavutskaya (2016) considered diversification in hedge funds, risk-free assets, mutual funds, the real estate index, fund of funds, commodity index, and the foreign equity index. Their results show that investing only 10% in hedge funds improves their pension fund's performance by 6.4%. The gain is not as much when other asset classes are considered, however, it still suggests that diversification is beneficial. The results also show that diversification in hedge funds is beneficial especially during market downturns. That is, hedge funds can be used for downside protection. Platanakis et al. (2019) also support diversification in hedge funds; however, their view-point on other alternative assets, specifically commodities, is different. Their results show that commodities have larger estimation errors than traditional assets, which can be harmful during a crisis. Even with respect to hedge funds, the study does not strongly support investing in hedge funds during a crisis.

One of the issues with international diversification of pension funds is the limitations imposed by governments on allocation to international assets. In many emerging markets, there is a limit on how much can be invested in international markets. Generally, limitations are imposed in order to limit the risks that different markets bring with the view of protecting retirement savings, however, this approach can do more harm than good. For example, Angelidis & Tessaromatis (2010) found that Greek pension funds are heavily under-diversified since international investments are prohibited. Up to 23% is invested in domestic equities, while the remaining is in domestic bonds and cash. Portfolio risk is low since a large percentage is in bonds and cash however, the share invested in equity carries high risk. It is high risk as the performance of equity allocation is dependent on the performance of a few companies only. Imposing restrictions on international diversification thus restricts Greek pension funds from diversifying away the domestic idiosyncratic risk or earning higher returns. Preference for having low constraints is also supported by Clarke et al. (2002). They found that having restrictions on short-selling, turnover, investment style, etc. is common but when imposed together they reduce the value that diversification creates. This is because having more number of restrictions limits the ability of fund managers to convert valuable information about the market and companies in to portfolio positions.

Srinivas & Yermo (1999) examined the impact of "draconian" regulations on Latin American pension funds. They found that imposition of rules, although done with the intention of safeguarding pensions, comes with costs such as poor asset management and limited opportunities for risk reduction, in particular. Under the "draconian" regulation, pensioners do not often have the choice in funds or risk-return characteristics. They do not have the option to re-balance their portfolios in order to achieve sufficient diversification levels either. It is understandable that the pension industry is regulated in emerging markets in particular, for the purpose of protecting retirement savings of pensioners, but at the same time returns earned under these regulations are less than what can be achieved when they are liberalised. Looking further into the differences between the "draconian" regulation and liberalisation approach to pensions, Hu et al. (2007) found that, from a Chinese regulatory perspective, liberalisation of regulations around pensions is more beneficial. Pension funds in China fall into three categories, Pillar 1 (has two mandatory components: Pillar 1A and Pillar 1B), Pillar 2 (also called Enterprise Annuities, is voluntary) and Pillar 3 (also called personal plan, is voluntary and in the development phase). Pillar 1B is restricted to only domestic government bonds and bank deposits while Pillar 2 is restricted to domestic equities, domestic bonds and bank deposits. The study examines the performance of a basic portfolio and four variants with differing restrictions on international diversification to conclude that quantitative restrictions should be imposed sparingly. They should be used in conjunction with the prudent person rule[28]. Stewart et al. (2017), however, state that changing government regulations around pension funds may not be enough to change their asset allocation structure. In many countries, pension funds do not even invest up to the limit prescribed by the regulation. That is, the majority of the investment is contained within the domestic market in government bonds, bank deposits and cash. These low yield investments result in low returns. Poorly developed capital markets were found to be one of the reasons for less exposure to domestic and international equities. Perhaps, improving domestic capital markets, permitting or encouraging international inflow and outflow of funds, establishing better systems to support international investments, etc. will help.

With respect to Australian superannuation funds, Phillips et al. (2007) found that SMSFs are heavily under-diversified. In addition, they are being poorly managed. Investment in international assets is not yielding profitable gains but rather is resulting in poor performance. Since the percentage of total SMSF assets invested in the international markets is very low, small movements in the stocks of Australian companies are making large impacts on the performance of SMSFs. One issue that Phillips et al. (2007) found with measuring diversification benefits of SMSFs is that when assets of the trustees are combined with the fund then diversification looks optimal but when the SMSF is held alone then under-diversification is an issue. This issue, however, is not applicable to superannuation funds that are examined in this study as they are not SMSFs.

From the above discussion, it is clear that the pension fund industry around the world has varying degrees of regulation. Several developed and emerging markets have strict regulations on how much can be invested in international markets. Even though these regulations are imposed for good reasons, such as to discourage inappropriate and extreme investment behaviours, promote domestic financial markets, employment for youth, etc., the above-mentioned studies have found that portfolio returns earned under strict regulations are lower than those earned when regulations are liberalised. Kumara & Pfau (2011) recommend that at least 50% of the emerging market pension fund portfolio should be invested in international markets. They found this result holds true for 17 out of 25 countries in their sample. China, Israel, Pakistan and Sri Lanka perform better when 80% of the portfolio is allocated to international assets while Argentina, Chile, South Africa and Turkey require at least 40% in international markets. Given the

[28]The prudent person rule is a behaviourally-oriented principle which, according to US and UK law, is stated as: "A fiduciary must discharge his or her duties with the care, skill, prudence and diligence that a prudent person acting in a like capacity would use in the conduct of an enterprise of like character and aims" (Galer 2002).

strong support for international diversification of pension funds, and the scant research on international diversification of Australian superannuation funds, this current study examines whether the current level of international diversification of superannuation funds is appropriate or whether further diversification can lead to financial gains.

3.5 Review of Models Used in Portfolio Diversification Literature

From the review of Markowitz's MPT and portfolio diversification literature, this study found that co-integration and correlation between markets help in determining the level of association between, them which in turn assists in estimating portfolio diversification benefits. A higher level of association means lower diversification benefits while a lower level of association means higher diversification benefits. Accordingly, the purpose of this section is to review co-integration and correlation models for a better understanding of their strengths and weaknesses and make an appropriate selection for data analysis. The section also reviews models used for portfolio construction as constructing optimal portfolios is the next step in estimating diversification benefits after measuring co-integration and correlation.

3.5.1 Models Measuring Co-integration, Vector Error Correction and Vector Autoregression

Co-integration measures movements between variables over a period of time. Two variables, x_t and y_t, are said to be co-integrated, or integrated of order one, I(1), if they both are non-stationary in their levels but stationary [29] after differencing and their linear combination, having the form z_t=x_t-ay_t, is also generally I(1) (Fabozzi et al. 2014). Co-integrated variables are said to share long-run linkages. This means that the existence of co-integration indicates that in the long run, variables are likely to be highly correlated and diversification may not yield large benefits. On the other hand, absence of co-integration shows the lack of association between variables and diversifying between them over the long run is likely to offer large diversification benefits.

[29] A variable is stationary if it has a constant mean and variance. A non-stationary variable, on the other hand, may move arbitrarily far away from the mean (Fabozzi et al. 2014).

Co-integration allows variables to diverge in the short-run before returning to equilibrium [30] through an error correction mechanism. Therefore, when variables are co-integrated, examining diversification benefits for investors with a long-term return horizon by short-run correlation measures is inadequate and the benefits are overstated (Fabozzi et al. 2014). The two most popular methods for testing co-integration are the Engle-Granger co-integration test developed by Engle & Granger (1987) and the Johansen procedure developed by Johansen (1988). The Engle & Granger (1987) co-integration test is a two-step estimation procedure where co-integration between two variables is examined by estimating the ordinary least squares (OLS) regression equation and obtaining the residuals in the first instance, and then testing the residuals for stationarity. If the residuals are found to be stationary then the variables are said to co-integrate over the long-term. However, this method has several shortcomings. First, since it is a two-step estimation procedure, any error introduced in the first step is carried forward to the second step, making the results unreliable. Second, the test requires placing one variable on the left-hand side of the regression equation and the other on the right-hand side. This requirement is flawed in itself as one regression might suggest a co-integrating relationship while the other might not. Long-run relationships should not be dependent on the choice of dependant and independent variables. Third, if more explanatory variables are added to the regression equation then, even though the test will be successful in identifying the existence of long-term equilibrium relationship, it will not be able to suggest the number of equilibrating relationships. In other words, it assumes that the co-integration vector is unique (Juselius 2007).

The Johansen (1988) procedure, on the other hand, overcomes the shortcomings posed by the Engle-Granger co-integration test by bypassing the two-step estimation procedure. Unlike the Engle & Granger (1987) co-integration test, the Johansen (1988) procedure does not rely on OLS estimation to analyse co-integrating relationships between variables; instead it employs the maximum likelihood estimation, thus permitting the estimation of multiple co-integrating relationships. Therefore, this procedure can be applied in both, bivariate and multivariate settings. Since this study examines more than two markets, there will be more than one co-integrating relationship. The study will, thus, examine the suitability of the Johansen (1988) method and if suitable, then the co-integrating relationship between the countries considered in the sample (presented in Section 4.3.2) will be examined.

[30] In co-integration analysis, equilibrium refers to the tendency of the variables to converge over time (Fabozzi et al. 2014).

3.5.2 Models Measuring Correlation

A review of literature indicates that scholars have used different correlation models to determine whether gains from international diversification exists (Cha & Jithendranathan 2009; Gupta & Donleavy 2009; Marshall et al. 2015; Solnik & Roulet 2000; Sukumaran et al. 2015; Watson & Dickinson 1981; Zhang et al. 2013). Correlation measures the degree to which two sets of values or variables vary together. Correlations can vary between -1 to $+1$, where the negative and positive signs indicate the direction of variation. A positive sign implies movement in the same direction whereas a negative sign implies movement in opposite directions. Further, higher correlation implies a stronger relationship between the two variables, which symbolises lower benefits in the context of portfolio diversification, while lower correlation implies a weaker relationship between two variables, signifying higher diversification benefits.

The objective of international portfolio diversification is to earn superior returns at a given or lower level of risk. Therefore, a low correlation between two variables is of interest in diversification studies. One of the common approaches to estimate diversification benefits is by constructing a set of efficient portfolios using Markowitz's MVO model (Markowitz 1952), which is discussed in the next sub-section. This model requires three input variables in order to construct efficient portfolios, namely, expected return of the assets, risk of the assets measured by its standard deviation, and correlation between expected return of the assets. An accurate estimation of correlation is, therefore, important in order to achieve the best risk-return combination in the portfolio. This is another reason why correlations play a crucial role in estimating diversification benefits. However, the estimates of correlation used in conventional portfolio optimisation models are unconditional, meaning that they are assumed to be time invariant, even though several studies (Gilmore & McManus 2002; Jithendranathan 2005; Speidell & Krohne 2007; Zhang et al. 2013) have proved that correlations vary with time. Jithendranathan (2005) explains that there are several reasons why correlations change over time. For example, integration of financial markets starts when countries permit cross-border purchase and sale of securities, lift restrictions on foreign ownership of domestic assets, allow currency convertibility, reduce tax and legal barriers, etc. Negative or external shocks also cause correlation to change over time as they impact the conditional variance of both markets. This change happens only when the change in variance of both markets is not symmetrical. If the change is symmetrical then there is no change in correlations. Thus, it is evidenced that correlations are not time invariant, that is, they change over time.

The most commonly used methods to estimate time-varying correlations are the multivariate GARCH models. Engle's (1982) autoregressive conditional heteroscedasticity (ARCH) model[31] was generalised by Bollerslev in 1986 in to a univariateGARCH model. ARCH models capture time-varying volatility in asset returns while GARCH models capture both time-varying volatility and correlations. Both, volatility and correlation play an important role in financial markets. Volatility is a measure of risk, which makes it important for decision-making. However, volatility varies with time and moves in clusters. This phenomenon is called volatility clustering, wherein small price changes are followed by small price changes and large price changes are followed by large price changes in either direction. This phenomenon in financial time series data violates the assumption of random walk, due to which GARCH models are used as they are intended for the purpose of modelling volatility. Volatility between assets and markets moves closely to each other, due to which their co-movement or covariance is of significant importance. One way to estimate a covariance matrix is by extending the univariate GARCH model of Bollerslev (1986) to a multivariate GARCH model. Allowing this development has opened up more tools for analysis and decision-making. The biggest concern, however, with multivariate GARCH models is to make them as parsimonious as possible, retain flexibility and ensure positive definiteness of the covariance matrix.

Models that fall under the category of multivariate GARCH models are the vectorised (VECH) model of Bollerslev et al. (1988), the Baba, Engle, Kraft and Kroner (BEKK) model of Engle & Kroner (1995), the constant conditional correlation (CCC) model of Bollerslev (1990), the dynamic conditional correlation (DCC) models of Engle (2002) and Tse & Tsui (2002), and the ADCC GARCH model of Cappiello et al. (2006). The VECH and the BEKK models compute conditional covariance matrices directly while the CCC, DCC and ADCC models disintegrate conditional covariance matrices into conditional standard deviations and correlations matrices instead. The VECH model of Bollerslev et al. (1988) was one of the first models introduced in this category. This model is easy to understand but it has two shortcomings, which limits its use in estimating time-varying correlations. First, it requires a large number of parameters for estimation. Specifically, it requires $3/2N(N+1)$ parameters which would be 630 parameters if 20 countries are considered. Second, the model may not yield a positive definite covariance matrix unless strict conditions are imposed. A restrictive version of the VECH model is the BEKK model which

[31] For a survey of ARCH models refer to Bollerslev et al. (1992), Bera & Higgins (1993), and Pagan (1996).

was proposed by Engle & Kroner (1995). This model overcomes the problem of positive definiteness posed by the VECH model but requires an even larger number of parameters for estimation. It asks for $(5/2)N^2 + (N/2)$ parameters, that is, $1,010$ parameters for 20 countries, thus restricting its application in many financial systems.

The next set of multivariate GARCH models includes CCC and DCC models. These models require the specification of conditional correlations along with its variances. These models are less demanding in terms of requirement of the number of parameters for estimation and are, therefore, easier to compute. For example, the CCC model needs only $(1/2)N^2 + (7/2)N$ parameters for estimation, which is 270 parameters in the case of 20 countries. However, the computational appeal of this model is offset by its one major drawback, the assumption of constant correlations. Specifically, the model assumes that correlations are time-invariant and it is only covariance that changes with time. Therefore, its conditional correlation matrix is constant and only conditional variances are time-varying. This drawback makes the CCC model less competent and appealing in empirical studies and begs for more flexibility. The disadvantage of the CCC model is overcome by the DCC models of Engle (2002) and Tse & Tsui (2002) as they can handle high-dimensional data sets. Not only do these models allow conditional correlations to vary with time, but they also reduce the number of parameters to only two, α and β, by employing "correlation targeting". Since these models also capture time-varying nature of assets, results of estimation and forecasting are considered to be more accurate (Wong & Vlaar 2003) than other methods previously discussed. The model is also considered to be flexible as it allows different univariate specifications for different assets or series in the sample. Despite these benefits, the model is restrictive in nature, in that it demands that correlations have the same dynamic pattern and symmetry. The imposition of same dynamic pattern can be easily violated when correlations are estimated for equities from different industries because equities of one industry are likely to behave differently from equities of another industry. Similarly, the imposition of symmetry, which implies that conditional correlations are affected in the same way by both positive and negative returns of the same magnitude, has also been found to be violated in empirical studies. For example, Ang & Chen (2002) found asymmetry in correlations; that is, correlations are higher when markets are performing poorly in comparison to when markets are performing better. When markets are bearish investors have more incentive to diversify and reduce the risk in their portfolio, but it is precisely in these situations that correlations are high and diversification benefits are low. Cappiello et al. (2006) also found similar correlation dynamics in equities and bonds, although bonds respond less strongly than equities during a crisis. Correlations for both equities and bonds increase during periods of negative shocks or bad news. For example, at the time of introduction of the Euro and establishment of a fixed exchange rate system within the European Union, correlations between equities increased while between bonds they were nearly close to 1.

According to Cappiello et al. (2006), the models discussed above are capable of capturing conditional asymmetries in volatility, but they do not have the ability to capture asymmetries in conditional correlations[32]. Conditional asymmetry in volatility can be explained by the leverage effect, which explains the unexpected drop in stock price due to increase in financial leverage of a firm. However, Bekaert & Wu (2000) found that changes in volatility after decline in asset price cannot be explained wholly by the leverage effect. Further, if the asset is a government bond then the leverage effect cannot be applied. For this reason, Cappiello et al. (2006) developed a model, called the ADCC GARCH model, that will capture conditional asymmetries in correlation. The ADCC GARCH model of Cappiello et al. (2006) thus overcomes the problem posed by the DCC GARCH model as it estimates the impact of asymmetric correlations on asset allocation. It is a generalisation of Engle's DCC GARCH model (Cappiello et al. 2006). Generalisation permits the model to account for asymmetries in correlations and volatilities, making it more suitable for examining correlation dynamics among equities from different industries and between different asset classes. This model has received support in recent empirical studies by Baumohl & Lyocsa (2014), Gupta & Donleavy (2009), Hou & Li (2016), Jones & O'Steen (2018), and Sukumaran et al. (2015), who have used it in their estimation of time-varying correlations, although the empirical results between the ADCC GARCH model and the DCC GARCH model are not much different. Possibly, superiority of the ADCC GARCH model requires more empirical attention.

This thesis employs the ADCC GARCH model to estimate conditional correlations and Pearson's correlation coefficient to estimate unconditional correlations between Australia's superannuation funds and developed, emerging and frontier markets.

[32]Univariate GARCH models such as Glosten-Jagannathan-Runkle GARCH (GJR-GARCH) (Glosten et al. 1993), exponential GARCH (EGARCH) (Nelson 1991) and Threshold GARCH (TGARCH) (Zakoian 1994) also have the ability of capturing asymmetry in volatility but not asymmetry in correlations. Univariate models are outside the scope of this study as the study examines equities from multiple countries at the same time.

3.5.3 Models Used for Optimal Portfolio Construction

Portfolio construction is a process of identifying assets and their proportions that work together as an investment strategy for the superannuation fund. The goal is to construct optimal portfolios using appropriate combinations of risk and return. An optimal portfolio is one that exhibits the highest return for a given level of risk or lowest risk for a given level of return. The concept of constructing an optimal portfolio is influenced by the MPT pioneered by Markowitz (1952). MPT assumes that investors aim to maximise expected returns for a given level of risk or minimise risk for a given level of return. In order to achieve this objective, Markowitz asserts that it is important to consider the effect of the change in price of one asset relative to the change in price of another asset in a portfolio rather than choosing assets one by one. A portfolio constructed by following this criterion is an efficient portfolio.

Markowitz's MVO model is recognised as one of the cornerstones of MPT. It is popular in academic research but it is not without its flaws. This model is widely criticised for its computational difficulty in solving large-scale covariance matrices. However, with significant advancement in computing power in the last few decades, this shortcoming can be minimised. Another weakness of this model is explained by Harvey et al. (2010), who state that it is a necessary condition of MVO that asset returns should be normally distributed. However, this mistaken notion is clarified in Markowitz (2014, p. 346):

> Gaussian return distributions, or quadratic utility are sufficient conditions for the use of mean-variance analysis in practice. But they are not necessary conditions.

This brings clarity to the widely-held belief of normality of asset returns and emphasises that MVO can be used in analysing returns that are not normally distributed. This also clarifies the second major criticism of MVO that is concerned with its disregard for higher moments of return distribution. Since normality of asset returns is not a prerequisite of MVO and it can give a satisfactory approximation of optimisation results, models that incorporate skewness and kurtosis may not be very effective.

The other portfolio optimisation model that is commonly used in practice is the single-index model (SIM) developed by Sharpe (1971). SIM is a simplified variant of the MVO as it calls for a smaller number of inputs compared to MVO but this lower number of inputs is also a target for criticism. The model assumes only one source of risk, that is, the market risk that affects all asset returns. Firm-specific risk such as change in management, operations breakdown, etc. can be eliminated by diversification. The model's assumption is based on the premise that most assets react in a similar manner to market risk or other macroeconomic factors and hence have positive covariance. However, this assumption may not be appropriate for this study as the study deals with assets in several markets rather than several assets in one market. Hence, Markowitz's MVO model is used for portfolio construction in Chapter 5.

3.6 Summary and Open Research Problems

Review of theoretical and empirical research on international portfolio diversification and the models used for measuring diversification benefits indicates that, despite increasing market integration, frontier markets promise both risk reduction and superior returns in abundance. These gains arise due to economic, financial, legal and political differences between countries. The largest difference arises between the levels of economic development between developed and frontier markets. Thus, on theoretical grounds, diversifying in frontier markets should provide higher risk-adjusted returns for investors from developed markets.

Differences between developed, emerging and frontier markets are reflected in correlations between their asset returns. From literature, it seems that frontier markets are largely uncorrelated with developed and emerging markets and thus have all the hallmarks of justifiable portfolio diversification. However, research on this is limited, especially from an Australian context. Theoretically, it is expected that Australian investors will benefit from frontier markets; however, the question remains whether investment in these markets can be beneficial to Australia's superannuation investors; an area of vital concern for Australian and its policy-makers. If correlations are low and due to the small size of the Australian market, diversification benefits are expected to be substantial and more apparent.

Since frontier markets have a high risk exposure, it becomes important to examine correlation between Australian superannuation funds and frontier markets, and construct portfolios such that the impact of including frontier market securities leads to an overall gain to Australian investors. This study uses Pearson's correlation and ADCC GARCH correlation models to measure correlation and Markowitz's MVO model to construct portfolios with and without restrictions to examine whether the current level of diversification of Australia's superannuation funds is sufficient or whether further gains are achievable. This discussion, thus, gives rise to the following research question which this thesis aims to answer:

RQ 1: Does portfolio diversification in developed, emerging and frontier markets yield risk-returns benefits to Australia's superannuation funds?

Chapter 4

Data and Methodology

4.1 Overview

This chapter explains the research design of the first study, the process and methodology of sample selection, description of the selected sample, the hypotheses to be tested and the models used for hypothesis testing. Accordingly, Section 4.2 describes the research design using the "research onion" framework. Section 4.3 discusses the sample selection process and defines the variables used for analysis. Section 4.4 explains the characteristics of time series data and some of the issues associated with it. Section 4.5 discusses hypotheses development. Section 4.6 discusses the models used for testing the hypothesis and Section 4.7 concludes the chapter.

4.2 Research Design

This study uses the "research onion" framework, proposed by Saunders (2009), to devise a research plan based on the research question outlined in Chapter 1. From the "research onion" framework, it can be identified that this study takes a positivist stance in its philosophy and a deductive approach in addressing the research question. The primary objective of this study is to examine the effect of developed, emerging and frontier markets on the performance of Australia's superannuation funds. This study hypothesises that these markets improve the performance of Australia's superannuation funds due to low correlations between them and Australia. Accordingly, it can be established that the study is of explanatory nature as it places emphasises on examining the relationship between developed, emerging and frontier markets and Australia's superannuation funds. The study employs a quantitative approach to the data collection technique and analysis procedure, in that it uses time series data and employs time series analysis for hypothesis testing. Use of time series data and analysis is most appropriate to address the research question of this study as this approach enables observation of markets over-time, identifies their specific attributes and deduces relationships between them. The estimates obtained through time series analysis allow validation or further development of existing theories and makes findings applicable to all markets.

4.3 Sample Selection and Description

This section elaborates the sample selection methodology and provides a description of the variables used in the study. It also discusses the characteristics of time series data and some assumptions and issues associated with it.

4.3.1 Sample Selection

Most papers examining international diversification benefits have used one of three indices for country classification purposes, namely MSCI, FTSE and S&P Dow Jones. These indices classify countries into developed, emerging or frontier markets based on several criteria presented in Table B.2, Table B.3 and Table B.4. The classification of countries is shown in Table B.5.

From the literature review, the study finds that while MSCI indexes are a preferred choice for most researchers, such as Berger et al. (2011), Cha & Jithendranathan (2009), Kohlert (2011), and Li et al. (2003), particularly as a proxy for developed, emerging and frontier markets, there is no discussion and consensus on the choice of country classification framework. To bring uniformity in the country classification approach and to ensure that all available country classification frameworks are attended to, this study creates a joint country classification matrix (Table B.1). A regional classification of these countries is also presented in Table B.6. Using this approach, the study identifies 22 developed, 21 emerging and 18 frontier markets countries as candidates for this thesis. Ghana, classified as a frontier market, is excluded from the sample because of unavailability of data, which brings down the frontier markets sample to 17 countries. It is important to note that Australia, categorised as a developed market by all three indices, is not included in the joint country classification matrix because it is the country with which correlating and co-integrating association with the rest of the markets is measured.

4.3.1.1 Joint Country Classification Matrix

The indices that classify countries into developed, emerging and frontier markets categories are MSCI, FTSE and S&P Dow Jones indices. Individually, they classify a different number of countries into these categories and, in that, there is a large variation in the number of countries classified in the frontier markets category. For example, Palestine is classified as a frontier market by MSCI but not by the other two indices whereas Pakistan is not classified in this category by FTSE but the other two indices consider it as a frontier market. This difference in their classification is due to differences in their country classification criteria or methodology, encapsulated in Table B.2, Table B.3 and Table B.4. Hence, to assure and ensure that countries chosen for the purpose of this study are classified in the same category across all the three indices, this study creates a joint country classification matrix, presented in Table B.1, which is used for both RQs. A brief overview of the country classification criteria used by MSCI, FTSE and S&P Dow Jones indices is discussed below.

MSCI: MSCIs Market Classification Framework (given in Table B.2) classifies countries into developed, emerging and frontier markets categories on the basis of (a) economic development, (b) size and liquidity and (c) market accessibility. Each criterion is further broken down into different sections that provide specific requirements to be met for categorisation.

(a) Economic Development is an essential criterion for developed markets. That is, for a country to be categorised as a developed market its per capita GNI for three consecutive years should be 25% above United States Dollars (USD) $12,736$ (World Bank's high income threshold for 2015), while for emerging or frontier markets categorisation, there is no such requirement provided in the framework.

(b) Size and Liquidity criterion specifies company size (based on full market capitalisation), security size (based on float market capitalisation) and security liquidity that must be met by a minimum number of constituents in each category. The framework uses the security liquidity criterion for further categorisation of countries identified as frontier markets into smaller and larger frontier markets. However, this sub-categorisation is not significant for the purpose of this study.

(c) Market Accessibility assesses a country's openness to foreign ownership, ease of capital inflows and outflows, efficiency of operational framework, competitive landscape and stability of the institutional framework. A detailed description of each of these criterion is given in Table B.2.

FTSE: FTSE's country classification process consists of seven elements defined in The Financial Times Stock Exchange (2015), of which the Quality of Markets (given in Table B.3) matrix is the most significant because it outlines the parameters against which countries are objectively assessed and compared. The matrix is divided into five sections: (1) market and regulatory environment, (2) custody and settlement, (3) dealing landscape, (4) derivatives, and (5) size of market. In addition to these five sections, the World Bank's GNI per capita rating and credit worthiness of the countries are also considered. Each of these sections are further broken down into several factors, which forms the basis for developed, emerging and frontier markets categorisation. Each factor is used to score countries as either 'pass', 'restricted' (partial failure) or 'not met' which helps in determining the category they are likely to fall into.

For a country to be categorised as a developed market, it must meet all factors listed in the matrix, whereas a frontier markets categorisation requires the fulfilment of only five factors. These five factors examine whether a country's stock market is actively monitored by its regulatory authorities, constraints or penalties placed on investment or repatriation of capital and income, incidents of failed trades, clearing and settlement time-lines, and level of market and trade reporting transparency. Prior to 2008, FTSE's country classification was only for the developed and emerging markets categories. The frontier markets category was introduced in 2008 in order to distinguish between countries that are emerging and those that have not sufficiently evolved to fit into this category. This leads to further sub-categorisation of emerging markets into advanced emerging and secondary emerging categories, but this is not significant for the purpose of this study.

S&P Dow Jones: S&P Dow Jones's country classification process (given in Table B.4) is two-fold. First, countries must meet the initial eligibility criteria of full domestic market capitalisation, domestic annual turnover value and exchange development ratio as specified in the table. In order to be identified as a developed or emerging market, all three specifications must be met, whereas, for a frontier markets categorisation, any of the two must be satisfied.

In the second step, six additional criteria and a requirement of GDP per capita greater than USD $15,000$ must be met in order to attain a developed markets status. The six additional criteria include full domestic market capitalisation over USD 15 billion, settlement period of T+3 or better, sovereign debt rating of BB+ or above, non-occurrence of hyperinflation, no significant foreign ownership restrictions and freely traded foreign currency. Out of these, full domestic market capitalisation over USD 15 billion and any three of the remaining five criteria must be satisfied for obtaining emerging market status, but, none of these is a requirement for being a frontier market.

When deviations from baseline requirements are observed, S&P Dow Jones reviews the criteria discussed above and also examines countries on the basis of other quantitative and qualitative factors such as political unrest, restrictions on investments imposed by other governments, rate and variability of GDP growth, size of the economy, settlement procedures, rules on short sales, derivative trading and more. A detailed description of the additional factors is given on pages 18-19 of S&P Dow Jones (2015).

4.3.1.2 Australian Superannuation Benchmark Selection

A benchmark for superannuation funds is created from the data obtained from APRAs "The Annual Fund-level Superannuation Statistics", issued on 20 March 2018. The report contains information on profile and structure of trustees and funds, financial performance and financial position of each fund as on date of the report, fees, rebates and discounts and membership details. The information available pertains to only APRA regulated superannuation funds with more than four members and eligible rollover funds [33]. The report contains all the above-mentioned information in an excel format from June 2004 until June 2017[34]. It is a public resource permitted for use under Creative Commons Attribution 3.0 Australia License[35].

Table 3 of the Australian Prudential Regulation Authority (2018) report contains fund-level financial performance of each fund for the period June 2004 – 2017. It includes net assets at the beginning of the period which are adjusted for members' benefits flows, insurance activities, superannuation investment

[33] See Australian Prudential Regulation Authority (2018) for information on what is excluded.
[34] The excel spreadsheet is available at `https://www.apra.gov.au/annual-fund-level-superannuation-statistics`
[35] `http://www.creativecommons.org/licenses/by/3.0/au/`

income and expenses, whole-of-fund profit/loss and return to obtain net assets at the end of the period. From this report, data on net assets at the end of the period is used for the purpose of constructing a superannuation index that will be useful in comparing the performance of superannuation funds with other countries mentioned in the JCC. Calculation of this superannuation index is similar to the calculation of a stock market index by weighted average market capitalisation. Instead of market value of stocks, total net assets at the end of each year, from Table 3 of the Australian Prudential Regulation Authority (2018), is used. Table 4.1 below shows the calculation of the superannuation index.

Table 4.1: Australia's Superannuation Index (2004-2017)

A	B	C	D	E	F
Year	Total funds	Data available for funds	Total Net Assets at the End of Each Period ($'000)	Index Divisor (Base year's value/Base year's total net assets)	Index Value (D*E)
2004	1135	548	362,251,657	2.7605E-07	100.00
2005	881	559	447,959,782		123.66
2006	534	439	548,477,555		151.41
2007	470	391	679,041,907		187.45
2008	429	360	656,091,998		181.11
2009	394	317	602,919,067		166.44
2010	354	278	705,204,673		194.67
2011	320	248	785,001,437		216.70
2012	300	230	806,948,885		222.76
2013	273	216	942,293,543		260.12
2014	245	202	1,085,917,385		299.77
2015	232	198	1,202,178,421		331.86
2016	220	183	1,258,849,817		347.51
2017	199	170	1,580,827,833		436.39

4.3.2 Sample Description

As discussed in the previous section, the study uses broad market indices of countries identified in the developed, emerging and frontier markets category in Table B.1. Monthly closing price for the period 2006 – 2017 for each country in the JCC is available on the Thomson Reuters Eikon database, which is available at Swinburne University of Technology. This price data is sourced in the local currency of each country. Prices are then converted into returns for the purpose of analysis because asset returns permit a scale-free measurement of asset performance as it brings uniformity in the data set. Returns also have more attractive statistical properties than prices such as stationarity, see Section 4.4 for a detailed discussion.

Similar conversion from prices to returns is performed for superannuation data. However, in the case of superannuation funds, an interpolation technique is performed prior to that for the purpose of obtaining monthly data points. As presented in Table 4.1, the superannuation index has only 12 data points with annual frequency. The limitation of APRAs data set is that it maintains fund-level data on an annual basis. Only 12 data points, however, may not be adequate for this study. A larger sample size is usually preferred to a smaller sample size as it is easier to detect and account for imperfections in a large sample. Correlation estimates are also likely to be less noisy in a large sample and thus more reliable. Sample size of at least more than 50 data points in believed to capture periodic effects such as seasonality, even better if it is 100 (Beard et al. 2019; Hyndman & Kostenko 2007). For this purpose, interpolation techniques are used.

Interpolation, also called temporal disaggregation, can create new monthly data points from the existing annual data points. Lack of availability of a time series in a desired frequency is a common problem in finance and economics. Although there is no way to make up for the loss of data points, using a higher frequency indicator series that closely resembles the movements of the lower frequency time series is useful (Sax & Steiner 2013). Interpolation can also be performed without the requirement of an indicator series. However, this procedure has several issues. According to Abeysinghe & Rajaguru (2004), univariate techniques of interpolation, such as linear or cubic spline, can introduce pseudo-seasonal patterns in the time series. These techniques can also introduce autocorrelation in the interpolated time series, which can yield biased regression estimates and distort regression relationships. A higher quality of interpolated series is achieved when an indicator series is available. From Table 4.2, it is evident that the indicator series "S&P ASX 300 Franking Credit Adjusted Annual Total Return (Superannuation) Index" demonstrates a very high correlation (0.96) to our superannuation index. A highly correlated indicator series is suitable for interpolating higher frequency data points for the superannuation index.

The choice of interpolation technique depends on whether an indicator series is available or not. When an indicator series is not available then the choice of interpolation methods for creating new data points is limited to linear interpolation, cubic spline interpolation, and Denton-Cholette (DC) or

Table 4.2: Finding Indicator Series

	Superannuation Index
Superannuation Index	1
S&P ASX 300 Franking Credit Adjusted Annual Total Return Index (Superannuation)	0.96
S&P ASX Small Ordinaries	-0.26
S&P ASX Midcap 50	0.45
S&P ASX 200 VIX	-0.54
S&P ASX 200 REIT	-0.06
S&P ASX 200 Real Estate	-0.05
S&P ASX 200	0.42
All Ordinaries	0.44
S&P ASX 200 Financials	0.46
S&P ASX 300	0.40

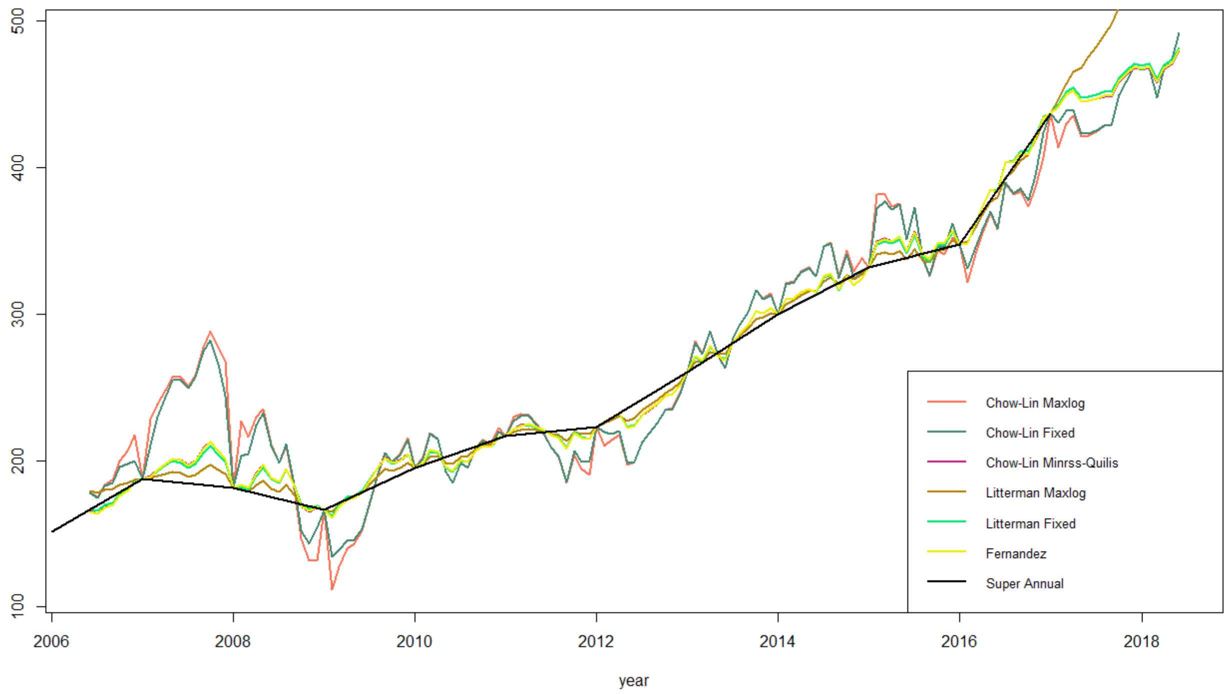
Note: Data for the above-mentioned indices, except Superannuation Index, is obtained from `https://us.spindices.com`

Boot, Feibes and Lisman (BFL) smoothing methods[36] (Chamberlin 2010). Regression-based techniques such as Chow-Lin regression (Chow & Lin 1971), Fernandez random walk model (Fernandez 1981), and Litterman random walk Markov model (Litterman 1983) are preferred when a higher frequency indicator series is available. All of these techniques ensure that either the first, last, sum or average value of the disaggregated series is consistent with the previously un-disaggregated one. Figure 4.1 plots the superannuation index of annual data points against an interpolated series of monthly data points using Chow-Lin, Fernandez and Litterman models. The "tempdisagg" package built for R Studio is used to conduct interpolation. Function "td" in the tempdisagg package performs Chow-Lin, Fernandez and Litterman interpolation. Detailed explanation of the package is provided in Sax & Steiner (2013). From Figure 4.1, the Litterman maxlog model shows the smoothest curvature and moves very closely to the annual superannuation line.

The quality of this disaggregated monthly superannuation series is compared against others using root mean square error (RMSE) to confirm the outcome observed in Figure 4.1. RMSE measures the standard deviation of the residuals. It shows the concentration of the data points around the best fit line. When all points lie on the regression line, it indicates no errors. This situation occurs only when the correlation coefficient between two variables is one. A lower RMSE thus implies a better fit. The study

[36] See Chamberlin (2010) for an explanation of interpolation techniques.

Figure 4.1: Interpolation using Chow-Lin, Litterman and Fernandez Models



finds that the RMSE of the Litterman Maxlog model is the lowest amongst all interpolation models used. This procedure thus yields 133 data points from June 2006 to June 2017.

4.4 Statistical Properties of Time Series Returns

As mentioned in Section 4.3.2, when examining asset or financial performance it is common to use returns data instead of prices. The two main reasons for using returns instead of prices are raised by Campbell et al. (1997). First, returns are expressed as a percentage change in price from the initial price, which makes them scale-free and thus comparable to other asset returns. Second, asset prices are non-stationary and difficult to analyse. Some commonly observed behaviour and statistical properties of time series returns data are discussed below.

- Heavy tails: The probability distribution of returns data is not normal. That is, it often exhibits heavier tails than a normal distribution. Normality can be checked graphically using a quantile-quantile plot and statistically using the Jarque-Bera (JB) test. The JB test is used in this study. However, according to the central limit theorem, when time horizon increases from daily to monthly, for example, distribution of returns approaches a normal distribution. This is assumed to be true for sample sizes larger than 30. This is called aggregational gaussianity.

- Stationarity: Returns data is considered to be stationary. Changes in the economy such as expansion or contraction, increase in national output or productivity, innovation and its impact, etc. affect asset prices. As a result, asset prices are generally non-stationary. Their returns, however, are mean-reverting, that is, fluctuate around the mean. When large changes happen in the economy, returns move widely too but the general property of returns is that they revert to the mean.
- Asymmetry: In finance, return data tends to be negatively skewed, that is, skewed to the left. It means that more data points are concentrated on the right-hand side of the distribution plot than on the left. This gives rise to asymmetry. Negatively skewed distribution indicates that investors generally expect larger losses and smaller gains. It also indicates that investors react more strongly to negative information than positive information.
- Autocorrelation: Returns data generally does not show any autocorrelation but it does not mean that it is independent. In contrast, squared and absolute returns data often show significant autocorrelation, indicating the property of long-term memory, however, it decays when the sampling period increases from daily to monthly. Autocorrelation in absolute returns is larger than squared returns.

4.5 Hypothesis

A review of literature (Berger et al. 2011; Gupta 2006; Gupta & Donleavy 2009; Gupta & Guidi 2012) indicates that international portfolio diversification has significant benefits when countries between which diversification is conducted are at different stages of economic and financial development. This is because there are substantial differences in their GDP growth rate, size and liquidity of their financial markets, market accessibility and openness, political stability, infrastructure development, competitive landscape, and such factors. In addition, the review notes that with increasing financial liberalisation post-1980s countries that are categorised as developed and emerging markets are moving closer to each other in terms of their economic and financial development (Asness et al. 2011; Gupta & Guidi 2012; Longin & Solnik 1995; Solnik & Roulet 2000; Zhang et al. 2013). As gaps between markets reduce, their ability to gain from international portfolio diversification in each other diminishes.

This study focuses on frontier markets, which are identified to be at a significantly different stage of economic and financial development from the rest of the world (Speidell 2011; Speidell & Krohne 2007). Each country in the frontier market category has unique characteristics, and hence unique financial benefits attached to it. However, since it is unreasonable to assume that all frontier markets have the potential to offer international portfolio diversification benefits, this study aims to examine and measure the possibilities of gains from these markets. The study also examines the results obtained from diversification in frontier markets to those achievable from developed and emerging markets.

The scope of this study will be to examine and measure international portfolio diversification in developed, emerging and frontier markets for Australia's superannuation funds. The objective is to find a meaningful outcome for a particular group of investors and use this outcome to further assess the sustainability of the benefits, or the lack thereof, from frontier markets in RQ 2.

In RQ 1, the first step is to examine the association between frontier markets and Australia's superannuation funds using Pearson's correlation and ADCC GARCH estimation models (see Section 4.6.2). Based on the results obtained in the first step, the second step is to construct portfolios and evaluate the performance of these portfolios using Markowitz's MVO model (see Section 4.6.3). In the third and final step, the performance of each constructed portfolio is compared to a benchmark to determine international portfolio diversification benefits (see Section 4.6.4). All three steps are repeated for developed and emerging markets for the purpose of comparison with frontier markets.

Accordingly, the following hypothesis is developed to test RQ 1:

> H1: Portfolio diversification in developed, emerging and frontier markets provides risk-return benefits to Australian superannuation funds.

4.6 Models for Hypothesis Testing

This section explains the models used in this study for testing the above-mentioned hypothesis.

4.6.1 Estimating Unconditional Correlation - Pearson's Correlation Estimate

As discussed in Section 3.5, correlation is a measure of linear dependence between two variables. Positive correlation indicates that both variables move in the same direction while negative correlation indicates opposite direction. Correlation estimate closer to +1 indicates stronger relationship between the two variables while closer to −1 indicates weaker relationship. Pearson's correlation estimate is the most commonly used method to measure unconditional correlations. It is defined as,

$$\rho_{x,y} = \frac{cov(X,Y)}{\sqrt{var(X)var(Y)}} \tag{4.1}$$

Where $\rho_{x,y}$ is the correlation coefficient, X and Y are random variables. It is assumed that variance of, both, X and Y, exists, and $\rho_{x,y}$ lies between −1 and +1.

4.6.2 Estimating Conditional Correlation - ADCC GARCH Model

The ADCC GARCH model was introduced by Cappiello et al. (2006) as an improvement over the DCC GARCH model of Engle (2002) by incorporating asymmetries in correlations and variances. Specifically, this model allows for series specific news impact and smoothing parameters, and permits conditional asymmetries in correlations.

The conditional correlation between two random variables that have returns of r_1 and r_2 and mean zero can be written as,

$$\rho_{(12,t)} = \frac{E_{t-1}(r_{1,t}r_{2,t})}{\sqrt{E_{t-1}(r_1,t^2)E_{t-1}(r_2,t^2)}} \tag{4.2}$$

Let $h_{i,t} = E_{t-1}(r^2_{1,t})$ and $r_{1,t} = \sqrt{h_{i,t}\varepsilon_{i,t}}$ for $i = 1,2$, where $\varepsilon_{i,t}$ is a standardised disturbance that has zero mean and a variance of one; $\varepsilon_t = D_t^{-1}r_t$. On substituting it in equation 4.2,

$$\rho_{(12,t)} = \frac{E_{t-1}(\varepsilon_{1,t}\varepsilon_{2,t})}{\sqrt{E_{t-1}(\varepsilon_1,t^2)E_{t-1}(\varepsilon_2,t^2)}} = E_{t-1}(\varepsilon_{1,t}\varepsilon_{2,t}) \tag{4.3}$$

Using a GARCH (1,1) specification, the covariance between the random variables can be written as,

$$q_{12,t} = \overline{\rho_{12}} + \alpha(\varepsilon_{1,t-1}\varepsilon_{2,t-1} - \overline{\rho_{12}} + \beta(q_{12,t} - \overline{\rho_{12}}) \tag{4.4}$$

The unconditional expectation of the cross product is $\overline{\rho_{12}}$, while for the variances $\overline{\rho_{12}} = 1$

The correlation estimator is $\rho_{12}, t = \frac{q_{12,t}}{\sqrt{q_{11,t} q_{22,t}}}$

This model is mean-reverting if $\alpha + \beta < 1$. The matrix version of this model is written as,

$$Q_t = S(1 - \alpha - \beta) + \alpha(\varepsilon_{t-1}\varepsilon'_{t-1}) + \beta Q_{t-1} \tag{4.5}$$

Where S is the unconditional correlation matrix of the disturbance terms and $Q_t = \mid q_{1,2,t} \mid$

The log likelihood for this estimator can be written as,

$$L = -\frac{1}{2}\sum_{t=1}^{T}(nlog(2\pi) + 2log \mid D_t \mid + log \mid R_t \mid + \varepsilon'_t R_t^{-1} \varepsilon_t) \tag{4.6}$$

Where $D_t = diag\{\sqrt{h_{i,t}}\}$ and R_t is the time-varying correlation matrix.

Since this model does not allow for asymmetries and asset-specific news impact parameters, the modified model which Cappiello et al. (2006) use to incorporate asymmetrical effects and asset-specific news impact is,

$$Q_t = (\overline{Q} - A'\overline{Q}A - B'\overline{Q}B - G'\overline{N}G) + A'\varepsilon_{t-1}\varepsilon'_{t-1}A + B'Q_{t-1}B + G'n_{t-1}n'_{t-1}G \tag{4.7}$$

Where A, B and G are diagonal parameter matrices, $n_t = I[\varepsilon_t < 0] o \varepsilon_t$ (with o indicating Hadamard product) and $\overline{N} = E[n_t n'_t]$. For $\overline{Q}$ and $\overline{N}$, expectations are infeasible and are replaced with sample analogs, $T^{-1}\sum_{t=1}^{T}\varepsilon_t\varepsilon'_t$ and $T^{-1}\sum_{t=1}^{T} n_t n'_t$, respectively. $Q_t^* = [q_{ii,t}^*] = [\sqrt{q_{ii,t}}]$ is a diagonal matrix with the square root of the i^{th} diagonal element of Q_t in its i^{th} diagonal position.

4.6.3 Optimal Portfolio Construction - Mean-Variance Optimisation Model

MVO aims to minimise portfolio risk, measured by its variance, restricted by the expected return of the portfolio. It considers covariance of different assets and presents a foundation to estimate variance and expected returns based on the risk and return of individual assets in the portfolio.

Expected return of a portfolio with N assets is given as,

$$r_p = \sum_{1=1}^{N} w_i r_i \tag{4.8}$$

Where w_i is the weight of the i^{th} asset in the portfolio and r_i is the expected return of that asset.

Risk of the portfolio which is measured by its variance (σ_p^2) is not only a simple weighted average of the risk of individual assets but also includes association between different assets in the portfolio as shown in the following equation.

$$\sigma_\rho^2 = \sum_{i=1}^{N} w_i^2 \sigma_i^2 + \sum_{i=1}^{N} \sum_{j=1}^{N} w_i w_j \sigma_{i,j} \tag{4.9}$$

Where $\sigma_{i,j}$ is the covariance between the two assets i and j and $\sum_{i=1}^{N} \sum_{j=1}^{N}$ is the double summation of all possible pairs of i and j.

Mathematically, the optimisation problem is stated as,

$$Min \sigma_\rho^2 = \sum_{i=1}^{N} \sum_{j=1}^{N} w_i w_j \sigma_{i,j} \tag{4.10}$$

Subject to the following constraints,

$$\sum_{i=1}^{N} w_i^2 = 1 \tag{4.11}$$

Constraint (4.11) means that the sum of total fractions must be equal to one, that is, all money will be invested.

$$\sum_{i=1}^{N} w_i^2 \sigma_i^2 \geq R \tag{4.12}$$

Constraint (4.12) makes sure that investors will attain the expected rate of return R.

$$0 \leq w_i \leq 1 \forall i = 1, \cdots, N \tag{4.13}$$

Constraint (4.13) indicates that short selling is restricted.

By applying the above optimisation equation, the study constructs optimal portfolios that offers the most favourable risk-return profile given that investors are risk-averse.

4.6.4 Estimating Diversification Benefits

The final step involves evaluating the performance of each constructed portfolio with its benchmark in order to determine the benefits derived because of diversification. Performance evaluation gained importance in the investment industry because of Markowitz's (1952) modern portfolio theory. This has led to the emergence of several performance measures to estimate risk or return benefits. This study employs the most commonly used performance measure, Sharpe ratio[37] to evaluate the performance of each constructed portfolio and to ensure the validity of the results.

Sharpe ratio estimates excess return earned for one unit of total risk in a portfolio (Sharpe 1994). It is given as,

$$SR_p = \frac{E(R_p) - R_F}{\sigma(R_p)} \tag{4.14}$$

Where $E(R_p)$ is the expected return of the portfolio p, R_F is risk-free rate of return. $E(R_p) - R_F$ denotes excess return and $\sigma(R_p)$ is standard deviation of portfolio returns. A Sharpe ratio closer to one or higher indicates good performance. A higher ratio means more attractive risk-adjusted returns. From a portfolio diversification perspective, adding more assets to the portfolio should increase the Sharpe ratio.

4.7 Summary

This study examines the association between developed, emerging, frontier markets and Australia's superannuation funds using Pearson's correlation and ADCC GARCH models. Using these results, the study then constructs optimal portfolios and evaluates their performance using performance measures discussed in Section 4.6. The intention is to determine whether international portfolio diversification is beneficial for Australian superannuation funds. To do so, this chapter elaborates on the sample selected and the procedure adopted in arriving at the sample.

[37]This study uses the Sharpe ratio to measure portfolio performance as it is the most commonly used measure in research and industry for this purpose. In addition, the results of Sharpe ratio and other performance measures are found to be similar in a review conducted by Eling & Schuhmacher (2007). The authors note that the choice of performance measure does not have sufficient influence on the outcome.

Chapter 5

Analysis of Data and Empirical Results

5.1 Overview

The objective of this chapter is to report and discuss descriptive statistics and empirical results obtained from analysing the benefits of international portfolio diversification in developed, emerging and frontier markets. Analysis is conducted for the full study period from 2006 – 2017, the GFC sub-period from 2006 – 2009, and the post-GFC sub-period from 2009 – 2017. Regional analysis, based on the regional classification presented in Table B.6, for developed, emerging and frontier markets, is also conducted. This chapter is structured as follows: A detailed description of the descriptive statistics is discussed in Section 5.2. The data is examined for stationarity in Section 5.3. Sections 5.4.1 to 5.4.3 report and discuss the results of unconditional correlations, using Pearson's correlation, and Section 5.5 reports and discusses the results of conditional correlations, using ADCC GARCH, between Australia's superannuation funds and developed, emerging and frontier markets. Correlation estimates obtained from Pearson's and ADCC GARCH models are used as inputs in the Markowitz's MVO model to find optimal portfolios for Australian superannuation investors. Results are presented and discussed in Sections 5.6 and 5.7.

5.2 Descriptive Statistics

Descriptive statistics for monthly returns of superannuation funds, developed, emerging and frontier markets for the full period from 2006 to 2017 are presented in Table 5.1.

5.2.1 Superannuation Funds

The monthly mean return of Australia's superannuation funds stands at 0.0048 with a minimum of −0.0167 and maximum of 0.0277. Its standard deviation is 0.0101, which is the lowest among all countries in the sample. Also, it is the only variable with negative excess kurtosis of −0.6337, indicating flat tails and less outliers. The return data is negatively skewed as is the case for most countries' financial returns. The JB test shows that Australia's superannuation returns are normally distributed at 5% significance level.

5.2.2 Developed Markets

In the developed markets category, in the Americas, the average monthly return of Canada is 0.0027 with a standard deviation of 0.0375 and that of the United States is 0.0058 with a standard deviation of 0.0422. Both countries' returns are negatively skewed, which is a common observation in the case of financial returns as most investors react more strongly to negative news than positive news. Both countries also exhibit positive excess kurtosis, which is an indication of peaked distribution and fatter tails than a normal distribution. In that, excess kurtosis is highest for Canada (4.1559). For both countries, the JB test of normality shows that null hypothesis of normal distribution is rejected at 5% significance level: that is, the returns are not normally distributed.

In the EMEA region of developed markets, except Italy (−0.0023) and Portugal (−0.0029) all countries have positive mean returns. Among these, Norway (0.007), Germany (0.0073) and Denmark (0.0088) report the highest mean returns. Standard deviation is highest for Austria (0.0655) with Italy and Norway falling in the same range, and lowest for Switzerland (0.037). Small difference in high and low values is an indication of low volatility in asset returns. With respect to skewness, all countries report negatively skewed returns, except Finland. In regard to excess kurtosis, all countries report positive excess kurtosis indicating peaks and fat tails, which is a sign of large positive or negative returns. In the case of Belgium (3.0539) and Norway (4.4439), excess kurtosis is the highest in the EMEA region of developed markets. It means that investment in these two countries can lead to extremely large or small returns. The JB test shows that except four countries, France, Italy, Spain and Switzerland, the remaining countries have non-normal return distribution at 5% significance level.

In the Asia-Pacific region of developed markets, monthly mean returns are the lowest for Japan

(0.0016), with a standard deviation of 0.0535, and highest for New Zealand (0.0062), with a standard deviation of 0.0331. Returns are negatively skewed for all four countries in this region and excess kurtosis is positive. Only Singapore exhibits a very high excess kurtosis of 4.6478 in this region. The return distribution of all countries is non-normal at 5% significance level.

5.2.3 Emerging Markets

In the emerging markets category, there are five countries in the Americas region, nine in the EMEA region, and seven in the Asia-Pacific region. Monthly mean returns of all countries in the Americas region are positive and range between 0.0102 (Peru) and 0.0029 (Colombia). Amongst all, standard deviation is the highest for Peru at 0.0919. In terms of skewness, returns of Brazil, Colombia and Mexico are negatively skewed while those of Chile and Peru are positively skewed. Excess kurtosis is positive for all countries in this region, with Peru's being the highest at 3.9249. This indicates higher chances of extreme positive or negative returns from investment in Peru. The return distribution of Chile passes the JB test of normality and in the case of remaining countries, the null hypothesis of normal distribution is rejected at 5% significance level.

In the EMEA region of emerging markets, except the Czech Republic and Greece, all countries' monthly mean returns are positive. The Czech Republic yields -0.0003 with a standard deviation of 0.0614 and Greece realises -0.0075 with a standard deviation of 0.0947. The standard deviation of returns of many countries in this region, such as Egypt, Greece, Russia and Turkey, is higher than the Americas and all regions of developed markets, indicating higher risk. With regard to skewness, except Egypt and Turkey, all countries' returns are negatively skewed. The Czech Republic exhibits very high positive excess kurtosis (3.8048) while the remaining countries show lower positive excess kurtosis. Overall, they all have fatter tails than a normal distribution. Returns of two countries, Greece and Turkey, resemble a normal distribution while the remaining countries' returns are non-normally distributed at 5% significance level.

In the Asia-Pacific region of emerging markets, monthly mean returns of all countries are positive, ranging between 0.0046 and 0.013. Their standard deviation is lower than what is observed for the EMEA region, except for China's, which stands at 0.0951. The mean return of India is positively skewed, while those of the remaining countries are negatively skewed, reflecting investors' expectation of smaller gains and larger losses from them. In terms of kurtosis, Indonesia and Thailand exhibit larger chances of extreme returns as their excess kurtosis is 6.48 and 5.3971 respectively. India (3.1755) and Malaysia (3.5175) also have higher positive excess kurtosis but not as high as Indonesia and Thailand. The JB test of normality shows that except China, the remaining countries' returns do not follow a normal distribution at 5% significance level.

5.2.4 Frontier Markets

In the frontier markets category, 14 countries lie in the EMEA region and three lie in the Asia-Pacific region. In the EMEA region, all countries, except Slovenia, Bahrain and Jordan, exhibit positive monthly mean returns. Oman (0.0017) yields the lowest positive return in this region while Tunisia (0.009) yields the highest. Standard deviation of returns of this region in general is higher than developed markets and also higher than some countries in the emerging markets category. Frontier markets are generally identified to be more risky countries than the rest of the world: hence, investment in them carries higher risk. With higher risk comes higher returns. Returns, however, in the full study period (2006 – 2017) are not much higher than developed or emerging markets and this is because the GFC period is included in the full study period. In terms of skewness, there is a mix of both positively and negatively skewed returns. Excess kurtosis, on the other hand, is positive for all countries but also the highest that is observed in the entire sample. Jordan (21.9047), Lithuania (12.658) and Estonia (9.523) demonstrate extremely higher chances of large positive or negative returns. Bulgaria (5.3853), Croatia (5.8414) and Oman (5.0664) also have higher positive excess kurtosis. The return distribution of all countries in this region follows a non-normal distribution at 5% significance level.

In the Asia-Pacific region of frontier markets, monthly mean returns of all three countries are positive: Bangladesh (0.0163), Sri Lanka (0.0104) and Vietnam (0.0071). Their standard deviations are as high as the EMEA region, suggesting risky investments. Excluding Bangladesh, returns of Sri Lanka and Vietnam are positively skewed. None of the countries exhibit very high positive excess kurtosis. It ranges between 1.6373 and 2.9089. Additionally, their returns follow a non-normal distribution at 5% significance level.

Table 5.1: Descriptive Statistics of Superannuation Funds, Developed, Emerging and Frontier Markets: Full Period (2006-2017)

Australia's Superannuation Funds								
Country	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**	**Jarque-Bera**
AUS	0.0048	-0.0167	0.0277	0.0001	0.0101	-0.1679	-0.6337	2.8502

Developed Markets								
Country	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**	**Jarque-Bera**
CAN	0.0027	-0.1693	0.1121	0.0014	0.0375	-1.1604	4.1559	125.56**
USA	0.0058	-0.1694	0.1077	0.0018	0.0422	-0.7872	1.9192	34.148**
AUT	0.0008	-0.2782	0.1451	0.0043	0.0655	-0.9442	2.7745	62.42**
BEL	0.0015	-0.2141	0.117	0.0023	0.0484	-1.1607	3.0539	81.543**
DNK	0.0088	-0.1878	0.2033	0.0029	0.0534	-0.4652	2.5212	40.022**
FIN	0.0051	-0.1702	0.255	0.0031	0.0556	0.1318	2.8633	45.819**
FRA	0.0015	-0.1352	0.1256	0.0024	0.0489	-0.4093	0.1463	3.8313
DEU	0.0073	-0.1919	0.1676	0.0029	0.0541	-0.5825	1.5796	21.347**
IRL	0.001	-0.2101	0.1951	0.0036	0.0602	-0.6633	1.7576	26.871**
ISR	0.0051	-0.182	0.1153	0.0023	0.0482	-0.6081	1.2243	16.504**
ITA	-0.0023	-0.1631	0.208	0.004	0.0629	-0.0539	0.3911	0.91206
NLD	0.0024	-0.1971	0.1117	0.0027	0.0515	-1.0005	2.6193	60.21**
NOR	0.007	-0.2535	0.1723	0.0036	0.0603	-1.1987	4.4439	141.29**
PRT	-0.0029	-0.2082	0.106	0.0032	0.0563	-0.5761	0.7281	10.295**
ESP	0.0011	-0.1703	0.1662	0.0035	0.059	-0.1582	0.5539	2.2551
SWE	0.0051	-0.1686	0.1697	0.0022	0.0469	-0.5965	2.4636	41.52**
CHE	0.0019	-0.1133	0.1012	0.0014	0.037	-0.4201	0.3399	4.5521
GBR	0.0026	-0.1302	0.0845	0.0015	0.0393	-0.5082	0.5351	7.3128**
HKG	0.0057	-0.2247	0.1707	0.004	0.0631	-0.38	1.3423	13.185**
JPN	0.0016	-0.2026	0.126	0.0029	0.0535	-0.4455	0.9702	9.6159**
NZL	0.0062	-0.1185	0.0837	0.0011	0.0331	-0.8491	1.8517	34.984**
SGP	0.0038	-0.2394	0.2129	0.0028	0.0527	-0.4985	4.6478	125.22**

Emerging Markets								
Country	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**	**Jarque-Bera**
BRA	0.0062	-0.248	0.1697	0.0041	0.0641	-0.2357	0.9719	6.4665**
CHL	0.0069	-0.0955	0.1606	0.0019	0.0441	0.3049	0.3848	2.8812
COL	0.0029	-0.2187	0.1767	0.003	0.0548	-0.4317	2.0063	26.437**

MEX	0.0084	-0.1785	0.1158	0.0021	0.0453	-0.4318	1.8011	22.111**
PER	0.0102	-0.3728	0.3846	0.0085	0.0919	0.3695	3.9249	88.394**
CZE	-0.0003	-0.2713	0.1866	0.0038	0.0614	-0.7333	3.8048	92.144**
EGY	0.0101	-0.3319	0.3658	0.0097	0.0984	0.0918	1.5327	13.205**
GRC	-0.0075	-0.2787	0.2196	0.009	0.0947	-0.2598	0.1717	1.6595
HUN	0.006	-0.2842	0.1626	0.0044	0.066	-0.4531	2.2681	33.059**
POL	0.005	-0.2401	0.2073	0.0035	0.0589	-0.2462	2.3691	32.448**
RUS	0.002	-0.3618	0.3058	0.0095	0.0973	-0.2159	1.7541	18.085**
ZAF	0.0077	-0.1491	0.1286	0.0021	0.0455	-0.1864	1.1107	7.6062**
TUR	0.0103	-0.2416	0.2507	0.0063	0.0797	0.0131	0.6754	2.5321
ARE	0.0032	-0.1654	0.2006	0.0033	0.0576	-0.0588	1.4615	11.913**
CHN	0.012	-0.2585	0.2793	0.009	0.0951	-0.1078	0.7108	3.0575
IND	0.0103	-0.2389	0.2826	0.0042	0.065	0.0102	3.1755	55.884**
IDN	0.013	-0.3142	0.2013	0.0035	0.0596	-1.1446	6.48	261.74**
MYS	0.0055	-0.1522	0.1355	0.0013	0.0358	-0.3984	3.5175	72.084**
PHL	0.0108	-0.2407	0.1497	0.003	0.0544	-0.7227	2.7678	54.03**
TWN	0.0046	-0.1883	0.15	0.003	0.0545	-0.3618	1.4735	14.934**
THA	0.0078	-0.3018	0.1398	0.0033	0.0577	-1.289	5.3971	198.26**

Frontier Markets								
Country	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**	**Jarque-Bera**
BGR	0.002	-0.3788	0.2914	0.0067	0.0816	-0.6837	5.3853	171.08**
HRV	0.0004	-0.2672	0.3455	0.0051	0.0714	0.1264	5.8414	189.45**
EST	0.0076	-0.3014	0.4482	0.0063	0.0793	1.1275	9.523	530.73**
LTU	0.0055	-0.296	0.4344	0.0051	0.0714	0.655	12.0658	816.28**
ROM	0.0041	-0.3268	0.2878	0.0064	0.0799	-0.6553	3.6174	82.036**
SVN	-0.0011	-0.1681	0.1701	0.0032	0.0562	-0.1499	1.2891	9.7068**
KEN	0.0003	-0.2264	0.1549	0.0033	0.0573	-0.6592	1.9445	30.587**
MUS	0.0083	-0.1863	0.1659	0.0022	0.0465	-0.0485	4.281	101.62**
NGA	0.0052	-0.3064	0.382	0.0061	0.0783	0.2701	4.7756	128**
TUN	0.009	-0.133	0.1004	0.0014	0.0378	-0.2521	1.4456	12.99**
BWA	0.0066	-0.1015	0.1485	0.0014	0.0378	0.4934	2.5806	42.3**
BHR	-0.0027	-0.122	0.0969	0.0011	0.0335	-0.3507	1.8726	22.158**
JOR	-0.0023	-0.2831	0.4213	0.0036	0.0599	1.5025	21.9047	2709**
OMN	0.0017	-0.2689	0.1481	0.0027	0.0523	-1.0539	5.0664	166.87**
BGD	0.0163	-0.3146	0.2172	0.0053	0.073	-0.346	2.9089	49.546**
LKA	0.0104	-0.1497	0.2367	0.004	0.0636	0.8113	1.6373	29.447**
VNM	0.0071	-0.2401	0.3852	0.0089	0.0942	0.4067	2.0856	27.771**

** indicates rejection of null hypothesis of normal distribution at 5% significance level.

5.3 Stationarity

The time series returns data used in this study is tested for stationarity. Conventional unit root tests such as the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller 1979) and Phillips-Perron (PP) test (Phillips & Perron 1988) are employed[38]. All unit root tests examine whether the series has a unit root (i.e. if it is non-stationarity) or is a stationary process. If the series is non-stationary then its means covariances and variances change with time and if the series is stationary (or weakly stationary) then its means covariances and variances are not affected by time (Gujarati 2003). Results of both tests are presented in Table B.7.

When a series is said to be integrated of order 'd', then it means that it has to be differenced 'd'times to make it stationary. A series such as this is written as I(d). On the other hand, when a series is stationary at levels, that is, stationary without differencing, then it is said to be integrated of order zero, that is, I(0). Identifying the order of integration is a requirement for examining long-run co-integrating relationships among variables. Non-stationarity is a pre-condition for examining co-integration. When all series are integrated of the same order then such an examination is possible. However, when all series are I(0), then co-integration cannot be performed and instead OLS regression analysis must be performed. Unit root tests thus assist in identifying whether or not co-integrating relationships can be studied. From Table B.7, it can be noted that all time series are stationary at levels I(0), at 5% significance level. In this view, co-integration cannot be performed on this data set. On the other hand, for examining correlations between variables using ADCC GARCH model, stationarity is a required condition. Correlation measures the strength among variables and the direction of their relationship. Low correlation between variables implies weak relationship and thus more portfolio diversification opportunities from them. Since all time series in this data set are stationary at levels, see Table B.7, conditional correlations using ADCC GARCH model is employed in this study.

[38] see Appendix C

5.4 Pearson's Correlation of Monthly Returns between Australia's Superannuation Funds and Developed, Emerging and Frontier Markets

This section discusses the outcome of unconditional correlations between Australia's superannuation funds and broad market indices of developed, emerging and frontier markets. Unconditional correlation is measured using Pearson's correlation coefficient in this thesis, which is explained in Section 4.6.1. Pearson's correlation coefficient is the most commonly used method to estimate correlations between two or more variables. A positive correlation implies movement in the same direction whereas a negative correlation implies movement in the opposite direction. A higher correlation implies a stronger relationship while lower correlation implies a weaker relationship. Results of Pearson's correlation are discussed in Sections 5.4.1 to 5.4.3.

5.4.1 Pearson's Correlation of Monthly Returns between Australia's Superannuation Funds and Developed Markets

This section discusses the outcome of Pearson's correlation between Australia's superannuation funds and broad market indices of developed markets. Results are discussed for the full sample period from 2006 to 2017, the GFC sub-period from 2006 to 2009 and the post-GFC sub-period from 2009 to 2017.

5.4.1.1 Full Period: 2006-2017

Table 5.2 presents unconditional correlations using Pearson's correlation coefficient between Australia's superannuation funds and 22 developed markets for the full study period from 2006 to 2017. Unconditional correlations between monthly returns of superannuation funds and broad market indices of developed markets are low. The highest correlation is with Ireland (0.185). Superannuation funds are negatively correlated with Israel, Sweden, Hong Kong and Singapore. In the Americas region, correlation is higher with the United States of America (0.085) than Canada (0.012). In the Asia-Pacific region, only Japan (0.122) has relatively higher correlation than the remaining countries, although it is still quite low. Similarly, low correlation is observed in the EMEA region.

On the other hand, correlation between developed markets is quite high and consistent with the international portfolio diversification literature on developed markets (discussed in Chapter 3). All developed markets' correlations are greater than 0.5 at least. The highest correlation is seen between France and Germany at 0.903. France and Germany are each other's largest trading partner[39], so a strong relationship between the two countries is natural. France also has strong correlations with Italy, Netherlands and Spain that are also its trading partners and share geographical borders. Many countries in the EMEA regions have similar correlations. In the Asia-Pacific region, on the other hand, only Hong Kong and Singapore have a strong correlation of 0.832. Remaining countries have a moderate correlation with each other (between 0.5 – 0.6).

Low correlations between superannuation funds and developed markets can be attributed to the asset allocation structure of superannuation funds. As discussed in Section 1.1, superannuation funds invest in a mix of asset classes such as domestic and international equity, fixed income, property, infrastructure, commodities, cash and a few more. Due to a good mix of asset classes, the returns of superannuation funds are not strongly correlated with the broad market equity indices of developed markets. With this view, it can be suggested that there may be potential benefits to Australia's superannuation investors from diversification in developed markets.

5.4.1.2 GFC Sub-Period: 2006-2009

Table 5.3 presents unconditional correlations using Pearson's correlation coefficient between Australia's superannuation funds and 22 developed markets for the GFC sub-period from 2006 to 2009. Unconditional correlations during the GFC period are negative and low for countries in the sample, which indicates that these countries are potential investment options for Australian superannuation investors in times of uncertainties as they are likely to even out the volatilities in total portfolio returns.

The landscape is different within developed markets. As observed for the full period, correlations among developed countries in the Americas, EMEA and the Asia-Pacific are very strong. Returns between Canada and the United States of America are correlated at 0.837. Correlations in the EMEA region are higher than 0.6 and as high as 0.966. Most countries in this region are trade partners, share geographical borders and have similar level of economic and financial development, which makes them strongly

[39] France's total exports to the European region account for 63% (valued at USD 312 billion) of its world trade. Out of this, 22% (valued at USD 70.1 billion) are to Germany and 27% of its imports (valued at USD 99.8 billion) come from Germany. Germany's exports to France account for 12% of its total exports (valued at USD 99.8 billion) in Europe and its imports from France are 11% (valued at USD 70.1 billion) (Simoes 2018).

correlated with each other. Countries in the Asia-Pacific region also experience strong correlations with each other. The highest is between Hong Kong and Singapore (0.877) and lowest is between Hong Kong and New Zealand (0.680). Such high correlations do not offer much to international portfolio diversification.

5.4.1.3 Post-GFC Sub-Period: 2009-2017

The post-GFC scenario is different than the GFC sub-period. Table 5.4 presents unconditional correlations using Pearson's correlation coefficient between Australia's superannuation funds and 22 developed markets for the post-GFC sub-period from 2009 to 2017. Unconditional correlations during this period are negative only for 7 countries, specifically, the Netherlands, Sweden, Switzerland, the United Kingdom, Hong Kong, New Zealand and Singapore. Remaining countries in the sample have positive correlations with returns of superannuation funds although the degree of correlations are quite low. The highest correlation is with Japan at 0.1. Such low correlations are a good sign for international portfolio diversification.

In the Americas and the EMEA region, correlation among developed markets is quite strong for the post-GFC period as well, although it has lowered slightly for most countries since the GFC. The highest correlation is between France and the Netherlands (0.907) and the lowest is between Ireland and Israel (0.407). Correlations within the Asia-Pacific region have been impacted the most after the GFC. Correlation between Hong Kong and Japan, which was 0.815 during the GFC period, has fallen down to 0.403. Correlation between Japan and Singapore has also seen a drop from 0.841 in the GFC period to 0.414 in the post-GFC period. The lowest correlation is between Japan and New Zealand at 0.368, which was 0.683 in the GFC period.

Table 5.2: Unconditional Correlations: Superannuation Funds and Developed Markets (2006-2017)

	AUS	CAN	USA	AUT	BEL	DNK	FIN	FRA	DEU	IRL	ISR	ITA	NLD	NOR	PRT	ESP	SWE	CHE	GBR	HKG	JPN	NZL	SGP
AUS	1																						
CAN	0.012	1																					
USA	0.085	0.782	1																				
AUT	0.047	0.782	0.786	1																			
BEL	0.084	0.687	0.783	0.833	1																		
DNK	0.085	0.602	0.614	0.690	0.734	1																	
FIN	0.084	0.702	0.773	0.771	0.839	0.797	1																
FRA	0.082	0.670	0.821	0.809	0.888	0.695	0.861	1															
DEU	0.059	0.645	0.807	0.760	0.800	0.685	0.826	0.903	1														
IRL	0.185	0.598	0.678	0.708	0.773	0.708	0.744	0.716	0.664	1													
ISR	-0.019	0.707	0.687	0.694	0.652	0.584	0.676	0.655	0.674	0.519	1												
ITA	0.088	0.599	0.719	0.750	0.824	0.664	0.777	0.898	0.815	0.663	0.565	1											
NLD	0.074	0.722	0.797	0.817	0.873	0.766	0.840	0.893	0.823	0.725	0.704	0.800	1										
NOR	0.020	0.817	0.754	0.814	0.754	0.700	0.728	0.747	0.712	0.613	0.758	0.677	0.829	1									
PRT	0.037	0.557	0.592	0.721	0.754	0.596	0.635	0.767	0.682	0.553	0.570	0.788	0.694	0.618	1								
ESP	0.008	0.556	0.681	0.696	0.763	0.547	0.699	0.826	0.728	0.528	0.550	0.867	0.729	0.628	0.770	1							
SWE	-0.013	0.575	0.725	0.711	0.756	0.741	0.811	0.792	0.789	0.633	0.623	0.685	0.789	0.708	0.586	0.657	1						
CHE	0.058	0.544	0.748	0.682	0.751	0.619	0.698	0.772	0.707	0.625	0.611	0.697	0.736	0.587	0.596	0.643	0.657	1					
GBR	0.052	0.742	0.834	0.777	0.801	0.627	0.787	0.849	0.783	0.633	0.650	0.750	0.840	0.794	0.649	0.702	0.739	0.713	1				
HKG	-0.117	0.695	0.695	0.703	0.608	0.498	0.619	0.622	0.647	0.384	0.657	0.559	0.646	0.707	0.551	0.585	0.663	0.514	0.691	1			
JPN	0.122	0.528	0.652	0.662	0.622	0.548	0.613	0.648	0.650	0.583	0.531	0.605	0.655	0.611	0.556	0.581	0.644	0.593	0.574	0.558	1		
NZL	0.073	0.505	0.670	0.640	0.696	0.570	0.636	0.631	0.620	0.532	0.579	0.575	0.656	0.572	0.577	0.530	0.608	0.684	0.590	0.541	0.514	1	
SGP	-0.098	0.738	0.753	0.733	0.677	0.593	0.682	0.670	0.711	0.478	0.719	0.587	0.742	0.777	0.548	0.596	0.701	0.560	0.689	0.832	0.587	0.630	1

Table 5.3: Unconditional Correlations: Superannuation Funds and Developed Markets (2006-2009)

	AUS	CAN	USA	AUT	BEL	DNK	FIN	FRA	DEU	IRL	ISR	ITA	NLD	NOR	PRT	ESP	SWE	CHE	GBR	HKG	JPN	NZL	SGP
AUS	1																						
CAN	-0.170	1																					
USA	-0.223	0.837	1																				
AUT	-0.196	0.902	0.875	1																			
BEL	-0.145	0.791	0.883	0.902	1																		
DNK	-0.127	0.768	0.702	0.761	0.809	1																	
FIN	-0.142	0.773	0.817	0.775	0.847	0.897	1																
FRA	-0.150	0.767	0.924	0.864	0.914	0.779	0.886	1															
DEU	-0.117	0.736	0.919	0.822	0.846	0.730	0.856	0.966	1														
IRL	-0.127	0.752	0.761	0.785	0.854	0.759	0.867	0.789	0.718	1													
ISR	-0.183	0.838	0.734	0.813	0.722	0.717	0.709	0.739	0.739	0.646	1												
ITA	-0.117	0.752	0.902	0.828	0.889	0.793	0.916	0.951	0.928	0.822	0.711	1											
NLD	-0.132	0.838	0.824	0.901	0.931	0.875	0.866	0.893	0.827	0.782	0.762	0.852	1										
NOR	-0.169	0.897	0.757	0.906	0.820	0.785	0.756	0.797	0.764	0.682	0.848	0.739	0.885	1									
PRT	-0.037	0.680	0.749	0.796	0.852	0.715	0.706	0.832	0.783	0.692	0.714	0.784	0.805	0.723	1								
ESP	-0.149	0.689	0.848	0.783	0.836	0.727	0.811	0.883	0.875	0.684	0.684	0.864	0.777	0.701	0.853	1							
SWE	-0.294	0.622	0.741	0.712	0.798	0.771	0.800	0.843	0.808	0.669	0.655	0.797	0.780	0.714	0.733	0.783	1						
CHE	-0.185	0.670	0.852	0.796	0.812	0.694	0.793	0.904	0.857	0.693	0.640	0.873	0.793	0.678	0.705	0.767	0.686	1					
GBR	-0.122	0.816	0.873	0.878	0.894	0.709	0.833	0.917	0.886	0.752	0.735	0.876	0.901	0.845	0.771	0.835	0.772	0.793	1				
HKG	-0.367	0.765	0.771	0.797	0.753	0.655	0.690	0.777	0.757	0.548	0.776	0.751	0.776	0.796	0.726	0.788	0.710	0.673	0.813	1			
JPN	-0.207	0.812	0.806	0.835	0.776	0.687	0.718	0.820	0.811	0.661	0.768	0.784	0.799	0.836	0.756	0.754	0.770	0.689	0.836	0.815	1		
NZL	-0.187	0.626	0.788	0.779	0.814	0.721	0.769	0.831	0.816	0.632	0.666	0.789	0.801	0.713	0.746	0.751	0.737	0.829	0.766	0.680	0.683	1	
SGP	-0.278	0.868	0.839	0.881	0.826	0.780	0.762	0.819	0.805	0.656	0.812	0.782	0.859	0.876	0.782	0.799	0.741	0.716	0.804	0.877	0.841	0.761	1

Table 5.4: Unconditional Correlations: Superannuation Funds and Developed Markets (2009-2017)

	AUS	CAN	USA	AUT	BEL	DNK	FIN	FRA	DEU	IRL	ISR	ITA	NLD	NOR	PRT	ESP	SWE	CHE	GBR	HKG	JPN	NZL	SGP
AUS	1																						
CAN	0.028	1																					
USA	0.034	0.738	1																				
AUT	0.056	0.625	0.694	1																			
BEL	0.007	0.549	0.669	0.748	1																		
DNK	0.045	0.403	0.512	0.606	0.638	1																	
FIN	0.052	0.626	0.723	0.762	0.828	0.693	1																
FRA	0.047	0.616	0.751	0.785	0.896	0.633	0.850	1															
DEU	0.037	0.578	0.727	0.715	0.778	0.649	0.805	0.864	1														
IRL	0.105	0.425	0.571	0.625	0.663	0.643	0.616	0.668	0.628	1													
ISR	0.035	0.534	0.661	0.557	0.583	0.446	0.654	0.616	0.635	0.407	1												
ITA	0.064	0.516	0.611	0.723	0.818	0.588	0.701	0.870	0.754	0.572	0.490	1											
NLD	-0.005	0.588	0.759	0.723	0.801	0.646	0.807	0.907	0.826	0.648	0.656	0.785	1										
NOR	0.051	0.689	0.778	0.691	0.665	0.601	0.710	0.757	0.699	0.543	0.634	0.692	0.778	1									
PRT	0.055	0.479	0.502	0.689	0.720	0.526	0.600	0.738	0.626	0.485	0.472	0.796	0.636	0.569	1								
ESP	0.016	0.496	0.604	0.672	0.767	0.450	0.652	0.804	0.657	0.457	0.484	0.871	0.731	0.636	0.731	1							
SWE	-0.021	0.517	0.704	0.702	0.706	0.704	0.816	0.764	0.778	0.591	0.593	0.624	0.793	0.712	0.491	0.598	1						
CHE	-0.022	0.433	0.657	0.583	0.695	0.545	0.613	0.684	0.603	0.547	0.609	0.596	0.680	0.517	0.540	0.586	0.628	1					
GBR	-0.011	0.697	0.802	0.697	0.730	0.553	0.748	0.805	0.712	0.530	0.594	0.680	0.793	0.788	0.582	0.640	0.713	0.649	1				
HKG	-0.024	0.623	0.658	0.616	0.477	0.358	0.569	0.534	0.577	0.256	0.526	0.458	0.540	0.612	0.434	0.476	0.628	0.408	0.616	1			
JPN	0.100	0.304	0.535	0.539	0.499	0.438	0.532	0.543	0.550	0.507	0.369	0.508	0.545	0.444	0.456	0.502	0.555	0.517	0.405	0.403	1		
NZL	-0.062	0.362	0.533	0.482	0.541	0.395	0.488	0.479	0.463	0.371	0.510	0.436	0.486	0.402	0.482	0.413	0.471	0.550	0.436	0.442	0.368	1	
SGP	-0.063	0.550	0.695	0.551	0.502	0.386	0.611	0.585	0.655	0.298	0.596	0.480	0.629	0.625	0.370	0.487	0.668	0.441	0.614	0.786	0.414	0.516	1

5.4.2 Pearson's Correlation between Australia's Superannuation Funds and Emerging Markets

This section discusses the outcome of Pearson's correlation between Australia's superannuation funds and broad market indices of emerging markets. Results are discussed for the full sample period from 2006 to 2017, the GFC sub-period from 2006 to 2009 and the post-GFC sub-period from 2009 to 2017.

5.4.2.1 Full Period: 2006-2017

Table 5.5 presents unconditional correlations between Australia's superannuation funds and 21 emerging markets for the full study period from 2006 to 2017. Unconditional correlations between monthly returns of superannuation funds and broad market indices of emerging markets are largely negative. Correlations with only four countries in the EMEA region, specifically, the Czech Republic (0.003), Greece (0.067), Poland (0.001) and the United Arab Emirates (0.065) are positive but at the same time very low. Remaining countries in emerging markets have negative correlation with superannuation funds. Negatively correlated assets are assets which move in the opposite direction to each other. Such assets are used for the purpose of risk management. That is, when these assets are paired together it smooths out volatility in the overall portfolio returns. Such pairings are, therefore, very useful in times of political and economic uncertainty such as the US elections or the Brexit controversy.

Between emerging markets, on the other hand, correlations are fairly moderate. The highest correlations are between thee Czech Republic and Poland (0.819), Indonesia and Thailand (0.735), Indonesia and Malaysia (0.7), Hungary and Poland (0.709) and Brazil and Russia (0.7) and the lowest is observed for Greece. In the Americas regions, the highest correlation is between Brazil and Mexico (0.639) and lowest between Colombia and Mexico (0.433). In the Asia-Pacific region, correlations range between 0.282 (for China and Thailand) and 0.735 (for Indonesia and Thailand). In the EMEA region, there is more diversity in the correlation between countries. Most correlations range between 0.106 and 0.709 with the exception of Greece. Greece has very low correlation (near to 0.1) with all the countries, except Egypt (0.393), in the sample.

5.4.2.2 GFC Sub-Period: 2006-2009

Table 5.6 presents unconditional correlations between Australia's superannuation funds and 21 emerging markets for the GFC period from 2006 to 2009. Unconditional correlations between monthly returns of superannuation funds and broad market indices of emerging markets are negative and low for all countries in the sample except Greece. Negatively correlated assets, as discussed in the previous sub-section, are useful when there are political and economic uncertainties as it helps in risk management. Thus, investing is emerging markets during the GFC seems like a good investment destination for Australia's superannuation investors.

Among emerging markets, correlations between many, but not all, countries across all the three regions are higher during the GFC period than the full period. In the Americas, for example, correlation between Brazil and Chile for the full period is 0.572 while during the GFC it was 0.703. A similar increase is seen in the case of Chile and Peru and Mexico and Peru. These similar changes are an indication of similar impact of the GFC on their economy and finances. In the EMEA region, higher correlations are seen for the Czech Republic, Egypt and Greece, in particular. For example, in the full study period, correlation between Egypt and Greece is 0.393 while during the GFC period it was 0.723. This indicates that during times of crisis there are no gains from investing in both Egypt and Greece as both markets react in a similar manner, thus reducing possible gains from international portfolio diversification. Correlation in the Asia-Pacific region ranged from moderate (0.4), to higher levels (0.8). Some countries like China, India, Indonesia and Malaysia experienced higher correlations in the GFC period than in the overall study period.

5.4.2.3 Post-GFC Sub-Period: 2009-2017

Table 5.7 presents unconditional correlations between Australia's superannuation funds and 21 emerging markets for the post-GFC period from 2009 to 2017. Unconditional correlations between superannuation funds and broad market indices of emerging markets are both positive and negative. Positive and low correlations are observed with Chile (0.081), Greece (0.055), South Africa (0.044), the United Arab Emirates (0.089), India (0.022), Indonesia (0.008) and Taiwan (0.061). The remaining countries have negative and low correlations with superannuation funds.

Among emerging markets, in the Americas region, correlations are lower for most countries than during the GFC period. Correlation between Brazil and Chile was 0.703 in the GFC period and is 0.482 in the post-GFC period. Similarly, Chile and Peru fell from 0.622 to 0.302, and Mexico and Peru fell from 0.652 to 0.350. A similar pattern is observed in the EMEA region. Correlations were much lower than the GFC period and ranged between 0.1 to 0.7. The Czech Republic, Egypt and Russia, in particular, saw the largest decline compared with most other countries in the region. Correlations in the Asia-Pacific region were below 0.6. China's correlation fell down significantly with all countries in the region. China and India fell from 0.525 in the GFC period to 0.189 in the post-GFC period, China and Malaysia from 0.606 to 0.268, and China and Thailand from 0.410 to 0.176. India's correlation with Indonesia, Malaysia and Thailand also declined. Indonesia and Malaysia experienced a huge decline from 0.8 to 0.542. All these numbers suggest that markets are less integrated after the GFC, creating huge potential for gains from international portfolio diversification.

Table 5.5: Unconditional Correlations: Superannuation Funds and Emerging Markets (2006-2017)

	AUS	BRA	CHL	COL	MEX	PER	CZE	EGY	GRC	HUN	POL	RUS	ZAF	TUR	ARE	CHN	IND	IDN	MYS	PHL	TWN	THA
AUS	1																					
BRA	-0.158	1																				
CHL	-0.049	0.572	1																			
COL	-0.054	0.565	0.454	1																		
MEX	-0.098	0.639	0.493	0.433	1																	
PER	-0.189	0.583	0.458	0.473	0.534	1																
CZE	0.003	0.580	0.434	0.383	0.595	0.491	1															
EGY	-0.010	0.308	0.337	0.261	0.170	0.242	0.256	1														
GRC	0.067	0.113	0.136	0.184	0.116	0.139	0.105	0.393	1													
HUN	-0.011	0.607	0.461	0.441	0.535	0.488	0.697	0.269	0.194	1												
POL	0.001	0.596	0.480	0.441	0.655	0.487	0.819	0.281	0.141	0.709	1											
RUS	-0.078	0.700	0.486	0.476	0.625	0.644	0.588	0.293	0.158	0.697	0.573	1										
ZAF	-0.001	0.588	0.394	0.366	0.593	0.586	0.592	0.232	0.114	0.506	0.559	0.635	1									
TUR	-0.079	0.466	0.413	0.455	0.371	0.283	0.523	0.106	0.003	0.533	0.563	0.380	0.365	1								
ARE	0.065	0.339	0.193	0.148	0.183	0.238	0.268	0.300	0.128	0.346	0.241	0.357	0.329	0.286	1							
CHN	-0.150	0.454	0.338	0.256	0.325	0.397	0.332	0.165	0.157	0.371	0.375	0.277	0.387	0.316	0.181	1						
IND	-0.068	0.622	0.538	0.445	0.569	0.477	0.556	0.330	0.136	0.581	0.562	0.554	0.520	0.627	0.351	0.373	1					
IDN	-0.050	0.560	0.516	0.440	0.617	0.557	0.598	0.217	0.161	0.573	0.586	0.570	0.499	0.535	0.358	0.378	0.678	1				
MYS	-0.054	0.584	0.531	0.436	0.535	0.406	0.548	0.258	0.193	0.557	0.604	0.497	0.436	0.491	0.296	0.445	0.617	0.700	1			
PHL	-0.029	0.466	0.500	0.446	0.530	0.429	0.517	0.201	0.135	0.510	0.632	0.396	0.436	0.455	0.269	0.352	0.624	0.674	0.587	1		
TWN	-0.064	0.624	0.498	0.390	0.551	0.616	0.558	0.249	0.132	0.540	0.562	0.666	0.583	0.469	0.347	0.410	0.671	0.609	0.533	0.496	1	
THA	-0.021	0.613	0.513	0.502	0.564	0.526	0.503	0.282	0.189	0.515	0.536	0.602	0.492	0.499	0.320	0.282	0.642	0.735	0.576	0.580	0.641	1

Table 5.6: Unconditional Correlations: Superannuation Funds and Emerging Markets (2006-2009)

	AUS	BRA	CHL	COL	MEX	PER	CZE	EGY	GRC	HUN	POL	RUS	ZAF	TUR	ARE	CHN	IND	IDN	MYS	PHL	TWN	THA
AUS	1																					
BRA	-0.211	1																				
CHL	-0.224	0.703	1																			
COL	-0.128	0.581	0.500	1																		
MEX	-0.156	0.691	0.578	0.432	1																	
PER	-0.228	0.682	0.622	0.479	0.652	1																
CZE	-0.148	0.769	0.545	0.475	0.764	0.680	1															
EGY	-0.033	0.422	0.563	0.270	0.377	0.211	0.254	1														
GRC	0.013	0.383	0.472	0.230	0.319	0.209	0.107	0.723	1													
HUN	-0.202	0.791	0.663	0.591	0.668	0.712	0.776	0.331	0.325	1												
POL	-0.169	0.701	0.619	0.499	0.804	0.607	0.880	0.249	0.190	0.785	1											
RUS	-0.251	0.795	0.580	0.522	0.708	0.783	0.714	0.430	0.446	0.740	0.616	1										
ZAF	-0.194	0.726	0.528	0.370	0.680	0.793	0.721	0.308	0.178	0.566	0.507	0.735	1									
TUR	-0.265	0.587	0.491	0.547	0.413	0.421	0.651	0.228	0.097	0.755	0.661	0.486	0.367	1								
ARE	-0.117	0.483	0.316	0.105	0.222	0.312	0.342	0.423	0.358	0.421	0.239	0.465	0.352	0.387	1							
CHN	-0.290	0.585	0.464	0.287	0.374	0.542	0.494	0.103	0.066	0.521	0.444	0.384	0.418	0.506	0.294	1						
IND	-0.184	0.780	0.654	0.559	0.621	0.597	0.680	0.449	0.378	0.800	0.639	0.691	0.598	0.782	0.472	0.525	1					
IDN	-0.154	0.809	0.560	0.522	0.717	0.680	0.734	0.402	0.364	0.779	0.695	0.786	0.644	0.613	0.414	0.520	0.770	1				
MYS	-0.124	0.779	0.641	0.477	0.584	0.532	0.624	0.381	0.429	0.692	0.684	0.609	0.442	0.620	0.361	0.606	0.739	0.800	1			
PHL	-0.143	0.645	0.628	0.595	0.625	0.584	0.619	0.280	0.350	0.726	0.734	0.556	0.410	0.534	0.299	0.482	0.691	0.663	0.659	1		
TWN	-0.353	0.739	0.585	0.418	0.628	0.728	0.664	0.339	0.312	0.670	0.591	0.802	0.675	0.554	0.412	0.456	0.715	0.680	0.569	0.551	1	
THA	-0.102	0.805	0.536	0.564	0.637	0.635	0.642	0.382	0.402	0.672	0.602	0.705	0.617	0.577	0.388	0.410	0.733	0.821	0.696	0.549	0.758	1

Table 5.7: Unconditional Correlations: Superannuation Funds and Emerging Markets (2009-2017)

	AUS	BRA	CHL	COL	MEX	PER	CZE	EGY	GRC	HUN	POL	RUS	ZAF	TUR	ARE	CHN	IND	IDN	MYS	PHL	TWN	THA
AUS	1																					
BRA	-0.124	1																				
CHL	0.081	0.482	1																			
COL	-0.032	0.562	0.422	1																		
MEX	-0.102	0.616	0.428	0.437	1																	
PER	-0.127	0.506	0.302	0.475	0.350	1																
CZE	-0.008	0.436	0.356	0.277	0.364	0.242	1															
EGY	-0.079	0.249	0.207	0.263	-0.008	0.309	0.262	1														
GRC	0.055	0.003	-0.006	0.173	-0.003	0.123	0.109	0.260	1													
HUN	-0.067	0.498	0.334	0.311	0.414	0.288	0.624	0.222	0.132	1												
POL	-0.039	0.539	0.382	0.379	0.461	0.356	0.737	0.312	0.118	0.636	1											
RUS	-0.037	0.634	0.417	0.429	0.530	0.488	0.449	0.197	0.012	0.669	0.531	1										
ZAF	0.044	0.492	0.295	0.365	0.499	0.353	0.447	0.177	0.084	0.452	0.618	0.537	1									
TUR	-0.095	0.386	0.363	0.369	0.332	0.142	0.387	0.016	-0.049	0.344	0.460	0.281	0.360	1								
ARE	0.089	0.234	0.099	0.200	0.137	0.164	0.166	0.203	-0.002	0.265	0.229	0.243	0.300	0.179	1							
CHN	-0.028	0.347	0.233	0.226	0.273	0.211	0.177	0.224	0.223	0.273	0.333	0.179	0.369	0.159	0.085	1						
IND	0.022	0.491	0.443	0.296	0.486	0.271	0.384	0.245	-0.011	0.366	0.470	0.387	0.437	0.464	0.195	0.189	1					
IDN	0.008	0.334	0.496	0.336	0.460	0.362	0.408	0.060	0.048	0.372	0.444	0.307	0.329	0.460	0.290	0.216	0.526	1				
MYS	-0.064	0.417	0.447	0.387	0.459	0.212	0.441	0.158	0.058	0.427	0.496	0.364	0.435	0.350	0.208	0.268	0.419	0.542	1			
PHL	-0.086	0.339	0.413	0.294	0.423	0.264	0.394	0.139	0.021	0.309	0.511	0.235	0.459	0.377	0.227	0.247	0.560	0.705	0.505	1		
TWN	0.061	0.541	0.436	0.357	0.435	0.453	0.411	0.179	0.028	0.416	0.528	0.507	0.478	0.380	0.263	0.370	0.603	0.501	0.478	0.435	1	
THA	-0.145	0.478	0.529	0.438	0.475	0.414	0.311	0.198	0.069	0.349	0.437	0.492	0.350	0.417	0.221	0.176	0.532	0.629	0.410	0.612	0.484	1

5.4.3 Pearson's Correlation between Australia's Superannuation Funds and Frontier Markets

This section discusses the outcome of Pearson's correlation between Australia's superannuation funds and broad market indices of frontier markets. Results are discussed for the full sample period from 2006 to 2017, the GFC sub-period from 2006 to 2009 and the post-GFC sub-period from 2009 to 2017.

5.4.3.1 Full Period: 2006-2017

Table 5.8 presents unconditional correlations between Australia's superannuation funds and 17 frontier markets for the full study period from 2006 to 2017. Unconditional correlations between monthly returns of superannuation funds and broad market indices of frontier markets are low, just like developed and emerging markets. Correlations between superannuation funds and 9 frontier markets are negative while the rest are positive. Correlations are negative with Croatia (−0.021), Romania (−0.016), Slovenia (−0.023), Mauritius (−0.038), Tunisia (−0.082), Botswana (−0.068), Oman (−0.137), Bangladesh (−0.071) and Vietnam (−0.055) and positive with Bulgaria (0.031), Estonia (0.058), Lithuania (0.037), Kenya (0.049), Nigeria (0.066), Bahrain (0.156), Jordan (0.052) and Sri Lanka (0.07).

Among frontier markets, correlations range from negative to up to 0.8. Correlations are higher for countries that share borders, are trade partners or have high similarity in their level of economic development such as between Estonia and Lithuania (0.826). In the Asia-Pacific region, correlation between Bangladesh, Sri Lanka and Vietnam is less than 0.5 while in the EMEA region the average correlation ranges between 0.3 to 0.6, except for Estonia and Lithuania (0.826). Tunisia and Botswana, on the other hand, have very low correlations (less than 0.2) with most countries in the region.

5.4.3.2 GFC Sub-Period: 2006-2009

Table 5.9 presents unconditional correlations between Australia's superannuation funds and 17 frontier markets for the GFC sub-period from 2006 to 2009. Unconditional correlations between monthly returns of superannuation funds and broad market indices of frontier markets are very low (close to zero). They are positive for 5 countries and negative for the remaining 12.

In the EMEA region, correlations range between −0.013 and 0.877. The lowest correlation is between Romania and Botswana and the highest is between Estonia and Lithuania. Botswana has extremely low correlations with all countries in the sample. Its highest correlation is with Slovenia (0.309). Jordan and Tunisia also share low correlations with many countries in the sample, in the range of 0.2 to 0.4. Most other countries' correlations are higher than 0.4. In the Asia-Pacific region, correlation of Bangladesh with Sri Lanka is 0.036 and with Vietnam is 0.217 while correlation between Sri Lanka and Vietnam is 0.428. Overall, frontier markets have low correlation with superannuation funds and with each other.

5.4.3.3 Post-GFC Sub-Period: 2009-2017

Table 5.10 presents unconditional correlations between Australia's superannuation funds and 17 frontier markets for the post-GFC sub-period from 2009 to 2017. In the post-GFC period, the scenario is different from the GFC period. The majority of the countries that were positively correlated to superannuation funds in the GFC period are now negatively correlated, except Bahrain and Bangladesh, and countries that were negatively correlated are positively correlated now. The correlations, however, are still very low. The highest is with Bahrain (0.275) and Nigeria (0.249).

Correlations among frontier market countries are even lower in the post-GFC period than the GFC period for most countries in the sample. With the exception of correlation between Estonia and Lithuania (0.779), all correlations are less than 0.6, with some countries experiencing negative correlations too. Countries that have experienced increase in correlations in the post-GFC period are only a handful. Specifically, Bulgaria and Botswana saw a rise from 0.160 to 0.224, Botswana also saw a rise from 0.133 to 0.178 with Lithuania and from −0.013 to 0.153 with Romania. Similar increments was seen between Slovenia and Jordan, Kenya and Nigeria, Bahrain and Sri Lanka, Bahrain and Vietnam. The highest increase was between Oman and Vietnam: a jump from 0.193 to 0.508. Correlations in the Asia-Pacific region remained less than 0.2.

Table 5.8: Unconditional Correlations: Superannuation Funds and Frontier Markets (2006-2017)

	AUS	BGR	HRV	EST	LTU	ROM	SVN	KEN	MUS	NGA	TUN	BWA	BHR	JOR	OMN	BGD	LKA	VNM
AUS	1																	
BGR	0.031	1																
HRV	-0.021	0.597	1															
EST	0.058	0.556	0.580	1														
LTU	0.037	0.639	0.519	0.826	1													
ROM	-0.016	0.622	0.552	0.441	0.437	1												
SVN	-0.023	0.486	0.571	0.437	0.463	0.463	1											
KEN	0.049	0.304	0.264	0.334	0.343	0.476	0.267	1										
MUS	-0.038	0.447	0.531	0.335	0.420	0.422	0.394	0.460	1									
NGA	0.066	0.362	0.435	0.211	0.159	0.315	0.328	0.284	0.285	1								
TUN	-0.082	0.124	0.091	0.252	0.232	0.075	0.078	0.162	0.160	-0.081	1							
BWA	-0.068	0.168	0.094	0.136	0.126	0.027	0.191	0.027	0.137	0.151	0.037	1						
BHR	0.156	0.509	0.434	0.317	0.369	0.371	0.446	0.248	0.397	0.375	0.039	0.145	1					
JOR	0.052	0.286	0.333	0.234	0.186	0.207	0.194	0.184	0.272	0.337	0.201	0.046	0.399	1				
OMN	-0.137	0.429	0.386	0.284	0.367	0.508	0.373	0.313	0.367	0.409	0.217	0.030	0.525	0.371	1			
BGD	-0.071	0.096	0.178	0.139	0.077	0.101	0.143	0.099	0.191	0.154	0.342	0.068	0.279	0.301	0.279	1		
LKA	0.070	0.269	0.339	0.331	0.394	0.224	0.366	0.254	0.414	0.131	0.225	0.025	0.158	0.119	0.279	0.058	1	
VNM	-0.055	0.411	0.496	0.369	0.415	0.331	0.344	0.249	0.386	0.204	0.262	0.143	0.262	0.245	0.284	0.126	0.308	1

Table 5.9: Unconditional Correlations: Superannuation Funds and Frontier Markets (2006-2009)

	AUS	BGR	HRV	EST	LTU	ROM	SVN	KEN	MUS	NGA	TUN	BWA	BHR	JOR	OMN	BGD	LKA	VNM
AUS	1																	
BGR	-0.078	1																
HRV	0.002	0.701	1															
EST	0.069	0.686	0.718	1														
LTU	-0.069	0.718	0.671	0.877	1													
ROM	-0.109	0.766	0.608	0.494	0.515	1												
SVN	-0.152	0.652	0.717	0.707	0.720	0.550	1											
KEN	-0.021	0.513	0.457	0.523	0.571	0.658	0.407	1										
MUS	-0.009	0.599	0.633	0.493	0.599	0.530	0.474	0.645	1									
NGA	-0.051	0.480	0.589	0.355	0.315	0.391	0.430	0.201	0.371	1								
TUN	-0.038	0.363	0.224	0.432	0.344	0.253	0.231	0.313	0.230	0.112	1							
BWA	0.075	0.160	0.151	0.180	0.133	-0.013	0.309	0.017	0.167	0.222	0.069	1						
BHR	0.001	0.605	0.527	0.401	0.547	0.453	0.552	0.403	0.500	0.516	0.122	0.274	1					
JOR	0.046	0.312	0.334	0.298	0.239	0.221	0.200	0.223	0.297	0.401	0.337	0.035	0.461	1				
OMN	-0.170	0.572	0.387	0.314	0.447	0.560	0.462	0.451	0.413	0.599	0.408	-0.039	0.660	0.423	1			
BGD	0.032	0.484	0.447	0.348	0.277	0.326	0.258	0.263	0.251	0.458	0.176	0.105	0.506	0.575	0.357	1		
LKA	-0.190	0.383	0.504	0.582	0.669	0.305	0.532	0.315	0.506	0.206	0.467	-0.073	0.119	0.150	0.331	0.036	1	
VNM	-0.131	0.456	0.557	0.521	0.513	0.328	0.415	0.321	0.436	0.262	0.435	0.172	0.234	0.241	0.193	0.217	0.428	1

Table 5.10: Unconditional Correlations: Superannuation Funds and Frontier Markets (2009-2017)

	AUS	BGR	HRV	EST	LTU	ROM	SVN	KEN	MUS	NGA	TUN	BWA	BHR	JOR	OMN	BGD	LKA	VNM
AUS	1																	
BGR	-0.054	1																
HRV	-0.026	0.381	1															
EST	-0.119	0.427	0.497	1														
LTU	-0.150	0.561	0.389	0.779	1													
ROM	-0.167	0.304	0.446	0.389	0.332	1												
SVN	0.051	0.216	0.306	0.197	0.217	0.331	1											
KEN	-0.011	0.008	-0.008	0.167	0.124	0.229	0.113	1										
MUS	0.088	0.129	0.247	0.221	0.280	0.218	0.251	0.236	1									
NGA	0.249	0.194	0.162	0.102	0.026	0.217	0.189	0.392	0.117	1								
TUN	-0.012	-0.054	-0.036	0.191	0.215	-0.051	-0.037	0.090	0.100	-0.244	1							
BWA	-0.096	0.224	-0.052	0.135	0.178	0.153	-0.020	0.066	0.029	0.018	-0.007	1						
BHR	0.275	0.374	0.300	0.242	0.198	0.249	0.315	0.084	0.257	0.207	-0.009	-0.047	1					
JOR	0.165	0.240	0.357	0.220	0.155	0.194	0.219	0.155	0.181	0.229	0.095	0.092	0.348	1				
OMN	-0.129	0.169	0.384	0.302	0.332	0.438	0.227	0.155	0.246	0.099	0.060	0.163	0.345	0.235	1			
BGD	0.026	-0.154	-0.015	0.088	0.030	-0.017	0.085	0.040	0.171	-0.032	0.391	0.029	0.184	0.139	0.263	1		
LKA	0.134	0.138	0.159	0.144	0.174	0.129	0.213	0.196	0.373	0.069	0.107	0.170	0.191	0.106	0.249	0.086	1	
VNM	-0.073	0.307	0.332	0.216	0.328	0.342	0.218	0.153	0.255	0.105	0.139	0.077	0.329	0.279	0.508	0.088	0.178	1

5.5 ADCC GARCH Correlation of Monthly Returns between Australia's Superannuation Funds and Developed, Emerging and Frontier Markets

This section discusses the outcome of conditional correlations between Australia's superannuation funds and broad market indices of developed, emerging and frontier markets. Conditional correlations are measured using ADCC GARCH model in this thesis, which is explained in Section 4.6.2. Literature (Gilmore & McManus 2002; Speidell & Krohne 2007; Zhang et al. 2013) has evidenced that correlations change over time, that is, they do not remain constant. As a result, models measuring time-varying correlations have received more attention and support in academic literature (Baumohl & Lyocsa 2014; Gupta & Donleavy 2009; Sukumaran et al. 2015). Review of time-varying correlation models, discussed in Section 3.5, suggests that ADCC GARCH model is superior to all other models reviewed as it considers asymmetry in correlation and variances, which makes it suitable for studying the correlation dynamics among different asset classes across different regions.

In order to perform ADCC GARCH modelling, first, the returns data is checked for stationarity as it is a necessary condition for GARCH. In Section 5.3, it was found that all countries returns data are stationary at levels, I(0). Second, the squared residuals are checked for the presence of ARCH effect, that is, heteroscedasticity or unequal variance. Squared residuals should be independent for GARCH modelling. This check is performed in three steps: (i) the best fitted auto-regressive integrated moving average (ARIMA) model is found for each time series. In this thesis the auto.arima() function in R package called "forecast[40]" is used, (ii) Ljung-Box test is performed on the residuals to ensure that they are independently distributed, and (iii) Ljung-Box test is performed on the squared residuals to ensure ARCH effect. ADCC GARCH model is employed after satisfying these conditions. However, a limitation of this model is that it requires at least 100 data points of each time series to estimate conditional correlations. Since we have 133 data points in total for the full study period from 2006 to 2017, we are unable to split it to perform analysis for the GFC and post-GFC sub-periods. Hence, only a full study period analysis is conducted in this section. Results of ADCC GARCH correlation for the full study period from 2006 to 2017 are presented and discussed in Sections 5.5.1 to 5.5.3.

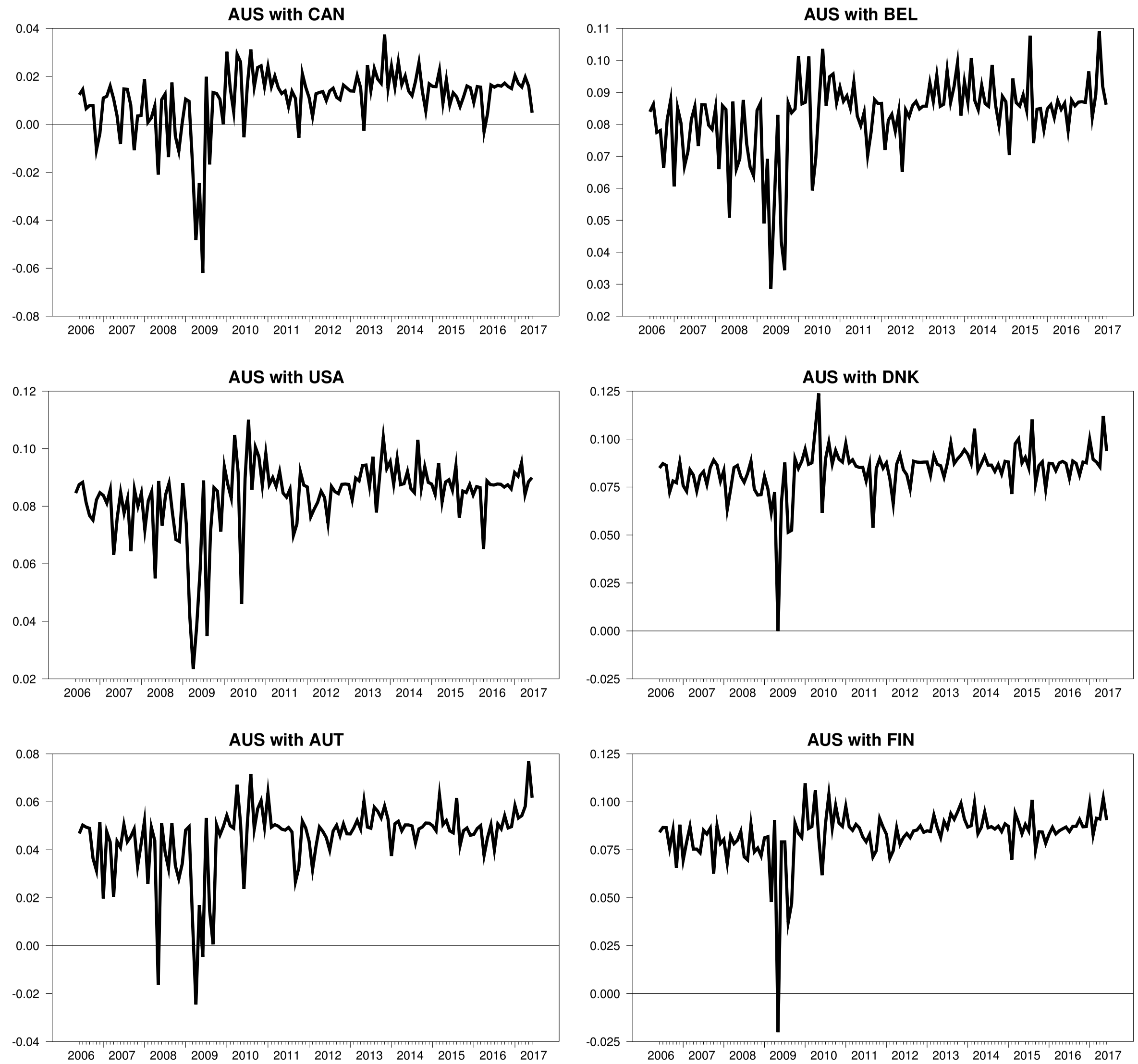
[40] For a detailed explanation, see Hyndman & Khandakar (2008).

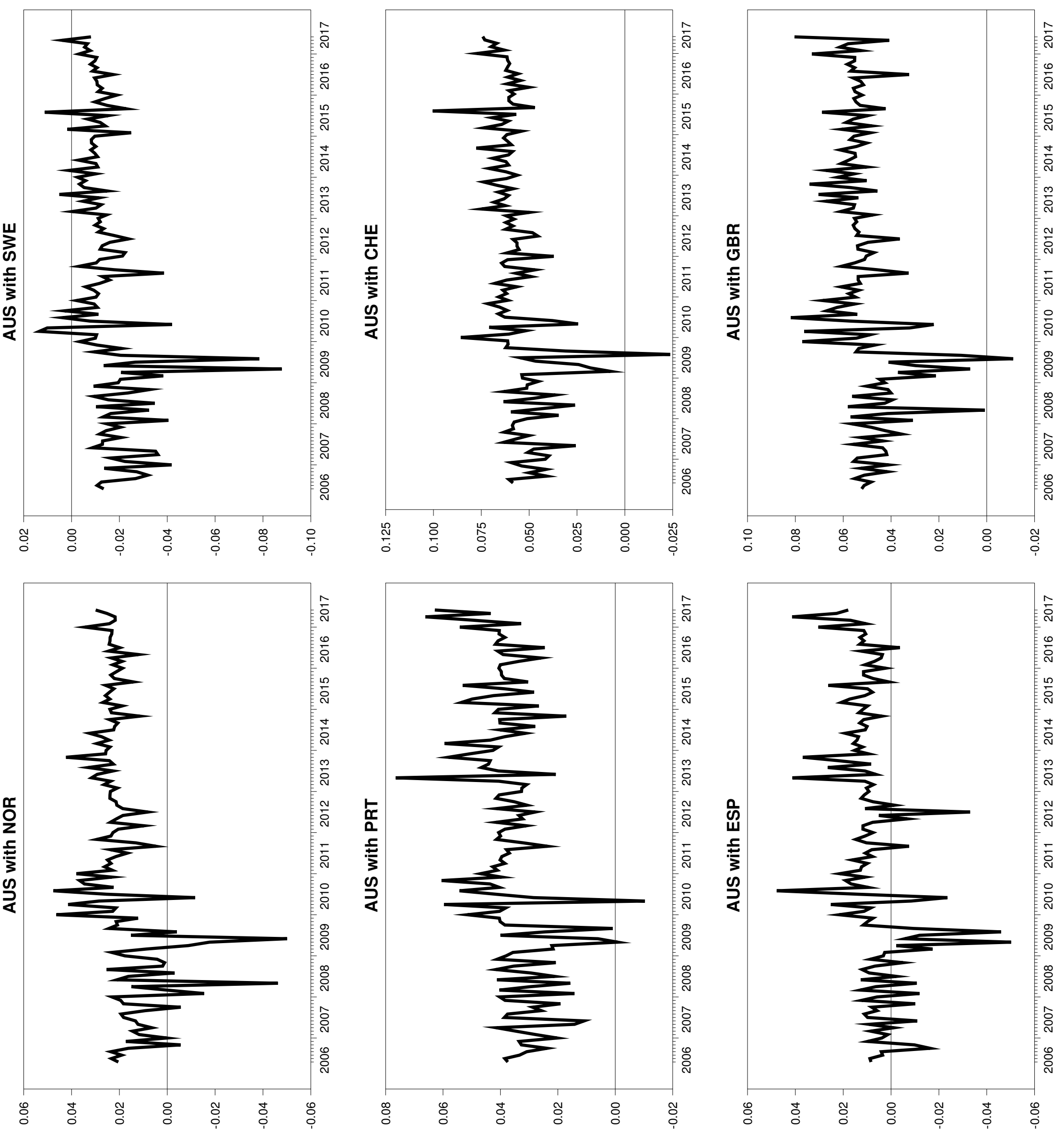
5.5.1 ADCC GARCH Correlation of Monthly Returns between Australia's Superannuation Funds and Developed Markets

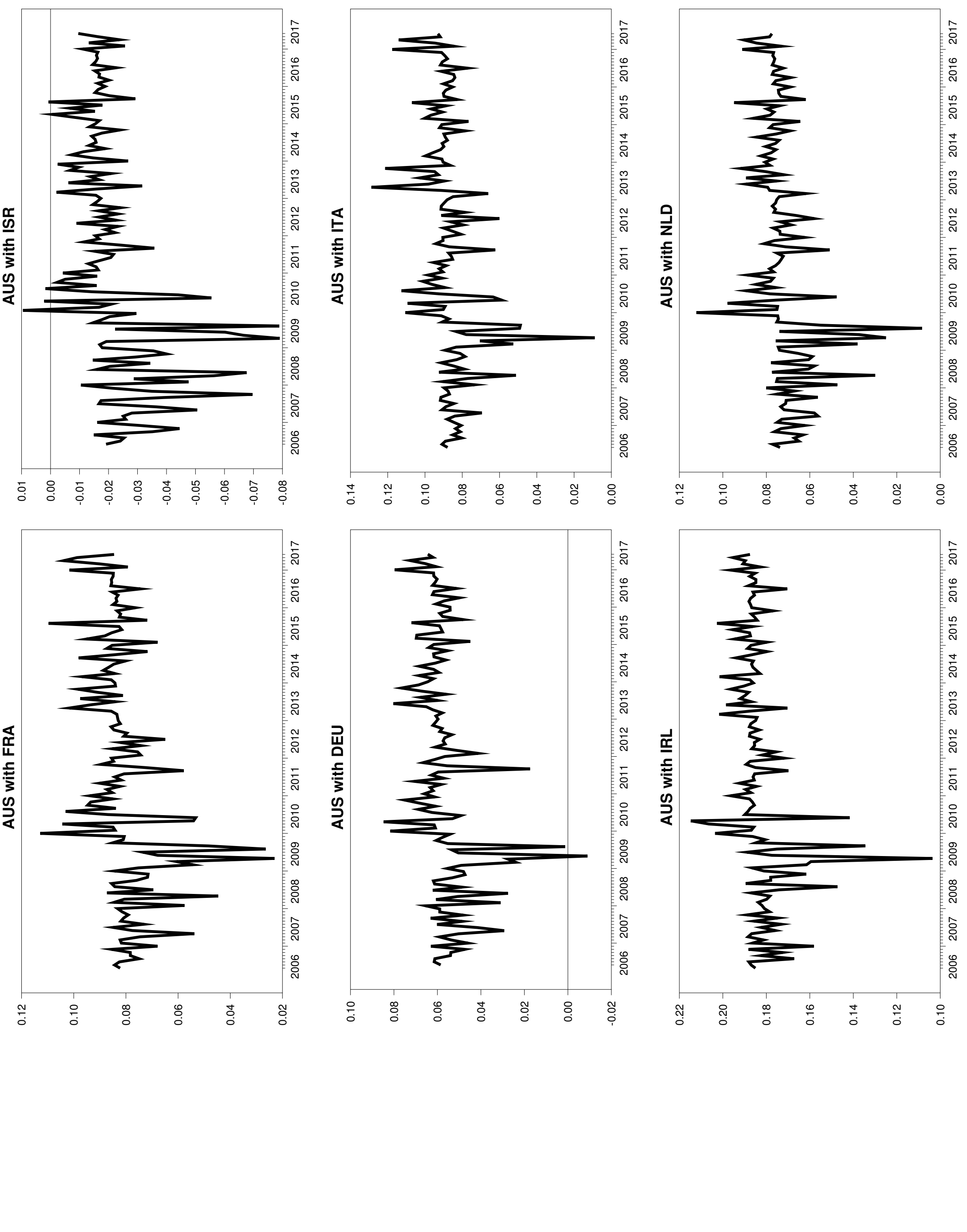
Figure 5.1 presents the results of ADCC GARCH correlation between Australia's superannuation funds and 22 developed markets for the full study period from 2006 to 2017. It shows that correlations are time-varying and increasing over time. Correlation with all countries, except Canada, has increased over the study period. Correlation with Canada at the start of the study period (June 2006) was 0.012 and at the end of the study period (June 2017) was 0.005. Except that, the largest increases in correlations between superannuation funds and developed markets are with Austria, Portugal, Switzerland, United Kingdom, Hong Kong and Japan. Despite the increase, correlations are still very low. As on 30 June 2017, the highest correlation of superannuation funds is with the broad market index of Hong Kong (0.270), see Appendix B. Correlations are also positive with all countries, except Israel, Sweden and Singapore. Negative correlations, as discussed in Section 5.4.1, with Israel, Sweden and Singapore are potential investment options in times of uncertainties as they are likely to even out the volatility in portfolio returns.

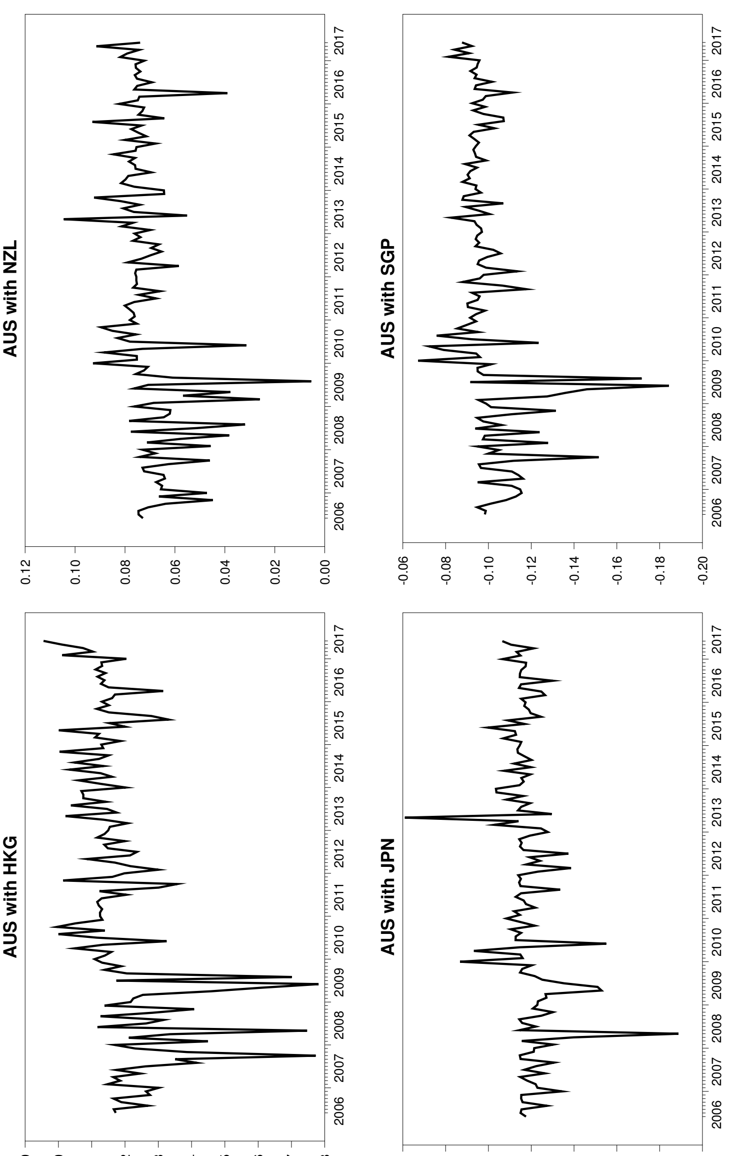
Between 2006 – 2009, it can be seen from the graphs that most correlations have reached their lowest point in 2008 or 2009. Correlations during this period are negative for a few countries in the sample, especially Canada, Austria, Finland, Germany, Israel, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, Hong Kong, and Singapore. After 2009, most countries' correlations have increased and are positive with most countries, except, Israel, Sweden, Switzerland, Hong Kong, and Singapore. Despite the increase, correlations with all developed markets are still very low (less than 0.3). These results suggest that though interdependence between superannuation funds and developed markets have increased slightly, there are huge opportunities for gains from international portfolio diversification.

Figure 5.1: ADCC GARCH Correlation between Australia's Superannuation Funds and Developed Markets: 2006-2017




AUS with NOR
AUS with SWE
AUS with PRT
AUS with CHE
AUS with ESP
AUS with GBR

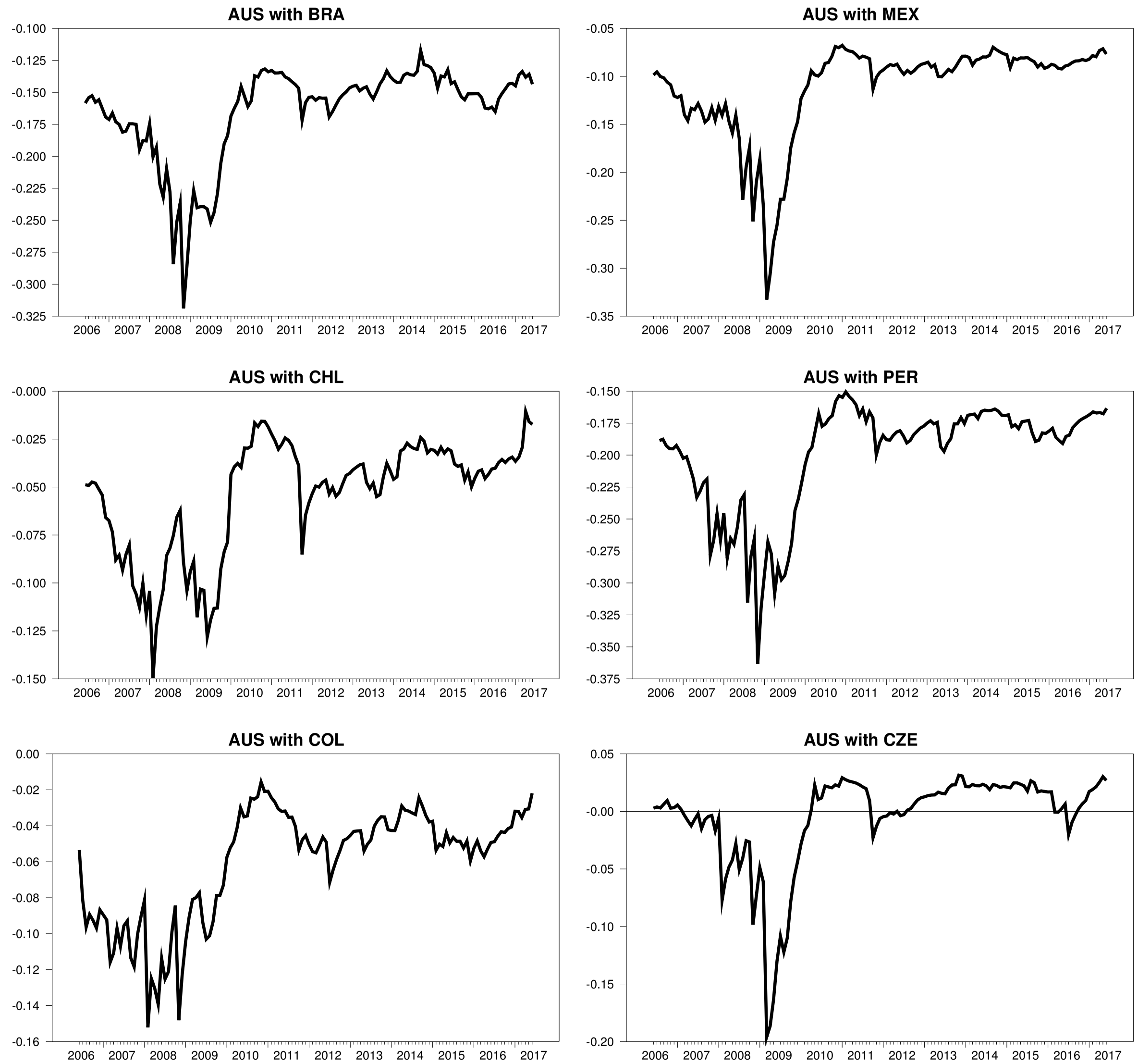

AUS with FRA
AUS with ISR
AUS with DEU
AUS with ITA
AUS with IRL
AUS with NLD

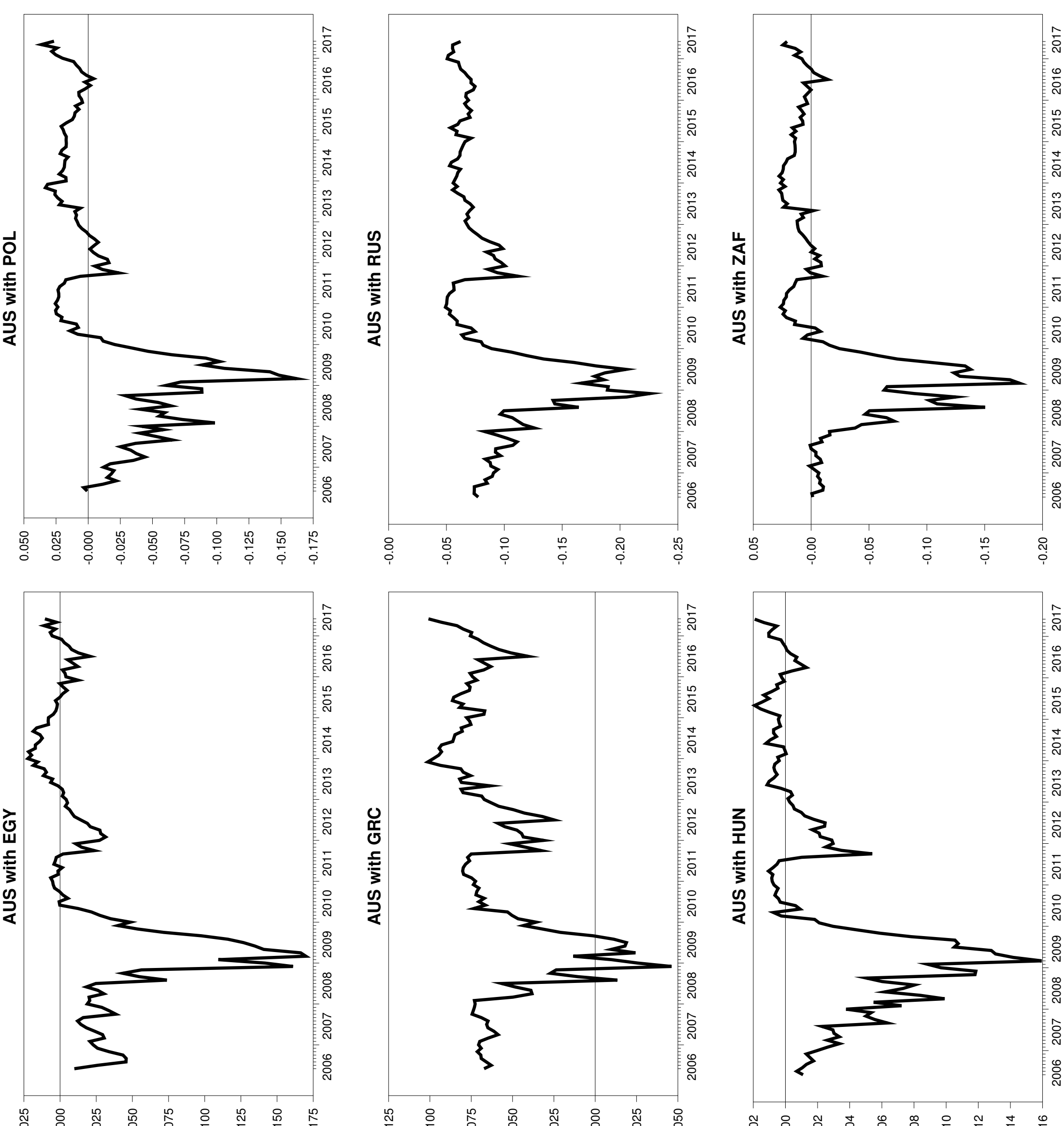

AUS with HKG
AUS with NZL
AUS with JPN
AUS with SGP
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
-0.09 -0.10 -0.11 -0.12 -0.13 -0.14 -0.15 -0.16 -0.17 -0.18
0.12 0.10 0.08 0.06 0.04 0.02 0.00
0.18 0.16 0.14 0.12 0.10 0.08 0.06 0.04
-0.06 -0.08 -0.10 -0.12 -0.14 -0.16 -0.18 -0.20

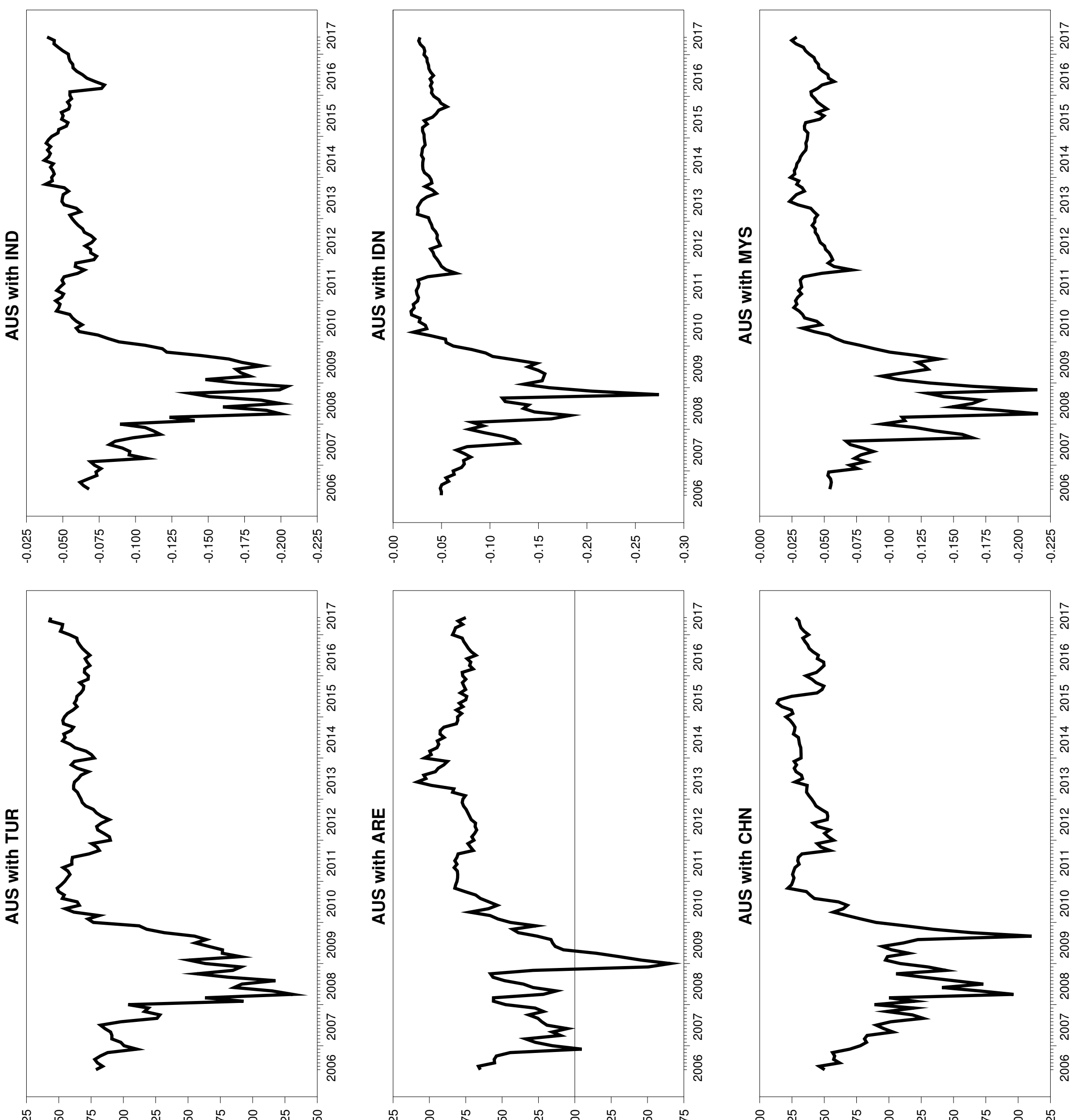
5.5.2 ADCC GARCH Correlation between Australia's Superannuation Funds and Emerging Markets

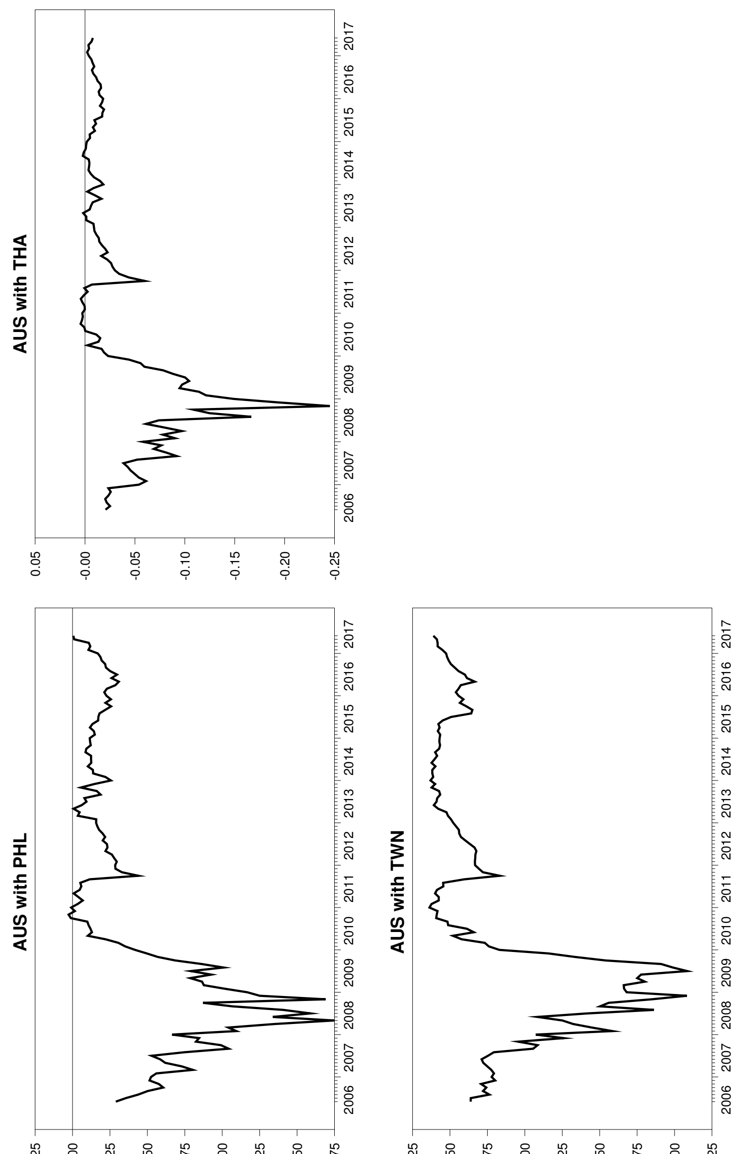
Figure 5.2 presents the results of ADCC GARCH correlation between superannuation funds and emerging markets for the full period from 2006 to 2017. Correlation for most countries in the sample have remained negative for the majority of the study period. All countries also saw a huge decline during the GFC period, especially in 2008 and early 2009. Greece and the United Arab Emirates are the exception, wherein correlations are positive for the majority of the study period and negative only briefly during the GFC. Correlations for the Czech Republic (0.027), Egypt (0.010), Hungary (0.019), Poland (0.027), and South Africa (0.021) have picked up since the GFC and are positive in the remaining period. Both positive and negative correlations, however, are very low, between −0.2 and +0.2, indicating potential gains for Australia's superannuation investors from international portfolio diversification. Assets with positive correlations are those that are moving in the same direction as superannuation funds while assets with negative correlations are moving in the opposite direction of superannuation funds, thereby, providing investment choices when markets are moving up and down.

Figure 5.2: ADCC GARCH Correlation between Australia's Superannuation Funds and Emerging Markets: 2006-2017




AUS with EGY
AUS with POL
AUS with GRC
AUS with RUS
AUS with HUN
AUS with ZAF
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017


AUS with TUR
AUS with IND
AUS with ARE
AUS with IDN
AUS with CHN
AUS with MYS



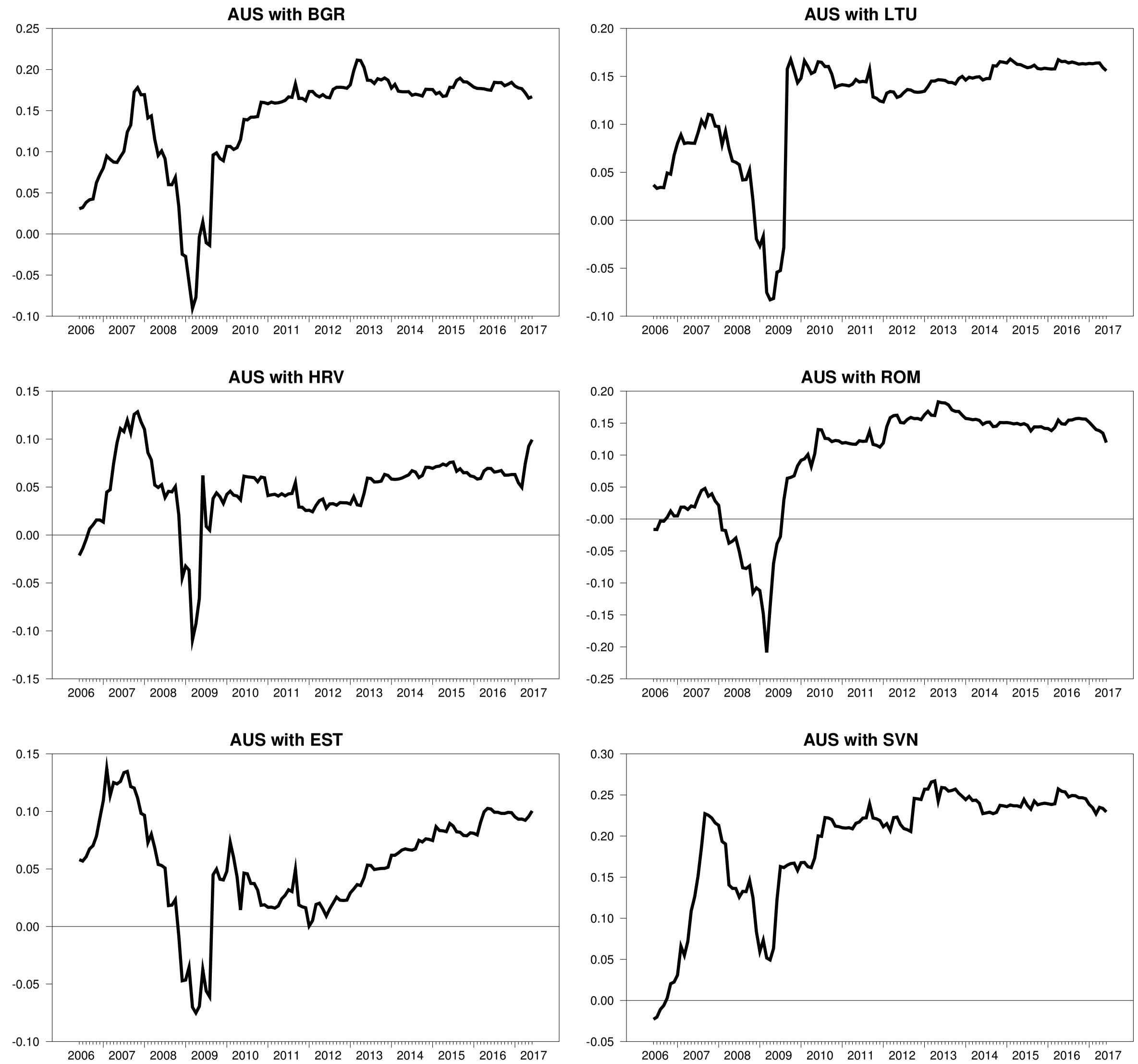
AUS with PHL
0.025
-0.000
-0.025
-0.050
-0.075
-0.100
-0.125
-0.150
-0.175
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
AUS with THA
0.05
-0.00
-0.05
-0.10
-0.15
-0.20
-0.25
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
AUS with TWN
-0.025
-0.050
-0.075
-0.100
-0.125
-0.150
-0.175
-0.200
-0.225
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017

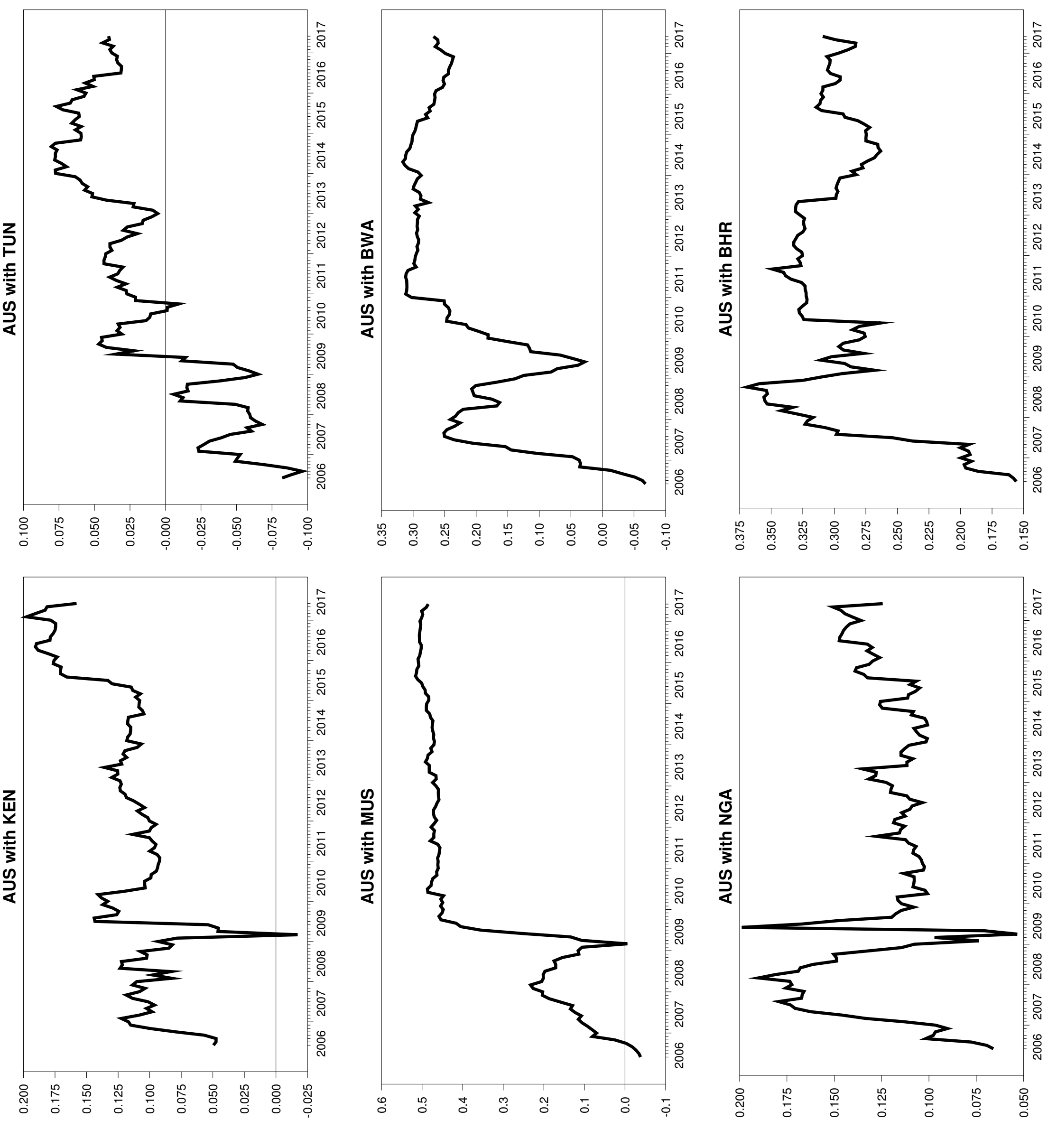
5.5.3 ADCC GARCH Correlation between Australia's Superannuation Funds and Frontier Markets

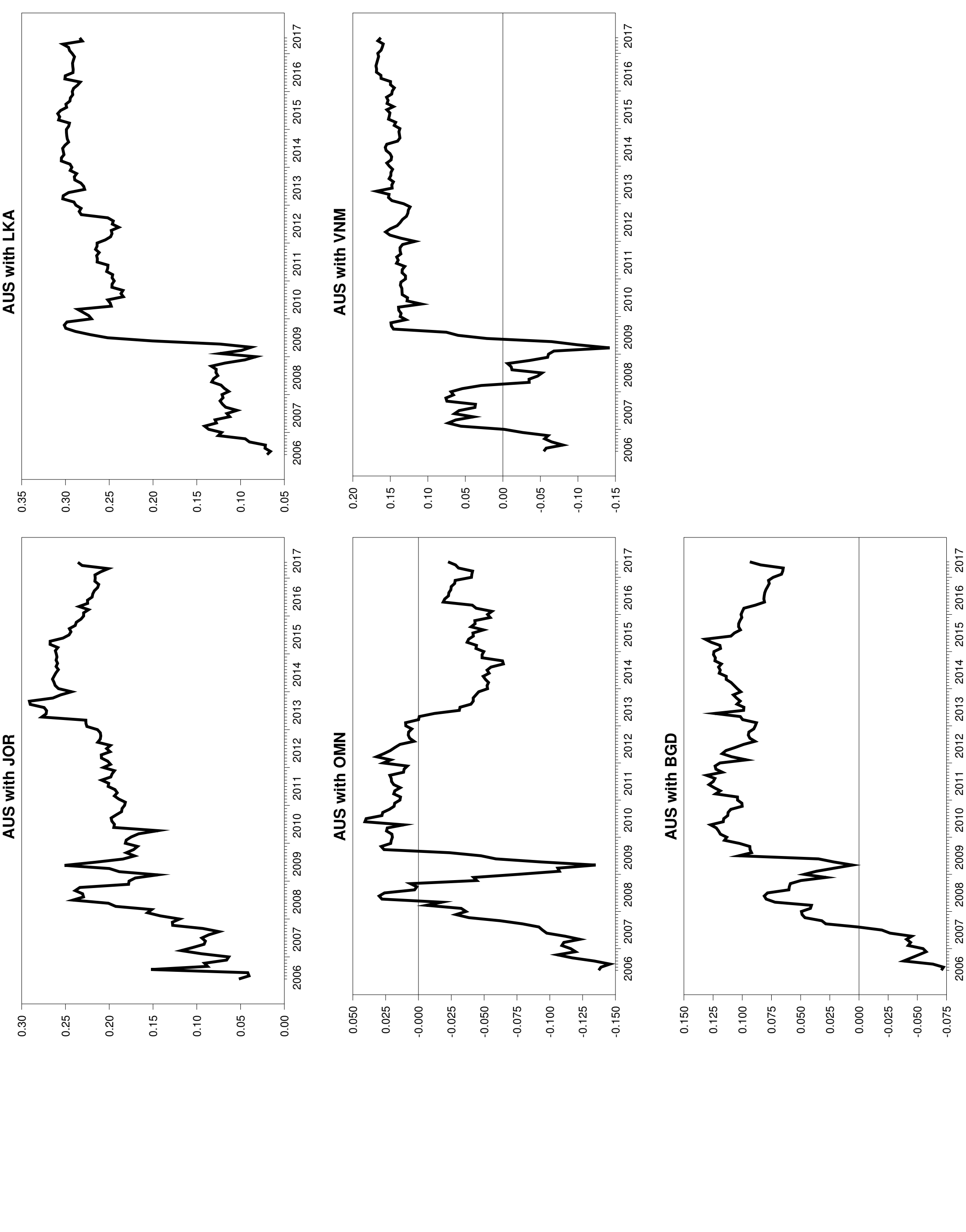
Figure 5.3 presents the results of ADCC GARCH correlation between superannuation funds and frontier markets for the full study period from 2006 to 2017. Results show that correlations are time-varying, positive and increasing over time. Oman (-0.023) is the only country that is negatively correlated with superannuation funds. The highest correlation is with Mauritius (0.485) and the lowest is with Oman (-0.023). From the graphs, it can be seen that during the GFC period, except Slovenia, Mauritius, Nigeria, Botswana, Bahrain, Jordan, Bangladesh and Sri Lanka, all other countries' correlations declined and were negative. These countries remained positively correlated with superannuation funds throughout the study period. It can also be noted that correlations of Mauritius, in particular, have remained stable in the post-GFC period. Lithuania and Vietnam also have not experienced much volatility since the GFC.

Compared to developed and emerging markets, correlations between superannuation funds and frontier markets are relatively higher, although the highest is less than 0.5. In summary, from these results, it can be suggested that there are still substantial opportunities for Australia's superannuation funds to gain from international portfolio diversification in developed, emerging and frontier markets.

Figure 5.3: ADCC GARCH Correlation between Australia's Superannuation Funds and Frontier Markets: 2006-2017




AUS with KEN
AUS with TUN
AUS with MUS
AUS with BWA
AUS with NGA
AUS with BHR


AUS with JOR
AUS with LKA
AUS with OMN
AUS with VNM
AUS with BGD

5.6 Portfolio Optimisation: Using Pearson's Correlation

Correlations estimated using Pearson's correlation coefficient, in Sections 5.4.1 to 5.4.3, are used to create optimal portfolios for Australia's superannuation investors. This procedure is performed in three-steps.

- First, mean return, standard deviation and Sharpe ratio of the Australian superannuation portfolio are estimated.
- Second, using Markowitz's MVO, 11 optimal portfolios with different investment restrictions are constructed. These are: an equally weighted portfolio, an unrestricted portfolio, and 9 portfolios with restrictions placed on how much can be invested in the superannuation portfolio and in developed, emerging and frontier markets. These portfolios are constructed on the basis of the "prudent person standard"[41], which is a common practice to ensure that a pension fund portfolio is sufficiently diversified. The prudent person standard places quantitative limitations and ceilings on the types of assets, countries, and regions in which investment is made. This standard is based on the assumption that a portfolio manager is generally risk-averse and may not divert from domestic market assets. To ensure that there is no unwarranted concentration of investment and the associated accumulation of risk, this standard is applied. Since the standard does not specifically state quantitative limitations for an investment portfolio, in this study, 11 portfolios ranging from an equally weighted portfolio, between 0 – 10% in international markets to an unrestricted portfolio is constructed and outcomes are analysed. The objective of each portfolio is based on Markowitz's MVO which aims to minimise risk for a given level of return or maximise return for a given level of risk.
- Third, the results of these portfolios are compared to the results of the Australian superannuation portfolio using mean returns, excess returns, standard deviation, and Sharpe ratio to determine if diversification is beneficial or not for Australia's superannuation investors.

The results of this analysis are presented and discussed in the following sub-sections.

[41] Detailed information on the "prudent person standard" can be found in OECD (2021).

5.6.1 Australian Superannuation Portfolio

The Australian superannuation portfolio represents the portfolio of an average Australian superannuation member whose SG, although invested in a wide range of asset classes, is largely invested in the domestic market (Australian Prudential Regulation Authority). Table 5.11 presents the performance of he Australian superannuation portfolio for the full study period (2006 – 2017), GFC sub-period (2006 – 2009) and the post-GFC sub-period (2009 – 2017). Annual mean return of the portfolio during the full study period is 5.85% with an annualised standard deviation of 3.48%. Its Sharpe ratio is 1.12. As explained in Section 4.6.4, Sharpe ratio measures excess return earned for one unit of total risk. A higher ratio indicates more attractive risk-adjusted return, which could either be due to a smart investment decision or excess risk. In the GFC sub-period, both annual mean return and the Sharpe ratio are negative. A negative Sharpe ratio implies that the risk-free rate of return is greater than the portfolio return. It also means that during the GFC period portfolio return was expected to be negative. In the post-GFC period, annual mean return is 10.88% and standard deviation is 8.92%. This increases the Sharpe ratio to 3.20. A higher Sharpe ratio indicates good portfolio performance; however, in this case the risk is also higher.

Table 5.11: Australian Superannuation Portfolio

	Full-period	GFC	Post-GFC
	2006-2017	2006-2009	2009-2017
Mean return	5.85%	-6.67%	10.88%
Excess return	3.89%	-8.63%	8.92%
Standard deviation	3.48%	2.41%	2.78%
Sharpe ratio	1.12	-3.59	3.20

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of 10-year Australian Bond.

5.6.2 Australia's Superannuation Funds and Developed Markets

Results of portfolio optimisation from diversification in developed markets are presented in Tables 5.12 to 5.15. From Table 5.12, the unrestricted portfolio provides an annual mean return of 5.81%, which is very close to the Australian superannuation portfolio, at a standard deviation of 3.34%. The Sharpe ratio of the unrestricted portfolio is 1.15, which is also better than the superannuation portfolio. To achieve this result, the unrestricted portfolio requires allocation of 1.59% in Canada, 0.61% in Switzerland, 1.42%

in Hong Kong, 1.62% in New Zealand and 1.98% in Singapore. The unrestricted portfolio is a slight improvement over the superannuation portfolio. The between 0 – 90% portfolio has also performed better than the superannuation portfolio. Its mean annual return is 5.78% with a standard deviation of 3.35% and Sharpe ratio of 1.14. This result requires allocation of 3.10% in Canada, 1.19% in Switzerland, 0.99% in Hong Kong, 3.29% in New Zealand and 1.43% in Singapore. Mean returns of the remaining portfolios are lower than the superannuation portfolio and their risk is much higher. These results clearly show that international portfolio diversification in developed markets is certainly beneficial to Australia's superannuation investors if they invest in either the unrestricted portfolio or between 0 – 90% portfolio.

During the GFC period, the performance of the superannuation portfolio, as discussed in Section 5.6.1, and the diversified portfolios are weak. From Table 5.13, it can be seen that none of the constructed portfolios are able to provide better returns on investment. The between 0 – 90% portfolio and the unrestricted portfolio are the only ones that allow some risk reduction. Between the two, the unrestricted portfolio offers more risk reduction benefits. To achieve this result, asset allocation of 1.66% in Sweden and 2.51% in Hong Kong is required. This strategy allows risk reduction to 2.18% with an annual mean return of −6.25%. The risk levels are substantially higher in the remaining portfolios.

In the post-GFC period, see Table 5.14, none of the constructed portfolios provide higher returns than the superannuation portfolio, although a slight risk reduction is possible. The between 0 – 80%, between 0 – 90% and unrestricted portfolios allow risk reduction to 2.69% and 2.61%. Between these three portfolios, between 0 – 90% and unrestricted portfolios have the highest Sharpe ratio (3.41) as they offer the best risk-return combination. There is no difference in the asset allocation structure of these two portfolios. It requires allocation of 2.99% in Canada, 1% in Switzerland, 7.12% in New Zealand and 0.74% in Singapore.

Regional portfolio optimisation, presented in Table 5.15, shows that in terms of maximising returns, diversification in the Asia-Pacific region can yield higher returns than the superannuation portfolio. Portfolios constructed with restrictions of between 0 – 40%, 0 – 50%, 0 – 60%, 0 – 70%, 0 – 80% offer higher returns at a higher risk than the superannuation portfolio while the between 0 – 90% and unrestricted portfolios provide higher returns (5.95% and 5.88%) at a lower risk (3.37% and 3.34%) at the same time. This result indicates that international portfolio diversification is beneficial. In the Americas region, the between 0 – 90% and unrestricted portfolios are the only two portfolios that provide slight risk reduction benefit on diversification. However, lower risk also comes with lower return than the superannuation portfolio. In the EMEA region, the results are similar to the Americas region. Except between $0-90\%$ and the unrestricted portfolio, all other portfolios do not offer any diversification benefits.

Table 5.12: Portfolio Optimisation with Different Restrictions on Developed Markets with Unconditional Correlations: 2006-2017

	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	4.35%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%	92.78%
CAN	4.35%	10.00%	20.00%	24.87%	20.21%	17.13%	14.06%	10.98%	7.90%	3.10%	1.59%
USA	4.35%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
AUT	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
BEL	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DNK	4.35%	5.76%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FIN	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FRA	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DEU	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IRL	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ISR	4.35%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ITA	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NLD	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NOR	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
PRT	4.35%	4.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ESP	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SWE	4.35%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHE	4.35%	10.00%	20.00%	15.13%	9.99%	8.23%	6.48%	4.72%	2.97%	1.19%	0.61%
GBR	4.35%	10.00%	19.64%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HKG	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.99%	1.42%
JPN	4.35%	10.00%	0.36%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NZL	4.35%	10.00%	20.00%	30.00%	29.80%	24.63%	19.47%	14.30%	9.13%	3.29%	1.62%
SGP	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.43%	1.98%
Mean returns	4.06%	4.84%	4.42%	5.18%	5.49%	5.54%	5.59%	5.65%	5.70%	5.78%	5.81%
Excess return	2.10%	2.88%	2.46%	3.22%	3.53%	3.58%	3.63%	3.69%	3.74%	3.82%	3.85%
Standard deviation	14.25%	11.14%	8.73%	7.43%	6.47%	5.58%	4.76%	4.07%	3.58%	3.35%	3.34%
Sharpe ratio	0.15	0.26	0.28	0.43	0.55	0.64	0.76	0.91	1.05	1.14	1.15

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

Table 5.13: Portfolio Optimisation with Different Restrictions on Developed Markets with Unconditional Correlations: 2006-2009

	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	4.35%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%	95.83%
CAN	4.35%	10.00%	20.00%	4.02%	3.85%	3.65%	3.38%	3.12%	2.71%	0.36%	0.00%
USA	4.35%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
AUT	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
BEL	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DNK	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FIN	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FRA	4.35%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DEU	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IRL	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ISR	4.35%	0.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ITA	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NLD	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NOR	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
PRT	4.35%	5.96%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ESP	4.35%	3.63%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SWE	4.35%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.20%	1.71%	1.66%
CHE	4.35%	10.00%	20.00%	24.51%	19.21%	16.51%	13.41%	10.31%	7.09%	3.23%	0.00%
GBR	4.35%	10.00%	20.00%	11.47%	8.22%	5.92%	3.88%	1.83%	0.00%	0.00%	0.00%
HKG	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.09%	2.51%
JPN	4.35%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NZL	4.35%	10.00%	20.00%	30.00%	28.72%	23.92%	19.33%	14.75%	10.01%	3.60%	0.00%
SGP	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mean returns	-7.47%	-7.77%	-6.69%	-7.59%	-7.40%	-7.27%	-7.14%	-7.01%	-6.87%	-6.59%	-6.25%
Excess return	-9.43%	-9.73%	-8.65%	-9.55%	-9.36%	-9.23%	-9.10%	-8.97%	-8.83%	-8.55%	-8.21%
Standard deviation	19.82%	15.22%	11.92%	10.09%	8.61%	7.15%	5.73%	4.37%	3.17%	2.35%	2.18%
Sharpe ratio	-0.48	-0.64	-0.73	-0.95	-1.09	-1.29	-1.59	-2.05	-2.78	-3.64	-3.77

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

Table 5.14: Portfolio Optimisation with Different Restrictions on Developed Markets with Unconditional Correlations: 2009-2017

	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	4.35%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	88.15%	88.15%
CAN	4.35%	10.00%	20.00%	30.00%	25.39%	20.81%	16.24%	11.66%	7.08%	2.99%	2.98%
USA	4.35%	6.64%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
AUT	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
BEL	4.35%	8.97%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DNK	4.35%	8.74%	4.06%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FIN	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FRA	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DEU	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IRL	4.35%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ISR	4.35%	10.00%	3.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ITA	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NLD	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NOR	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
PRT	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ESP	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SWE	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHE	4.35%	10.00%	20.00%	9.95%	5.54%	4.61%	3.68%	2.76%	1.83%	1.00%	1.00%
GBR	4.35%	10.00%	3.73%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HKG	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
JPN	4.35%	5.59%	1.81%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NZL	4.35%	10.00%	20.00%	30.00%	29.07%	24.57%	20.08%	15.58%	11.08%	7.12%	7.12%
SGP	4.35%	10.00%	7.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.74%	0.74%
Mean returns	8.67%	9.34%	9.14%	9.68%	10.08%	10.24%	10.40%	10.57%	10.73%	10.84%	10.84%
Excess return	6.71%	7.38%	7.18%	7.72%	8.12%	8.28%	8.44%	8.61%	8.77%	8.88%	8.88%
Standard deviation	11.41%	8.58%	6.75%	5.50%	4.77%	4.10%	3.50%	3.01%	2.69%	2.61%	2.61%
Sharpe ratio	0.59	0.86	1.06	1.40	1.70	2.02	2.41	2.86	3.26	3.41	3.41

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

Table 5.15: Portfolio Optimisation with Different Restrictions on Developed Markets with Unconditional Correlations: Regional (2006-2017)

Americas	equally weighted	minimum 10% in each market	minimum 20% in each market	minimum 30% in each market	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	33.33%	80.00%	60.00%	40.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%	93.50%
CAN	33.33%	10.00%	20.00%	30.00%	40.00%	40.30%	33.12%	25.94%	18.76%	10.00%	6.50%
USA	33.33%	10.00%	20.00%	30.00%	20.00%	9.70%	6.88%	4.06%	1.24%	0.00%	0.00%
Mean returns	5.40%	5.72%	5.58%	5.44%	5.05%	4.91%	5.06%	5.22%	5.37%	5.59%	5.68%
Excess return	3.44%	3.76%	3.62%	3.48%	3.09%	2.95%	3.10%	3.26%	3.41%	3.63%	3.72%
Standard deviation	8.82%	3.92%	5.72%	8.01%	7.87%	6.68%	5.59%	4.61%	3.84%	3.42%	3.38%
Sharpe ratio	0.39	0.96	0.63	0.43	0.39	0.44	0.56	0.71	0.89	1.06	1.10
Europe, the Middle East & Africas	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	5.88%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%	93.68%
AUT	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
BEL	5.88%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DNK	5.88%	10.00%	1.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FIN	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FRA	5.88%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DEU	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IRL	5.88%	5.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ISR	5.88%	10.00%	19.18%	7.93%	5.31%	4.75%	4.20%	3.64%	3.08%	2.53%	2.29%
ITA	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NLD	5.88%	1.99%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NOR	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
PRT	5.88%	10.00%	2.61%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ESP	5.88%	2.81%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SWE	5.88%	10.00%	16.72%	2.07%	0.35%	0.70%	1.06%	1.41%	1.77%	2.12%	2.19%
CHE	5.88%	10.00%	20.00%	30.00%	33.69%	27.77%	21.85%	15.93%	10.01%	4.08%	1.83%
GBR	5.88%	10.00%	20.00%	30.00%	20.65%	16.77%	12.90%	9.02%	5.14%	1.27%	0.00%
Mean returns	3.64%	3.61%	4.57%	4.01%	4.11%	4.42%	4.74%	5.05%	5.37%	5.69%	5.80%
Excess return	1.68%	1.65%	2.61%	2.05%	2.15%	2.46%	2.78%	3.09%	3.41%	3.73%	3.84%
Standard deviation	14.87%	12.86%	10.29%	8.67%	7.49%	6.41%	5.39%	4.49%	3.79%	3.41%	3.38%
Sharpe ratio	0.11	0.13	0.25	0.24	0.29	0.38	0.52	0.69	0.90	1.09	1.14
Asia-Pacific	equally weighted	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted		
AUS	0.2	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%	93.64%		
HKG	0.2	0.00%	0.00%	0.00%	0.00%	0.48%	1.07%	1.52%	1.69%		
JPN	0.2	20.14%	10.83%	3.08%	1.63%	0.09%	0.00%	0.00%	0.00%		
NZL	0.2	30.00%	40.00%	46.07%	36.41%	26.74%	16.35%	5.86%	2.05%		
SGP	0.2	19.86%	9.17%	0.85%	1.96%	2.70%	2.58%	2.61%	2.63%		
Mean returns	5.42%	5.36%	6.03%	6.55%	6.42%	6.30%	6.13%	5.95%	5.88%		
Excess return	3.46%	3.40%	4.07%	4.59%	4.46%	4.34%	4.17%	3.99%	3.92%		
Standard deviation	11.93%	9.26%	7.36%	6.10%	5.17%	4.34%	3.71%	3.37%	3.34%		
Sharpe ratio	0.29	0.37	0.55	0.75	0.86	1.00	1.12	1.18	1.17		

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

5.6.3 Australia's Superannuation Funds and Emerging Markets

Results of portfolio optimisation from diversification in emerging markets are presented in Tables 5.16 to 5.19. From Table 5.16, it can be seen that three portfolios, between 0 – 80%, between 0 – 90%, and unrestricted, provide the best risk-return combination to Australian superannuation investors. These three portfolios provide lower risk and higher return than the superannuation portfolio. The Sharpe ratio of the between 0 – 90% and the unrestricted portfolios are both 1.30, which shows better performance than the superannuation portfolio. The between 0 – 90% portfolio requires allocation of 0.20% in Brazil, 1.01% in Chile, 0.40% in Colombia, 2.55% in Mexico, 0.94% in Peru, 0.76% in China, and 4.13% in Malaysia. The unrestricted portfolio requires 0.41% in Brazil, 0.87% in Chile, 0.29% in Colombia, 2.24% in Mexico, 1% in Peru, 0.84% in China and 3.42% in Malaysia. The remaining portfolios yield higher returns than the superannuation portfolio but at a much higher risk. The equally weighted portfolio carries the highest risk (14.46%) amongst all.

Two portfolios, between 0 – 90% and unrestricted, provide risk reduction benefits during the crisis period, see Table 5.17. The unrestricted portfolio yields an annual mean return of −5.93% with a standard deviation of 2.17%, however, its Sharpe ratio (−3.64) does not show any improvement over the superannuation portfolio. Similar is the case for the between 0 – 90% portfolio. The between 0 – 20%, between 0 – 30%, and equally weighted portfolio, on the other hand, have positive Sharpe ratios (0.06, 0.00 and 0.16 respectively), suggesting better portfolio performance. These portfolios yield positive annual mean returns during the crisis period but at a much higher level of risk (12.66%, 11.01%, and 22.11% respectively).

During the post-GFC period, none of the constructed portfolios provide higher mean returns than the superannuation portfolio; however, slight risk reduction is possible, see Table 5.18. Only three constructed portfolios provide this benefit: between 0 – 80%, between 0 – 90% and unrestricted. Risk reduction up to 2.63% and 2.54% is achievable through these portfolios. Their Sharpe ratios (3.22 and 3.45) are also higher than the superannuation portfolio (3.20). The between 0 – 80% portfolio requires allocation of 5.18% in Mexico, 0.80% in Peru, 0.78% in Egypt, 0.20% in Greece, 0.11% in Turkey, 0.77% in the United Arab Emirates, 10.50% Malaysia, and 1.65% Thailand. The asset allocation structure of the between 0 – 90% and unrestricted portfolios is the same for both, probably because there is not much scope for diversification in this market given the restrictions imposed. These two portfolios require 3.21%

in Mexico, 0.81% in Peru, 0.67% in Egypt, 0.33% in Turkey, 5.56% in Malaysia and 1.61% in Thailand.

From Table 5.19, it can be seen that higher returns, especially, from diversification in the Americas and Asia-Pacific are possible; however, higher returns come with higher risk. Annual mean returns of most constructed portfolios are higher than the superannuation portfolio (5.85%) which indicates that earning superior returns from portfolio diversification is possible for Australian superannuation investors. In the Americas region, the between 0 – 80%, between 0 – 90%, and unrestricted portfolios offer the best risk return combination. Their Sharpe ratio, which is higher than the superannuation portfolio, suggests good performance. The Sharpe ratio is highest for the between 0 – 90% portfolio, which requires allocation of 0.91% in Brazil, 2.97% in Chile, 1.07% in Colombia, 4.16% in Mexico and 0.89% in Peru. The Sharpe ratio of the unrestricted portfolio is very close to the between 0 – 90% portfolio and requires a similar asset allocation structure with a slightly higher proportion in the superannuation fund. In the EMEA region, optimal portfolios are the between 0 – 90% and unrestricted portfolios. Their Sharpe ratios are 1.22 and 1.23 respectively. Their mean annual returns are 6.14% and 6.12% and standard deviations are 3.43% and 3.38%. Compared to the Americas and EMEA, optimal portfolios, between 0 – 90% and unrestricted in the Asia-Pacific region, yield lower returns, although still higher than the superannuation portfolio. Their Sharpe ratio is 1.23. The remaining constructed portfolios also offer higher returns on diversification to Australian superannuation investors although their risk levels are much higher than the superannuation portfolio. It is possible to earn as high as 10.81% annually from the Asia-Pacific region when equal weight is given to all countries in the region but the risk attached to this portfolio is the highest, 14.07%. A portfolio such as this is suitable for a risk-taker.

Table 5.16: Portfolio Optimisation with Different Restrictions on Emerging Markets with Unconditional Correlations: 2006-2017

	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	4.55%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%	90.93%
BRA	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.20%	0.41%
CHL	4.55%	10.00%	16.43%	10.77%	9.23%	7.68%	6.14%	4.59%	3.03%	1.01%	0.87%
COL	4.55%	10.00%	5.29%	3.32%	2.92%	2.52%	2.12%	1.72%	1.32%	0.40%	0.29%
MEX	4.55%	10.00%	10.33%	6.26%	5.76%	5.26%	4.76%	4.26%	3.76%	2.55%	2.24%
PER	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.94%	1.00%
CZE	4.55%	1.86%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EGY	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
GRC	4.55%	8.14%	3.74%	2.62%	2.12%	1.62%	1.13%	0.63%	0.12%	0.00%	0.00%
HUN	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
POL	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RUS	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ZAF	4.55%	10.00%	11.99%	9.06%	7.53%	5.99%	4.45%	2.91%	1.30%	0.00%	0.00%
TUR	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ARE	4.55%	10.00%	12.22%	8.78%	7.33%	5.88%	4.43%	2.98%	1.55%	0.00%	0.00%
CHN	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.21%	0.76%	0.84%
IND	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IDN	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MYS	4.55%	10.00%	20.00%	29.18%	25.11%	21.04%	16.97%	12.90%	8.71%	4.13%	3.42%
PHL	4.55%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TWN	4.55%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
THA	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mean returns	7.91%	6.01%	6.48%	6.40%	6.35%	6.31%	6.26%	6.21%	6.18%	6.17%	6.16%
Excess return	5.95%	4.05%	4.52%	4.44%	4.39%	4.35%	4.30%	4.25%	4.22%	4.21%	4.20%
Standard deviation	14.46%	10.65%	8.73%	7.59%	6.57%	5.61%	4.73%	3.98%	3.45%	3.24%	3.24%
Sharpe ratio	0.41	0.38	0.52	0.59	0.67	0.77	0.91	1.07	1.22	1.30	1.30

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

Table 5.17: Portfolio Optimisation with Different Restrictions on Emerging Markets with Unconditional Correlations: 2006-2009

	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	4.55%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%	95.65%
BRA	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHL	4.55%	10.00%	20.00%	18.80%	16.47%	14.13%	11.80%	9.47%	6.90%	4.00%	0.88%
COL	4.55%	10.00%	7.59%	5.36%	4.59%	3.82%	3.05%	2.27%	1.50%	0.68%	0.00%
MEX	4.55%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
PER	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CZE	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EGY	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
GRC	4.55%	10.00%	3.87%	2.29%	1.76%	1.23%	0.70%	0.16%	0.00%	0.00%	0.00%
HUN	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
POL	4.55%	1.93%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RUS	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ZAF	4.55%	10.00%	19.06%	15.18%	13.02%	10.87%	8.72%	6.57%	4.50%	1.59%	0.00%
TUR	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.33%
ARE	4.55%	10.00%	9.48%	7.70%	6.65%	5.60%	4.55%	3.51%	2.36%	1.02%	0.00%
CHN	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.38%	0.77%
IND	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IDN	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MYS	4.55%	10.00%	20.00%	20.67%	17.51%	14.35%	11.18%	8.02%	4.74%	0.74%	0.00%
PHL	4.55%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TWN	4.55%	8.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.60%	2.37%
THA	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mean returns	5.39%	1.73%	2.70%	1.94%	0.74%	-0.45%	-1.62%	-2.78%	-4.03%	-5.22%	-5.93%
Excess return	3.43%	-0.23%	0.74%	-0.02%	-1.22%	-2.41%	-3.58%	-4.74%	-5.99%	-7.18%	-7.89%
Standard deviation	22.11%	15.67%	12.66%	11.01%	9.39%	7.79%	6.22%	4.71%	3.35%	2.38%	2.17%
Sharpe ratio	0.16	-0.01	0.06	0.00	-0.13	-0.31	-0.58	-1.01	-1.79	-3.02	-3.64

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

Table 5.18: Portfolio Optimisation with Different Restrictions on Emerging Markets with Unconditional Correlations: 2009-2017

	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	4.55%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	87.81%	87.81%
BRA	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHL	4.55%	10.00%	10.72%	5.87%	2.95%	1.50%	0.00%	0.00%	0.00%	0.00%	0.00%
COL	4.55%	8.80%	1.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MEX	4.55%	10.00%	20.00%	16.99%	13.44%	11.80%	9.84%	7.50%	5.18%	3.21%	3.21%
PER	4.55%	0.00%	0.00%	0.00%	0.40%	0.57%	0.65%	0.72%	0.80%	0.81%	0.81%
CZE	4.55%	6.15%	1.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EGY	4.55%	0.00%	0.39%	0.66%	0.64%	0.74%	0.81%	0.79%	0.78%	0.67%	0.67%
GRC	4.55%	5.23%	4.15%	3.13%	2.37%	1.82%	1.26%	0.73%	0.20%	0.00%	0.00%
HUN	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
POL	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RUS	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ZAF	4.55%	10.00%	5.90%	2.61%	0.71%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%
TUR	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.11%	0.33%	0.33%
ARE	4.55%	10.00%	14.35%	10.74%	8.16%	6.38%	4.54%	2.63%	0.77%	0.00%	0.00%
CHN	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IND	4.55%	1.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IDN	4.55%	0.83%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MYS	4.55%	10.00%	20.00%	30.00%	31.34%	26.49%	21.59%	16.13%	10.50%	5.56%	5.56%
PHL	4.55%	5.16%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TWN	4.55%	10.00%	2.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
THA	4.55%	2.76%	0.00%	0.00%	0.00%	0.61%	1.31%	1.49%	1.65%	1.61%	1.61%
Mean returns	8.86%	7.60%	8.06%	8.51%	8.80%	9.23%	9.68%	10.06%	10.45%	10.72%	10.72%
Excess return	6.90%	5.64%	6.10%	6.55%	6.84%	7.27%	7.72%	8.10%	8.49%	8.76%	8.76%
Standard deviation	10.43%	7.93%	6.50%	5.55%	4.80%	4.12%	3.49%	2.97%	2.63%	2.54%	2.54%
Sharpe ratio	0.66	0.71	0.94	1.18	1.42	1.77	2.21	2.72	3.22	3.45	3.45

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

Table 5.19: Portfolio Optimisation with Different Restrictions on Emerging Markets with Unconditional Correlations: Regional (2006-2017)

Americas	equally weighted	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	16.67%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%	92.53%
BRA	16.67%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.91%	1.33%
CHL	16.67%	20.00%	29.96%	25.51%	21.08%	16.65%	12.22%	7.78%	2.97%	1.69%
COL	16.67%	20.00%	12.13%	10.37%	8.62%	6.87%	5.12%	3.37%	1.07%	0.41%
MEX	16.67%	20.00%	27.91%	24.12%	20.30%	16.48%	12.66%	8.84%	4.16%	2.85%
PER	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.89%	1.19%
Mean returns	8.17%	7.23%	7.70%	7.44%	7.18%	6.92%	6.66%	6.40%	6.18%	6.13%
Excess return	6.21%	5.27%	5.74%	5.48%	5.22%	4.96%	4.70%	4.44%	4.22%	4.17%
Standard deviation	13.66%	11.60%	9.11%	7.84%	6.61%	5.46%	4.44%	3.66%	3.28%	3.27%
Sharpe ratio	0.46	0.45	0.63	0.70	0.79	0.91	1.06	1.21	1.29	1.28

EMEA	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	10.00%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%	94.55%
CZE	10.00%	10.00%	6.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EGY	10.00%	10.00%	0.99%	0.00%	0.00%	0.00%	0.09%	0.25%	0.41%	0.57%	0.56%
GRC	10.00%	10.00%	11.18%	7.90%	6.43%	5.29%	4.11%	2.91%	1.71%	0.51%	0.00%
HUN	10.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
POL	10.00%	10.00%	16.31%	9.65%	6.12%	4.96%	3.76%	2.56%	1.33%	0.12%	0.00%
RUS	10.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.17%
ZAF	10.00%	10.00%	20.00%	30.00%	29.60%	24.81%	20.04%	15.25%	10.46%	5.67%	3.06%
TUR	10.00%	10.00%	5.44%	3.13%	2.74%	2.58%	2.40%	2.22%	2.07%	1.90%	1.66%
ARE	10.00%	10.00%	20.00%	19.32%	15.11%	12.36%	9.58%	6.80%	4.01%	1.23%	0.00%
Mean returns	5.08%	5.08%	4.61%	5.64%	5.90%	5.93%	5.98%	6.03%	6.08%	6.14%	6.12%
Excess return	3.12%	3.12%	2.65%	3.68%	3.94%	3.97%	4.02%	4.07%	4.12%	4.18%	4.16%
Standard deviation	14.92%	14.92%	11.19%	9.49%	8.20%	6.98%	5.82%	4.77%	3.92%	3.43%	3.38%
Sharpe ratio	0.21	0.21	0.24	0.39	0.48	0.57	0.69	0.85	1.05	1.22	1.23

Asia-Pacific	equally weighted	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	12.50%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%	91.57%
CHN	12.50%	3.18%	0.14%	0.00%	0.00%	0.00%	0.00%	0.40%	1.06%	1.16%
IND	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IDN	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MYS	12.50%	20.00%	30.00%	40.00%	42.73%	34.11%	25.48%	16.64%	7.60%	6.14%
PHL	12.50%	20.00%	16.67%	8.13%	1.88%	1.42%	0.96%	0.45%	0.00%	0.00%
TWN	12.50%	20.00%	18.21%	11.16%	5.39%	4.48%	3.57%	2.51%	1.34%	1.14%
THA	12.50%	16.82%	4.97%	0.72%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mean returns	10.81%	8.50%	7.59%	6.86%	6.39%	6.27%	6.16%	6.07%	6.02%	6.01%
Excess return	8.85%	6.54%	5.63%	4.90%	4.43%	4.31%	4.20%	4.11%	4.06%	4.05%
Standard deviation	14.07%	11.51%	9.34%	7.53%	6.27%	5.21%	4.29%	3.60%	3.29%	3.28%
Sharpe ratio	0.63	0.57	0.60	0.65	0.71	0.83	0.98	1.14	1.23	1.23

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

5.6.4 Australia's Superannuation Funds and Frontier Markets

Results of portfolio optimisation from diversification in frontier markets are presented in Tables 5.20 to 5.23. From Table 5.20, it can be noted that an Australian superannuation investor can earn higher returns than the superannuation portfolio through diversification in between 0 – 70%, between 0 – 80%, between 0 – 90% and unrestricted portfolios. Through these four portfolios, an investor can earn between 6.24% – 6.33% annual mean returns at a risk lower than the superannuation portfolio. The between 0 – 80% portfolio provides the best risk-return combination: 6.33% annual return at an annualised standard deviation of 3.07% and Sharpe ratio of 1.42. This portfolio requires allocation of 0.20% in Slovenia, 1.77% in Mauritius, 6.64% in Tunisia, 7.48% in Botswana, 3.74% in Oman and 0.18% in Bangladesh. This asset allocation structure suggests that only 20% diversification in frontier markets, while still remaining invested up to 80% in the superannuation portfolio, can yield superior risk-return benefits to the Australian superannuation investor. This result also suggests that although there is still scope to gain from international portfolio diversification, investing more than 30% in frontier markets is not beneficial to Australian superannuation investors.

Table 5.21 presents the results of portfolio diversification in frontier markets during the GFC period. The superannuation portfolio yields negative returns (−6.67%) during this period. The portfolio optimisation table shows that it is possible for Australian superannuation investors to earn positive returns during the crisis period by increasing their exposure to frontier markets of Tunisia, Botswana, Bahrain, Bangladesh and Sri Lanka, in particular. As high as 8.22% annual mean returns can be earned if 90% of the total assets is invested in frontier markets, see between 0 – 10% portfolio. The between 0 – 20% portfolio, however, has a better Sharpe ratio (0.64) and thus offers a better risk-return combination. It yields 7.70% annually at a standard deviation of 9%. However, such investment strategies are appropriate for a high risk-taker. For a risk-averse investor, benefits in terms of risk reduction are achievable through between 0 – 90% and unrestricted portfolios, although the benefit is marginal. The between 0 – 90% portfolio yields an annual mean return of −5.16% at a standard deviation of 2.39%, and the unrestricted portfolio yields −6.12% annually at a standard deviation of 2.30%. Both portfolios do not yield positive returns, but they manage to reduce negative returns and risk slightly.

Table 5.22 presents the results of portfolio diversification in frontier markets in the post-GFC period. None of the constructed portfolios provide higher annual mean returns than the superannuation portfolio. Taking on higher risk also does not yield higher returns in the post-GFC period. However, a risk-averse investor intending to reduce their portfolio risk can do so through between 0 – 60%, between 0 – 70%, between 0 – 80%, between 0 – 90% and unrestricted portfolios. The between 0 – 80%, between 0 – 90% and unrestricted portfolios have the same asset allocation structure. Investing in these portfolios leads to a better Sharpe ratio (3.25) than the superannuation portfolio (3.20). Diversification lowers the risk from 2.78% (for the superannaution portfolio) to 2.39%.

The regional international portfolio diversification results are presented in Table 5.23. In the EMEA region, four portfolios, between 0 – 70%, between 0 – 80%, between 0 – 90% and unrestricted, yield higher returns at a lower risk than the superannuation portfolio. The Sharpe ratio of the between 0 – 80% portfolio is the highest amongst all (1.41) and better than the superannuation portfolio. This portfolio offers the highest possible annual mean return of 6.31% at a standard deviation of 3.08%. The other constructed portfolios are unable to provide higher return or lower risk than the superannuation portfolio. In the Asia-Pacific region, on the contrary, superior returns are achievable. All constructed portfolios yield higher return than the superannuation portfolio. The between 0 – 30% portfolio offers the highest possible return from diversification in this region, that is, 12.82% per annum. The Sharpe ratio of this portfolio, however, is lower than the superannuation portfolio, which suggests that higher returns are due to high risk-taking rather than better investment decision-making ability. The Sharpe ratio of the between 0 – 90% portfolio is the highest amongst all constructed portfolios, 1.39, indicating a good risk-return combination. This portfolio yields 6.84% returns at a standard deviation of 3.52% and requires allocation of 4.65% in Bangladesh, 3.43% in Sri Lanka and 1.92% in Vietnam.

Table 5.20: Portfolio Optimisation with Different Restrictions on Frontier Markets with Unconditional Correlations: 2006-2017

	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	5.56%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	82.97%	82.97%
BGR	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HRV	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EST	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
LTU	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ROM	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SVN	5.56%	8.18%	0.90%	0.00%	0.00%	0.00%	0.03%	0.22%	0.20%	0.01%	0.01%
KEN	5.56%	10.00%	5.15%	3.09%	2.40%	1.71%	1.01%	0.26%	0.00%	0.00%	0.00%
MUS	5.56%	10.00%	5.28%	1.98%	2.18%	2.34%	2.53%	2.39%	1.77%	1.35%	1.35%
NGA	5.56%	0.29%	0.24%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TUN	5.56%	10.00%	20.00%	21.09%	18.34%	15.58%	12.82%	9.88%	6.64%	5.58%	5.58%
BWA	5.56%	10.00%	20.00%	20.29%	17.78%	15.30%	12.82%	10.31%	7.48%	6.37%	6.37%
BHR	5.56%	10.00%	20.00%	21.71%	17.34%	12.76%	8.17%	3.55%	0.00%	0.00%	0.00%
JOR	5.56%	9.39%	2.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
OMN	5.56%	8.16%	1.93%	0.00%	0.70%	1.65%	2.60%	3.39%	3.74%	3.52%	3.52%
BGD	5.56%	5.96%	0.32%	0.00%	0.00%	0.00%	0.00%	0.00%	0.18%	0.19%	0.19%
LKA	5.56%	8.02%	3.55%	1.81%	1.26%	0.65%	0.02%	0.00%	0.00%	0.00%	0.00%
VNM	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mean returns	5.69%	5.25%	5.38%	5.45%	5.64%	5.83%	6.02%	6.24%	6.33%	6.25%	6.25%
Excess return	3.73%	3.29%	3.42%	3.49%	3.68%	3.87%	4.06%	4.28%	4.37%	4.29%	4.29%
Standard deviation	12.31%	8.77%	6.30%	5.45%	4.79%	4.19%	3.68%	3.29%	3.07%	3.06%	3.06%
Sharpe ratio	0.30	0.38	0.54	0.64	0.77	0.92	1.11	1.30	1.42	1.40	1.40

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

Table 5.21: Portfolio Optimisation with Different Objectives on Frontier Markets with Unconditional Correlations: 2006-2009

	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	5.56%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%	95.93%
BGR	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HRV	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EST	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
LTU	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ROM	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SVN	5.56%	6.52%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.25%
KEN	5.56%	10.00%	2.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MUS	5.56%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NGA	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TUN	5.56%	10.00%	20.00%	30.00%	29.33%	24.27%	19.21%	14.16%	9.10%	3.91%	0.46%
BWA	5.56%	10.00%	19.83%	12.66%	9.81%	8.06%	6.32%	4.58%	2.83%	1.25%	0.39%
BHR	5.56%	10.00%	20.00%	20.34%	16.71%	13.94%	11.18%	8.41%	5.64%	2.48%	0.00%
JOR	5.56%	4.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
OMN	5.56%	9.45%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.39%	1.30%
BGD	5.56%	10.00%	8.38%	3.40%	2.19%	1.77%	1.35%	0.94%	0.52%	0.12%	0.00%
LKA	5.56%	10.00%	9.23%	3.59%	1.97%	1.95%	1.94%	1.92%	1.90%	1.85%	1.51%
VNM	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%
Mean returns	1.77%	8.22%	7.70%	5.78%	4.16%	2.22%	0.31%	-1.56%	-3.41%	-5.16%	-6.12%
Excess return	-0.19%	6.26%	5.74%	3.82%	2.20%	0.26%	-1.65%	-3.52%	-5.37%	-7.12%	-8.08%
Standard deviation	20.31%	13.50%	9.00%	7.50%	6.44%	5.44%	4.48%	3.59%	2.85%	2.39%	2.30%
Sharpe ratio	-0.01	0.46	0.64	0.51	0.34	0.05	-0.37	-0.98	-1.89	-2.98	-3.51

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

Table 5.22: Portfolio Optimisation with Different Restrictions on Frontier Markets with Unconditional Correlations: 2009-2017

	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	5.56%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	79.04%	79.03%	79.03%
BGR	5.56%	2.98%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.14%	0.14%	0.14%
HRV	5.56%	5.88%	1.80%	2.46%	2.46%	2.43%	2.20%	1.86%	1.18%	1.18%	1.18%
EST	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
LTU	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%	0.09%	0.09%
ROM	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.40%	0.97%	1.52%	1.52%	1.52%
SVN	5.56%	8.40%	2.60%	2.26%	2.06%	1.82%	1.47%	1.00%	0.22%	0.22%	0.22%
KEN	5.56%	8.02%	1.63%	1.54%	1.67%	1.64%	1.38%	1.10%	0.76%	0.76%	0.76%
MUS	5.56%	10.00%	13.35%	9.98%	8.36%	6.72%	5.11%	3.38%	1.27%	1.28%	1.28%
NGA	5.56%	3.04%	1.79%	0.90%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TUN	5.56%	10.00%	12.29%	9.78%	8.34%	7.05%	5.94%	4.82%	3.56%	3.56%	3.56%
BWA	5.56%	10.00%	20.00%	24.69%	21.82%	18.89%	15.86%	12.72%	9.46%	9.47%	9.47%
BHR	5.56%	10.00%	12.77%	9.83%	7.35%	4.78%	2.10%	0.00%	0.00%	0.00%	0.00%
JOR	5.56%	10.00%	11.86%	7.70%	6.22%	4.61%	2.98%	1.18%	0.00%	0.00%	0.00%
OMN	5.56%	10.00%	1.91%	0.86%	1.44%	2.06%	2.57%	2.90%	2.76%	2.76%	2.76%
BGD	5.56%	1.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
LKA	5.56%	0.52%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
VNM	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mean returns	7.18%	3.32%	4.54%	5.63%	6.42%	7.23%	8.12%	9.02%	9.73%	9.73%	9.73%
Excess return	5.22%	1.36%	2.58%	3.67%	4.46%	5.27%	6.16%	7.06%	7.77%	7.77%	7.77%
Standard deviation	7.57%	5.30%	4.05%	3.58%	3.21%	2.89%	2.63%	2.45%	2.39%	2.39%	2.39%
Sharpe ratio	0.69	0.26	0.64	1.02	1.39	1.83	2.34	2.88	3.25	3.25	3.25

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

Table 5.23: Portfolio Optimisation with Different Restrictions on Frontier Markets with Unconditional Correlations: Regional (2006-2017)

EMEA	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	6.67%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	82.94%	82.94%
BGR	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HRV	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EST	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
LTU	6.67%	5.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ROM	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SVN	6.67%	10.00%	2.00%	0.00%	0.00%	0.00%	0.02%	0.21%	0.20%	0.02%	0.02%
KEN	6.67%	10.00%	5.50%	3.21%	2.48%	1.75%	1.01%	0.27%	0.00%	0.00%	0.00%
MUS	6.67%	10.00%	7.00%	2.90%	2.77%	2.66%	2.57%	2.38%	1.79%	1.36%	1.36%
NGA	6.67%	4.91%	0.01%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TUN	6.67%	10.00%	20.00%	21.72%	18.73%	15.76%	12.81%	9.87%	6.74%	5.71%	5.71%
BWA	6.67%	10.00%	20.00%	20.27%	17.81%	15.33%	12.84%	10.31%	7.48%	6.41%	6.41%
BHR	6.67%	10.00%	20.00%	21.82%	17.28%	12.74%	8.15%	3.55%	0.00%	0.00%	0.00%
JOR	6.67%	10.00%	2.78%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
OMN	6.67%	10.00%	2.71%	0.06%	0.92%	1.76%	2.60%	3.40%	3.80%	3.57%	3.57%
Mean returns	4.02%	3.64%	5.01%	5.38%	5.59%	5.81%	6.03%	6.23%	6.31%	6.23%	6.23%
Excess return	2.06%	1.68%	3.05%	3.42%	3.63%	3.85%	4.07%	4.27%	4.35%	4.27%	4.27%
Standard deviation	12.33%	9.20%	6.33%	5.46%	4.80%	4.20%	3.68%	3.29%	3.08%	3.06%	3.06%
Sharpe ratio	0.17	0.18	0.48	0.63	0.76	0.92	1.11	1.30	1.41	1.40	1.40

Asia-Pacific	equally weighted	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	25.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	90.00%	95.66%
BGD	25.00%	29.49%	23.71%	19.90%	16.09%	12.27%	8.46%	4.65%	2.49%
LKA	25.00%	30.00%	28.74%	23.68%	18.62%	13.56%	8.50%	3.43%	0.57%
VNM	25.00%	10.51%	7.55%	6.42%	5.29%	4.17%	3.04%	1.92%	1.28%
Mean returns	12.20%	12.82%	11.74%	10.75%	9.76%	8.78%	7.80%	6.84%	6.30%
Excess return	10.24%	10.86%	9.78%	8.79%	7.80%	6.82%	5.84%	4.88%	4.34%
Standard deviation	13.47%	11.73%	10.07%	8.49%	6.96%	5.53%	4.31%	3.52%	3.39%
Sharpe ratio	0.76	0.93	0.97	1.04	1.12	1.23	1.36	1.39	1.28

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

5.7 Portfolio Optimisation: Using ADCC GARCH Correlation

In this section, correlations estimated using ADCC GARCH, in Sections 5.5.1 to 5.5.3, are used to create optimal portfolios for Australia's superannuation investors in order to examine whether international portfolio diversification is beneficial to them. As discussed in Section 5.6, 11 optimal portfolios with different investment restrictions are constructed. These are: an equally weighted portfolio, an unrestricted portfolio, and 9 portfolios with different restrictions placed on investment in superannuation funds and developed, emerging and frontier markets. The results of these constructed portfolios are then compared to the Australian superannuation portfolio using mean returns, standard deviation and Sharpe ratio. The results of this analysis are presented and discussed in the following sub-sections.

5.7.1 Australia's Superannuation Funds and Developed Markets

Table 5.24 presents the results of portfolio optimisation in developed markets using conditional correlations for the full study period from 2006 to 2017. The results of portfolio optimisation using conditional correlations are slightly different from when unconditional correlations are used. Table 5.24 shows that, except for the between 0 – 20% portfolio, none of the portfolios provide higher returns from diversification. The between 0 – 20% portfolio yields 5.96% annually; however, its portfolio risk is also higher (5.48%). The Sharpe ratio of this portfolio is 0.73 which is not as desirable as the superannuation portfolio's 1.12. None of the constructed portfolios offer the benefit of risk-reduction either. The annualised standard deviation of all portfolios is higher than the superannuation portfolio. This result suggests that portfolio diversification in developed markets is not beneficial for Australian superannuation investors. In contrast, when unconditional correlations are used to construct optimal portfolios, see Table 5.12, the between 0 – 90% and unrestricted portfolios are able to offer a slight risk-reduction benefit, although none of the portfolios yield higher returns than the superannuation portfolio. This result suggests that, for a risk-averse investor, there is some scope for risk-reduction from diversification in developed markets.

Regional portfolio optimisation results are present in Table 5.25. In the Americas regions, none of the portfolios offer higher returns than the superannuation portfolio, nor do they reduce portfolio risk. In the EMEA region, however, three portfolios provide higher returns than the superannuation portfolio. Portfolios between 0 – 80%, between 0 – 90% and the unrestricted portfolio yield 5.93% per annum at a standard deviation of 3.71%. These portfolios require allocation in Israel and Sweden to achieve the said returns. In the Asia-Pacific region, portfolios between 0 – 40% (6.10%), 0 – 50% (6.02%) and 0 – 60% (5.93%) provide higher returns than the superannuation portfolio but also at a higher risk. These are suitable for a risk-taker. For a risk-averse investor, none of the constructed portfolios provide risk-reduction benefits. In this view, portfolio diversification in developed markets has marginal benefits to the Australian superannuation investor.

Table 5.24: Portfolio Optimisation with Different Restrictions on Developed Markets with Conditional Correlations: 2006-2017

	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	4.35%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	73.00%	73.00%	73.00%
CAN	4.35%	10.00%	20.00%	30.00%	37.77%	31.15%	24.51%	17.88%	15.89%	15.89%	15.89%
USA	4.35%	10.00%	20.00%	8.74%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
AUT	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
BEL	4.35%	1.34%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DNK	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FIN	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FRA	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DEU	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IRL	4.35%	2.36%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ISR	4.35%	10.00%	5.41%	1.87%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ITA	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NLD	4.35%	3.61%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NOR	4.35%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
PRT	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ESP	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SWE	4.35%	10.00%	14.78%	12.16%	9.00%	7.10%	5.20%	3.30%	2.71%	2.71%	2.71%
CHE	4.35%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
GBR	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HKG	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
JPN	4.35%	2.69%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NZL	4.35%	10.00%	18.04%	15.07%	11.39%	8.23%	5.08%	1.93%	0.99%	0.99%	0.99%
SGP	4.35%	10.00%	1.77%	2.16%	1.84%	3.52%	5.21%	6.89%	7.41%	7.41%	7.41%
Mean returns	4.06%	5.41%	5.96%	5.47%	5.07%	5.16%	5.25%	5.35%	5.37%	5.37%	5.37%
Excess return	2.10%	3.45%	4.00%	3.51%	3.11%	3.20%	3.29%	3.39%	3.41%	3.41%	3.41%
Standard deviation	9.89%	6.80%	5.48%	4.76%	4.24%	3.87%	3.61%	3.49%	3.49%	3.49%	3.49%
Sharpe ratio	0.21	0.51	0.73	0.74	0.73	0.83	0.91	0.97	0.98	0.98	0.98

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

Table 5.25: Portfolio Optimisation with Different Restrictions on Developed Markets with Conditional Correlations: Regional (2006-2017)

Americas	equally weighted	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	33.33%	40.00%	50.00%	60.00%	70.00%	74.44%	74.44%	74.44%
CAN	33.33%	40.00%	37.61%	31.77%	25.92%	23.33%	23.33%	23.33%
USA	33.33%	20.00%	12.39%	8.23%	4.08%	2.23%	2.23%	2.23%
Mean returns	5.40%	5.05%	5.02%	5.12%	5.22%	5.26%	5.26%	5.26%
Excess return	3.44%	3.09%	3.06%	3.16%	3.26%	3.30%	3.30%	3.30%
Standard deviation	4.81%	4.42%	4.02%	3.73%	3.59%	3.57%	3.57%	3.57%
Sharpe ratio	0.72	0.70	0.76	0.85	0.91	0.93	0.93	0.93

EMEA	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	5.88%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	80.54%	80.54%
AUT	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
BEL	5.88%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DNK	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FIN	5.88%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FRA	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DEU	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IRL	5.88%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ISR	5.88%	10.00%	20.00%	23.68%	18.54%	15.57%	12.60%	9.64%	6.55%	6.33%	6.33%
ITA	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NLD	5.88%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NOR	5.88%	10.00%	20.00%	0.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
PRT	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ESP	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SWE	5.88%	10.00%	20.00%	30.00%	31.29%	26.87%	22.46%	18.04%	13.45%	13.12%	13.12%
CHE	5.88%	10.00%	20.00%	15.82%	10.18%	7.56%	4.94%	2.32%	0.00%	0.00%	0.00%
GBR	5.88%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mean returns	3.64%	4.46%	5.86%	5.51%	5.69%	5.75%	5.82%	5.88%	5.93%	5.93%	5.93%
Excess return	1.68%	2.50%	3.90%	3.55%	3.73%	3.79%	3.86%	3.92%	3.97%	3.97%	3.97%
Standard deviation	10.89%	8.33%	6.64%	5.75%	5.11%	4.56%	4.11%	3.82%	3.71%	3.71%	3.71%
Sharpe ratio	0.15	0.30	0.59	0.62	0.73	0.83	0.94	1.03	1.07	1.07	1.07

Asia-Pacific	equally weighted	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	20.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	80.96%	80.96%
HKG	20.00%	20.00%	0.89%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
JPN	20.00%	20.00%	9.11%	0.18%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NZL	20.00%	20.00%	30.00%	31.97%	25.12%	18.19%	11.26%	4.34%	3.67%	3.67%
SGP	20.00%	20.00%	30.00%	27.85%	24.88%	21.81%	18.74%	15.66%	15.37%	15.37%
Mean returns	5.42%	5.42%	5.69%	6.10%	6.02%	5.93%	5.84%	5.75%	5.74%	5.74%
Excess return	3.46%	3.46%	3.73%	4.14%	4.06%	3.97%	3.88%	3.79%	3.78%	3.78%
Standard deviation	7.58%	7.58%	5.95%	5.18%	4.58%	4.09%	3.76%	3.62%	3.62%	3.62%
Sharpe ratio	0.46	0.46	0.63	0.80	0.89	0.97	1.03	1.05	1.04	1.04

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

5.7.2 Australia's Superannuation Funds and Emerging Markets

Table 5.26 presents the results of portfolio optimisation from diversification in emerging markets for the full study period from 2006 to 2017. Results obtained from using conditional correlations to create optimal portfolios are similar to those obtained from unconditional correlations. Table 5.26 shows that all constructed portfolios have the potential to yield higher returns than the superannuation portfolio. The highest possible return is from the equally weighted portfolio, 7.91%; however, it comes with a higher risk, 9.23%. Portfolios constructed with restrictions on diversification between 0 – 60%, 0 – 70%, 0 – 80%, 0 – 90% and the unrestricted portfolio are able to provide risk-reduction benefits while yielding higher returns. Approximately 30% diversification in emerging markets creates optimal portfolios. The between 0 – 70%, between 0 – 80%, between 0 – 90% and unrestricted portfolios have the same asset allocation structure. This requires allocation of 0.97% in Mexico, 4.83% in Peru, 9.47% in Malaysia, 9.54% in Taiwan and 6.27% in Thailand. The Sharpe ratio of these portfolios is 1.39, which is higher than the remaining portfolios and the superannuation portfolio. These portfolios yield 6.55% annually at a standard deviation of 3.30%.

The regional portfolio optimisation results are presented in Table 5.27. In the Americas region, all constructed portfolios have the potential to provide returns superior to the superannuation portfolio; however, the risk levels of these portfolios is also higher. The highest possible return (8.81%) from this region can be obtained through the between 0 – 30% portfolio, which requires allocation of 12.19% in Chile, 7.98% in Colombia, 30% in Mexico, and 19.83% in Peru. Since the risk level of this portfolio (6.44%) is higher than the superannuation portfolio, its Sharpe ratio (1.06) is not as attractive to a risk-averse investor. However, a risk-taker can benefit from these constructed portfolios by diversifying in emerging markets of the Americas. In the EMEA region, none of the portfolios provide a risk-reduction benefit, although achieving higher returns than the superannuation portfolio is possible. Portfolios between 0 – 40%, between 0 – 50%, between 0 – 60%, between 0 – 70%, between 0 – 80%, between 0 – 90%, and unrestricted provide higher returns, see Table 5.27, although only the Sharpe ratio of the between 0 – 80% (1.17), between 0 – 90% (1.16) and unrestricted (1.16) portfolios are higher than the superannuation portfolio (1.12). In the Asia-Pacific region, all constructed portfolios provide better returns than the superannuation portfolio, which is beneficial to a risk-taker. In addition to superior returns, the between 0 – 60%, between 0 – 70%, between 0 – 80%, between 0 – 90% and unrestricted portfolios also provide lower risk than the superannuation portfolio, which makes them optimal portfolios. The Sharpe ratio of these portfolios is 1.29. Sharpe ratio of the remaining portfolios, except between $0-30\%$ is also higher than the superannuation portfolio but these come with higher risk.

Table 5.26: Portfolio Optimisation with Different Restrictions on Emerging Markets with Conditional Correlations: 2006-2017

	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	4.55%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	68.92%	68.92%	68.92%	68.92%
BRA	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHL	4.55%	2.46%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
COL	4.55%	4.21%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MEX	4.55%	10.00%	7.78%	2.78%	2.30%	1.84%	1.36%	0.97%	0.96%	0.96%	0.96%
PER	4.55%	8.47%	1.29%	0.41%	1.54%	2.68%	3.85%	4.83%	4.84%	4.84%	4.84%
CZE	4.55%	1.61%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EGY	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
GRC	4.55%	0.84%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HUN	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
POL	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RUS	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ZAF	4.55%	10.00%	2.38%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TUR	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ARE	4.55%	10.00%	8.55%	5.09%	3.74%	2.39%	1.06%	0.00%	0.00%	0.00%	0.00%
CHN	4.55%	2.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IND	4.55%	3.32%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IDN	4.55%	6.96%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MYS	4.55%	10.00%	20.00%	22.09%	18.84%	15.60%	12.46%	9.47%	9.47%	9.47%	9.47%
PHL	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TWN	4.55%	10.00%	20.00%	26.01%	21.80%	17.59%	13.28%	9.54%	9.54%	9.54%	9.54%
THA	4.55%	10.00%	20.00%	13.64%	11.77%	9.90%	8.00%	6.27%	6.28%	6.28%	6.28%
Mean returns	7.91%	8.47%	7.15%	6.60%	6.59%	6.58%	6.57%	6.55%	6.55%	6.55%	6.55%
Excess return	5.95%	6.51%	5.19%	4.64%	4.63%	4.62%	4.61%	4.59%	4.59%	4.59%	4.59%
Standard deviation	9.23%	6.28%	4.84%	4.29%	3.88%	3.56%	3.36%	3.30%	3.30%	3.30%	3.30%
Sharpe ratio	0.64	1.04	1.07	1.08	1.19	1.30	1.37	1.39	1.39	1.39	1.39

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

Table 5.27: Portfolio Optimisation with Different Restrictions on Emerging Markets with Conditional Correlations: Regional (2006-2017)

Americas	equally weighted	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	16.67%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	81.60%	81.60%
BRA	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHL	16.67%	20.00%	12.19%	6.83%	5.25%	3.67%	2.09%	0.51%	0.25%	0.25%
COL	16.67%	20.00%	7.98%	4.92%	3.74%	2.55%	1.37%	0.18%	0.00%	0.00%
MEX	16.67%	20.00%	30.00%	32.84%	26.98%	21.12%	15.26%	9.40%	8.46%	8.46%
PER	16.67%	20.00%	19.83%	15.41%	14.03%	12.66%	11.29%	9.91%	9.69%	9.69%
Mean returns	8.17%	8.28%	8.81%	8.56%	8.16%	7.77%	7.38%	6.99%	6.93%	6.93%
Excess return	6.21%	6.32%	6.85%	6.60%	6.20%	5.81%	5.42%	5.03%	4.97%	4.97%
Standard deviation	8.99%	7.68%	6.44%	5.56%	4.81%	4.18%	3.73%	3.53%	3.53%	3.53%
Sharpe ratio	0.69	0.82	1.06	1.19	1.29	1.39	1.45	1.42	1.41	1.41

EMEA	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	10.00%	10.00%	20.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	85.39%	85.39%
CZE	10.00%	10.00%	20.00%	13.11%	9.34%	7.03%	4.72%	2.42%	0.03%	0.00%	0.00%
EGY	10.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.11%	0.11%
GRC	10.00%	10.00%	4.67%	1.83%	1.29%	0.89%	0.49%	0.10%	0.00%	0.00%	0.00%
HUN	10.00%	10.00%	4.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.16%	0.00%	0.00%
POL	10.00%	10.00%	5.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RUS	10.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ZAF	10.00%	10.00%	20.00%	30.00%	28.92%	25.02%	21.13%	17.24%	13.01%	10.12%	10.12%
TUR	10.00%	10.00%	5.88%	1.52%	1.49%	1.66%	1.83%	2.01%	2.19%	2.07%	2.07%
ARE	10.00%	10.00%	20.00%	23.54%	18.97%	15.39%	11.82%	8.25%	4.54%	2.31%	2.31%
Mean returns	5.08%	5.08%	4.71%	5.51%	5.88%	6.03%	6.17%	6.31%	6.42%	6.34%	6.34%
Excess return	3.12%	3.12%	2.75%	3.55%	3.92%	4.07%	4.21%	4.35%	4.46%	4.38%	4.38%
Standard deviation	11.28%	11.28%	7.81%	6.53%	5.78%	5.10%	4.51%	4.07%	3.82%	3.78%	3.78%
Sharpe ratio	0.28	0.28	0.35	0.54	0.68	0.80	0.93	1.07	1.17	1.16	1.16

Asia-Pacific	equally weighted	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	12.50%	20.00%	30.00%	40.00%	50.00%	60.00%	67.92%	67.93%	67.93%	67.93%
CHN	12.50%	4.80%	0.00%	0.00%	0.00%	0.00%	0.37%	0.37%	0.37%	0.37%
IND	12.50%	5.75%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IDN	12.50%	9.46%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MYS	12.50%	20.00%	24.88%	21.08%	17.28%	13.49%	10.31%	10.35%	10.35%	10.35%
PHL	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TWN	12.50%	20.00%	28.37%	24.38%	20.38%	16.39%	12.97%	12.95%	12.95%	12.95%
THA	12.50%	20.00%	16.75%	14.54%	12.33%	10.12%	8.42%	8.40%	8.40%	8.40%
Mean returns	10.81%	8.64%	6.68%	6.57%	6.45%	6.34%	6.29%	6.28%	6.28%	6.28%
Excess return	8.85%	6.68%	4.72%	4.61%	4.49%	4.38%	4.33%	4.32%	4.32%	4.32%
Standard deviation	7.16%	5.40%	4.34%	3.91%	3.59%	3.39%	3.34%	3.34%	3.34%	3.34%
Sharpe ratio	1.24	1.24	1.09	1.18	1.25	1.29	1.29	1.29	1.29	1.29

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

5.7.3 Australia's Superannuation Funds and Frontier Markets

Table 5.28 presents the results of portfolio optimisation from diversification in frontier markets for the full study period from 2006 to 2017. All constructed portfolios provide higher returns than the superannuation portfolio. The highest possible return from diversification in frontier markets is offered by the between 0 – 50% portfolio: return of 6.89% at a standard deviation of 2.82%. This is an optimal portfolio for Australian superannuation investors as the risk-return combination yields the highest Sharpe ratio of 1.75. This portfolio requires allocation of 19.43% in Estonia, 5.52% in Lithuania, 5.40% in Tunisia, 14.21% in Botswana, 0.86% in Bahrain, 2.26% in Jordan, 2.17% in Oman, and 0.63% in Vietnam. Portfolios with restrictions between 0 – 60%, between 0 – 70%, between 0 – 80%, between 0 – 90%, and unrestricted have the same asset allocation structure as mentioned above. The between 0 – 20%, between 0 – 30%, and between 0 – 40% also provide higher return and lower risk than the superannuation portfolio but their Sharpe ratio is lower than the between 0 – 50% portfolio. The equally weighted and between 0 – 10% portfolios also provide higher returns, however, at a higher risk than the superannuation portfolio, hence they are not considered optimal for international portfolio diversification, although they may be suitable for a risk-taker.

The results of regional portfolio optimisation are presented in Table 5.29. In the EMEA region, except equally weighted and between 0 – 10%, all constructed portfolios are optimal portfolios as they yield higher returns at a lower risk than the superannuation portfolio. This result suggests that portfolio diversification in frontier markets is beneficial to Australian superannuation investors. The Sharpe ratio is the highest for between 0 – 60%, between 0 – 70%, between 0 – 80%, between 0 – 90%, and unrestricted portfolios, which essentially have the same asset allocation structure. These portfolios require allocation of 19.59% in Estonia, 5.66% in Lithuania, 5.49% in Tunisia, 14.24% in Botswana, 0.95% in Bahrain, 2.32% in Jordan, and 2.23% in Oman. Diversification in the Asia-Pacific region, on the contrary, can yield higher returns but the risk levels are also higher than the superannuation portfolio. A risk-taker can benefit from diversification in this region. The highest possible return, 12.20%, can be earned through the equally weighted portfolio but also at a higher risk, 8.29%. This result requires allocation of 25% in each of the Asia-Pacific frontier markets, that is, Bangladesh, Sri Lanka, and Vietnam.

Table 5.28: Portfolio Optimisation with Different Restrictions on Frontier Markets with Conditional Correlations: 2006-2017

	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	5.56%	10.00%	20.00%	30.00%	40.00%	49.53%	49.46%	49.46%	49.46%	49.46%	49.46%
BGR	5.56%	1.23%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HRV	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EST	5.56%	10.00%	20.00%	22.16%	20.68%	19.43%	19.42%	19.42%	19.42%	19.42%	19.42%
LTU	5.56%	10.00%	16.64%	9.96%	7.85%	5.52%	5.57%	5.58%	5.58%	5.58%	5.58%
ROM	5.56%	0.73%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SVN	5.56%	0.79%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
KEN	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MUS	5.56%	10.00%	1.85%	1.10%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NGA	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TUN	5.56%	10.00%	8.37%	7.01%	6.19%	5.40%	5.41%	5.41%	5.41%	5.41%	5.41%
BWA	5.56%	10.00%	20.00%	20.01%	17.07%	14.21%	14.20%	14.20%	14.20%	14.20%	14.20%
BHR	5.56%	10.00%	7.32%	5.26%	3.11%	0.86%	0.92%	0.93%	0.93%	0.93%	0.93%
JOR	5.56%	10.00%	3.56%	3.05%	2.67%	2.26%	2.26%	2.26%	2.26%	2.26%	2.26%
OMN	5.56%	5.23%	0.00%	0.00%	1.14%	2.17%	2.13%	2.13%	2.13%	2.13%	2.13%
BGD	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
LKA	5.56%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
VNM	5.56%	10.00%	2.26%	1.45%	1.06%	0.63%	0.61%	0.61%	0.61%	0.61%	0.61%
Mean returns	5.69%	5.83%	6.79%	6.92%	6.88%	6.89%	6.88%	6.88%	6.88%	6.88%	6.88%
Excess return	3.73%	3.87%	4.83%	4.96%	4.92%	4.93%	4.92%	4.92%	4.92%	4.92%	4.92%
Standard deviation	7.06%	4.36%	3.25%	3.01%	2.87%	2.82%	2.82%	2.82%	2.82%	2.82%	2.82%
Sharpe ratio	0.53	0.89	1.49	1.65	1.71	1.75	1.74	1.74	1.74	1.74	1.74

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

Table 5.29: Portfolio Optimisation with Different Restrictions on Frontier Markets with Conditional Correlations: Regional (2006-2017)

EMEA	equally weighted	between 0-10%	between 0-20%	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	6.6667%	10.00%	20.00%	30.00%	40.00%	49.56%	49.52%	49.52%	49.52%	49.52%	49.52%
BGR	6.6667%	5.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HRV	6.6667%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EST	6.6667%	10.00%	20.00%	22.62%	21.01%	19.54%	19.59%	19.59%	19.59%	19.59%	19.59%
LTU	6.6667%	10.00%	17.61%	10.10%	7.97%	5.76%	5.66%	5.66%	5.66%	5.66%	5.66%
ROM	6.6667%	1.45%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SVN	6.6667%	3.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
KEN	6.6667%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MUS	6.6667%	10.00%	2.11%	1.27%	0.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NGA	6.6667%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TUN	6.6667%	10.00%	8.76%	7.18%	6.32%	5.45%	5.49%	5.49%	5.49%	5.49%	5.49%
BWA	6.6667%	10.00%	20.00%	20.13%	17.16%	14.15%	14.24%	14.24%	14.24%	14.24%	14.24%
BHR	6.6667%	10.00%	7.58%	5.36%	3.19%	0.88%	0.95%	0.95%	0.95%	0.95%	0.95%
JOR	6.6667%	10.00%	3.95%	3.17%	2.78%	2.39%	2.32%	2.32%	2.32%	2.32%	2.32%
OMN	6.6667%	10.00%	0.00%	0.16%	1.26%	2.25%	2.23%	2.23%	2.23%	2.23%	2.23%
Mean returns	4.02%	4.87%	6.71%	6.89%	6.85%	6.86%	6.87%	6.87%	6.87%	6.87%	6.87%
Excess return	2.06%	2.91%	4.75%	4.93%	4.89%	4.90%	4.91%	4.91%	4.91%	4.91%	4.91%
Standard deviation	7.12%	4.71%	3.26%	3.01%	2.87%	2.82%	2.82%	2.82%	2.82%	2.82%	2.82%
Sharpe ratio	0.29	0.62	1.46	1.64	1.70	1.73	1.74	1.74	1.74	1.74	1.74

Asia-Pacific	equally weighted	between 0-30%	between 0-40%	between 0-50%	between 0-60%	between 0-70%	between 0-80%	between 0-90%	unrestricted
AUS	25.00%	30.00%	40.00%	50.00%	60.00%	70.00%	80.00%	81.89%	81.89%
BGD	25.00%	12.82%	7.18%	4.37%	3.65%	2.94%	2.22%	2.09%	2.09%
LKA	25.00%	27.18%	12.82%	5.68%	3.92%	2.15%	0.39%	0.05%	0.05%
VNM	25.00%	30.00%	40.00%	39.95%	32.43%	24.91%	17.39%	15.97%	15.97%
Mean returns	12.20%	10.65%	9.05%	8.10%	7.64%	7.18%	6.72%	6.64%	6.64%
Excess return	10.24%	8.69%	7.09%	6.14%	5.68%	5.22%	4.76%	4.68%	4.68%
Standard deviation	8.29%	6.94%	5.43%	4.71%	4.21%	3.86%	3.71%	3.71%	3.71%
Sharpe ratio	1.24	1.25	1.31	1.30	1.35	1.35	1.28	1.26	1.26

Note: Excess return and Sharpe ratio are calculated using risk-free rate of 1.96% of a 10-year Australian Bond.

5.8 Summary

This chapter reports the results and discusses the findings obtained from examining the benefits of international portfolio diversification for Australian superannuation investors in developed, emerging and frontier markets. The analysis is performed in three steps: first, unconditional and conditional correlations between superannuation funds and developed, emerging and frontier markets are estimated; second, the outcome of unconditional and conditional correlations are used as inputs to construct optimal portfolios using several restrictions discussed in Sections 5.6 and 5.7; third, the performance of these constructed portfolios are measured using annual mean returns, standard deviation and the Sharpe ratio to identify if international portfolio diversification is beneficial to Australian superannuation investors or not.

The analysis reveals that during the full study period (2006 – 2017), correlation between superannuation funds and developed markets is low. The same relationship is found between superannuation funds and emerging markets, and superannuation funds and frontier markets. It is also revealed that conditional correlations have increased over time, however, they are still substantially lower than what the literature has found. Correlations are largely negative between superannuation and emerging markets and both positive and negative between superannuation and frontier markets. The analysis also finds that correlations during the GFC period are negative for most countries. In the post-GFC period, though, correlations have increased and become positive for many countries in the sample.

The analysis further reveals that by diversification in developed markets it is possible to earn higher returns or lower risk specifically from the EMEA and Asia-Pacific regions. Diversification in the Americas is not beneficial. In the case of emerging markets, optimisation results show that up to 30% diversification can yield higher returns at a lower risk than the superannuation portfolio. All three regions, the Americas, EMEA and Asia-Pacific, offer diversification gains. In frontier markets, all constructed portfolios have the potential to provide higher returns or lower risk than the superannuation portfolio. The results thus suggest that international portfolio diversification for Australian superannuation investors is beneficial.

Part II

Study 2: Good Governance

Chapter 6

Review of Literature in Governance: Theory, Practice and Performance

6.1 Overview

The primary objective of this chapter is to present a synthesis of literature relating to the relationship between good governance practices and performance from a country-level perspective. In order to do this, the chapter first establishes the definition of governance that is followed in this study, in Section 6.2. The concept of good governance and its essential elements, which is based on the definition of governance that is used in this study and established by the World Bank, is discussed in detail in Section 6.2.1. The contrasting view of bad governance is also explained in the section following. In Section 6.3, theories relevant to country-level governance are discussed; specifically, the section focuses on new public governance theory, good governance and institutional theory. To give an idea about some country-level governance practices and concerns around the world, Section 6.4 highlights some of the critical issues related to human rights, corruption, political instability and violence in a few selected countries in developed, emerging and frontier markets. Literature on the relationship between governance and performance is discussed in Section 6.5, both from corporate and country-level perspectives, in order to find a stronger link between the two variables. Section 6.6 concludes this chapter.

6.2 What is Governance?

There is no universally accepted definition of governance. According to the World Bank (1992, p. 1), governance is "the manner in which power is exercised in the management of a country's economic and social resources for development". According to the WGI, developed by the World Bank, governance is:

> the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them.[42]

The International Monetary Fund (2019a) defines governance as, "a broad concept covering all aspects of how a country is governed, including its economic policies, regulatory framework, and adherence to rule of law"[43]. The term "governance" is usually applied to a country as a whole and its citizens but its definition can be modified and applied to different areas such as corporates, markets, state, networks, environment etc.

Corporate governance deals with behavioural patterns of businesses and corporations. It is based on performance, efficiency, growth, capital structure and role and treatment of stakeholders. It deals with the role of board of directors, executive management, impact of compensation on firm performance etc. ASX Corporate Governance Council (2003, p. 3) defines corporate governance as:

> the system by which companies are directed and managed. It influences how the objectives of the company are set and achieved, how risk is monitored and assessed, and how performance is optimised.

Governance provides structure through which the objectives of a company are set and the means of attaining those objectives and monitoring performance are determined. This definition is popularly used in single country studies and in examining the impact of corporate governance on several corporate-level variables. Country-level governance, on the other hand, is concerned with the rules under which

[42] `https://info.worldbank.org/governance/wgi`

[43] More information about this policy by International Monetary Fund (IMF) can be found on `https://www.imf.org/en/About/Factsheets/The-IMF-and-Good-Governance`

businesses operate, that is, the country-level rules and regulations that affect the functioning of businesses such as a country's legal and judicial system, financial markets and labour markets. This definition is commonly used in comparative studies (Claessens & Yurtoglu 2013). This study adopts the country-level definitions of governance laid down by the World Bank (1992) and the International Monetary Fund (2019a).

Public sector governance is the "formal and informal arrangements that determine how public decisions are made and how public actions are carried out, from the perspective of maintaining a country's constitutional values when facing changing problems and environments" (**?**, p. 2).

6.2.1 Good Governance

According to Kronouer (2014), governance is a process that prompts an outcome and, therefore, good governance is expected to lead to good outcomes. The Victorian Local Governance Association and Municipal Association of Victoria and Local Government Victoria and Local Government Professionals (2012, p. 6) define good governance as "processes for making and implementing decisions". The report adds that, "it's not about making 'correct' decisions, but about the best possible process for making those decisions". It follows that the key principle is to formulate and establish the best possible processes through which 'correct' decisions may be made, thus leading to a better overall outcome. Good governance is about bringing accountability and transparency in the decisions and actions of the government. It is about ensuring that the citizens and state officials act in accordance with laws and regulations, and that policies are designed in a way that is equitable and inclusive of all. The United Nations Development Programme (2014) states that good governance "promotes freedom from violence, fear and crime, and peaceful and secure societies that provide the stability needed for development investments to be sustained". The report talks about the need for institutions and systems to be responsive to the needs of their citizens, provide basic and essential amenities and services, and promote inclusive growth. From an economic and financial perspective, good governance is important for equitable and efficient allocation of resources, which not only ensures economic and financial development of countries but also brings them more macroeconomic stability. Hall & Jones (1999) found that countries with better institutions and policies, that is, higher quality of governance, achieve higher levels of output, which leads to higher capital accumulation, increased skill sets, inventions and technological developments. Higher quality of governance is also found to improve income levels (de Brouwer 2003). It also increases the confidence level of decision makers about the economic and financial environment of the country they are operating in, which in turn allows them to make well-informed decisions and employ better strategies to mitigate shocks.

From the above discussion, it can be said that the deeper a country is into improving its governance quality or standards, the more stable and prosperous it is expected to become. So the question is: how can countries improve their quality of governance? According to the International Monetary Fund (1997), the responsibility of achieving good governance lies in the hands of a country's government. Different countries adopt different practices in regard to governance and therefore their quality varies. Organisations like the World Bank (1992) and United Nations Development Programme (2014) have laid down some suggested guidelines and features that are essential for achieving good governance. For example, according to the World Bank (1992), accountability, rule of law, information and transparency are some of the key features of good governance. The United Nations Development Programme (2014) identifies accountability, openness and transparency, addressing corruption and curbing illicit financial flows, justice and rule of law, and curbing violence as some of the salient features of good governance.

Essential Characteristics of Good Governance

This section discusses some of the essential characteristics that are associated with improving governance based on the definitions discussed in Section 6.2.1 and strongly promoted by the World Bank.

- **Accountability**: Similar to the features of good governance listed in Victorian Local Governance Association and Municipal Association of Victoria and Local Government Victoria and Local Government Professionals (2012) and United Nations Development Programme (2014) identifies accountability, running both vertically, from the government to its people and horizontally, between states, as one of the essentials for successful employment of good governance. The World Bank (1992) also identifies accountability as one of the key variables that is useful in employing good governance. Lonsdale cited in World Bank (1992, p. 13) explains that accountability: "is found where rulers readily delegate authority, where subordinates confidently exercise their discretion, where the abuse of power is given its proper name, and is properly punished under a rule of law which stands above political faction". Accountability is when state officials are held answerable to their decisions and actions. However, the way it is conducted can differ among countries and that is because accountability can be influenced by a country's culture, history, political motives, administrative policies and capacities and public access to information.

Accountability take can many forms (World Bank 1992). One form of accountability is called macro-level accountability. It is composed of financial accountability and accountability for economic performance. Within that, financial accountability is concerned with management of cash and expenses, setting up an external audit system in order to control expenses, reducing misspending and corruption, and setting up a review and follow-up system to ensure that external audit results are adhered to. Financial accountability is, therefore, important to ensure that government systems are efficient and the misuse of resources is less. World Bank (1992) has developed a three-pronged strategy to combat the possibility of misuse of resources and to ensure financial accountability. The strategy focusses on improving the performance of borrowers, on their borrowing capacity and on conducting systematic reviews of auditing and accounting capacities and needs. This strategy has brought some improvements in the areas of budgeting, accounting, and information systems to name a few, particularly in South Asia, East Asia and the Pacific, Africa, Europe and Central Asia. Under accountability for economic performance, several measures such as review of public expenditure, mandating annual activity reports so that governments can monitor and evaluate their own performance, linking efficiency to performance, and use of contracts, programs and memorandums of understanding have been adopted. The results of these strategies are mixed.

Another form of accountability is called micro-level accountability. It is concerned with efficient and timely production and delivery of goods and services in the public sector. Over time, micro-level accountability has gained more importance than macro-level accountability because it has become increasingly difficult for the state to look after all activities of the government. In the Middle East and North Africa, the World Bank (1992) has successfully implemented this form of accountability using the "voice" mechanism. The mechanism involves encouraging the public to participate and voice their preferences or demands for quality or amount of service provided by service providers. This exerts pressure on the service providers to improve their offerings and therefore when participation increases, the level of accountability also increases. However, the success rate of this strategy varies among countries. In some countries, only the elite groups are able to gain from micro-level accountability; however, basic services such as water, roads, and public transport are useful even to the poor as these services are "non-excludable".

- **Rule of Law**: Another feature of good governance, according to the World Bank (1992), is the legal framework for development, which is based on the rule of law concept. There are five elements of rule of law, namely, rules known in advance, rules in force, mechanisms to ensure the application of the rules, conflict resolution, and procedures for amending rules that are no longer useful. In the World Bank's (1992) opinion, the elements of rule of law are important for the purpose of establishing a stable framework for businesses, farmers and workers to examine opportunities and risks, make investment decisions and business transactions and have a recourse against unlawful circumstances. The United Nations Development Programme (2014) identifies rule of law as one of the important features of good governance. They have found that rule of law is associated with higher levels of economic growth, increased investment levels, promotes equity and gender equality, prevents crime, resolves complaints and issues and protects citizens.

- **Information and Transparency**: Information and transparency are also important for achieving good governance and improving accountability. Transparency allows information to be available to the public and as a result allows opinions and concerns to be voiced. This in turn improves the accuracy of the information being disbursed. More information allows citizens to call for more accountability from the government. It is also useful in fighting against corruption. Transparency International (2018b) has been working on promoting the right to information as a human right and as an anti-corruption tool in the Asia Pacific region for many years. The UN also recognises the right to information under Article 19 of the Universal Declaration of Human Rights (UDHR) and Article 19 of the International Covenant on Civil and Political Rights (ICCPR). Transparency is also essential for successful implementation of public programs and projects as it sends a strong signal to investors and citizens and thus increases the level of confidence in the program or project. The effect of increased transparency thus leads to increase in economic growth (United Nations Development Programme 2014). Transparency also helps in reducing the level of public corruption because more transparency creates more chances of exposure, if corruption was to take place.

World Bank (1992) efforts to promote transparency are directed towards increasing transparency in budgets and public expenditure programs, preparing for environmental assessments, and assisting in improving procurement mechanisms to ensure competition, transparency and fair contract conditions. The Bank also collects and publishes economic and social data through its website in order to increase availability and accessibility of information.

6.2.2 Bad Governance

Bad or poor governance is the opposite of good governance. It creates opportunities for corruption, abuse of human rights, lack of responsiveness and accountability and lack of information and transparency. It creates distrust in the country's government and state officials, threatens market principles, deteriorates competition and puts economic development and welfare in danger (International Monetary Fund 1997). The cost of bad governance to a country and its citizens is plenty. According to the Global Corruption Barometer (GCB) of Africa, called the Afrobarometer, on average more than 50% of the nation's population are of the opinion that corruption levels in the country have deteriorated over time and that the efforts of the government to tackle this are poor (Transparency International 2019b). It is worse for some countries, like Gabon, Madagascar and Sudan, where more than 80% of the population are struggling with corruption and its consequences. The research found that the highest level of corruption was in the police force, followed by government officials, members of the parliament, business executives, and judges and magistrates. One in four people have to pay a bribe to get access to health care and education facilities, which according to World Bank (1992) are some of the basic services that should be provided by a country's government. Paying for basic services and amenities means that the vulnerable and poor are likely to be the most affected. In spite of these challenges, around 53% of the citizens believe that they can help stop corruption (Transparency International 2019b). One example to demonstrate this is Gambia. The autocratic government of President Jammeh was overthrown as the citizens called for greater integrity, which forced the leaders to respond and establish a framework against corruption. With the election of the new President, Adama Barrow in 2016, the country has started seeing signs of decline in oppression and violation of basic rights. During their research, Transparency International (2019b) noted that corruption is not a result only of immoral actions of the elite in the country but also non-citizens, especially foreign businesses. Foreign businesses bribe public officials to get access to resources and gain unfair advantage during a bidding process. Resources that should be utilised for providing basic facilities such as water, electricity, better roads, transport, health care and education and to improve the living standards of the citizens flow out instead. The case is similar for many countries. According to Transparency International (2018a), out of 180 countries surveyed, more than two-thirds have scored below 50 in the 2018 Corruption Perceptions Index. The survey has found that corruption is linked to weak democratic foundations of a country. Countries with autocratic governments are very low on the scale of 0 (highly corrupt) to 100 (very clean) of the index while those with a full democracy score higher, indicating that democratic governments have more control over the level of corruption in the country and thus are able to practice better governance practices.

Abuse of human rights is another issue that is an outcome of bad governance. Human rights advocate for the right to life and liberty, freedom from slavery and torture, freedom of opinion and expression, and the right to work and education, among many other rights. Human rights do not discriminate against people on the basis of race, religion, sex, nationality, ethnicity, language or any other status. The UDHR, which laid the foundation of international human rights law, is a document on human rights drafted by representatives of different countries with different legal and cultural backgrounds, announced by the UN General Assembly in 1948. It lays down the obligations of government, the ways in which it can act and cannot, in order to encourage and safeguard human rights and fundamental freedom of individuals or groups[44]. Violation of human rights occurs when a country's government fails in fulfilling its obligations laid down in international human rights law. Some examples of human rights abuse are failure to provide a minimum wage rate at work, denying access to health and education, denying services and facilities to people with disabilities, restricting the participation of minority or indigenous groups etc. For example, in Australia, research conducted by Human Rights Watch (2019) [45]

[44]Specifically, the international human rights law, "lays down obligations which States are bound to respect. By becoming parties to international treaties, States assume obligations and duties under international law to respect, to protect and to fulfil human rights. The obligation to respect means that States must refrain from interfering with or curtailing the enjoyment of human rights. The obligation to protect requires States to protect individuals and groups against human rights abuses. The obligation to fulfil means that States must take positive action to facilitate the enjoyment of basic human rights. Through ratification of international human rights treaties, Governments undertake to put into place domestic measures and legislation compatible with their treaty obligations and duties. The domestic legal system, therefore, provides the principal legal protection of human rights guaranteed under international law. Where domestic legal proceedings fail to address human rights abuses, mechanisms and procedures for individual and group complaints are available at the regional and international levels to help ensure that international human rights standards are indeed respected, implemented, and enforced at the local level." https://www.un.org/en/sections/universal-declaration/foundation-international-human-rights-law/index.html

[45]Human Rights Watch is an organisation that was founded in 1978 as the "Helsinki Watch". It started by investigating the abuse of those that had signed the Helsinki Accords but today it investigates all forms of human rights abuses all around the

found that prisoners with disabilities in Western Australia and Queensland prisons are regular victims of bullying, harassment, racism and many other forms of abuse from other prisoners and staff. The main reason behind this problem is the lack of training and understanding about the problems and associated behaviour of disabled people. The consequence of this lack is that the disabled prisoners experience punishment for their disability related behaviour. For example, prisoners with cognitive disability are at times made to stay in solitary confinement for 22 hours or more in a day which can continue for weeks, months or years. In China, it is known that journalists and interviewees who are involved with human rights issues are harassed by government officials. In May 2018, a camera person for a Hong Kong broadcaster, Now TV, was detained for covering a human rights lawyer's court hearing. In another instance, an independent blogger, Chen Jieren, was detained by the police in July 2018 for writing about aprovincial party's corrupt officials. Both these incidents are in violation of the right to freedom of expression. In another example, in India, minority communities, particularly Muslims, are continually persecuted. Not long ago, in November 2018, there were nearly 18 attacks by a mob of violent Hindu extremists accusing the religious minority community of trading cows for beef. Another minority group called dalits, famously known as the "untouchables", have faced discrimination for many years and continue to do so in several areas, such as education and jobs.

When governance is bad or poor, the essentials of good governance, discussed in Section 6.2.1, are violated. In other words, emphasis on, for example, accountability, rule of law, information and transparency, by government officials is weak or negligible. The absence of the attributes of good governance not only impacts the lives of the citizens but is also detrimental to growth and development of a country's public and private sector and the economy as a whole. To mitigate issues such as those discussed in this section, the World Bank, since the 1990s, as well as several other organisations, have been advocating for good governance practices. Practising good governance has benefits for every country. Countries with better governance practices are likely to experience higher income levels. This is evidenced by Kaufmann & Kraay (2002), who found that countries that have scored higher on rule of law such as the US, Singapore, Hong Kong, Australia, and Japan, have a higher per capita GDP than those countries that have scored very low such as the Philippines, Laos, Cambodia and China. Good governance also facilitates efficient allocation of resources, and allows investors and decision makers to operate

world. More information can be found on `https://www.hrw.org` with greater confidence in institutions, take well-informed decision because of higher transparency and deal with shocks or economic downturns in a better way (de Brouwer 2003). It has also been found that having sound policies and institutions makes a country more likely to receive foreign aid in the form of investments projects because they are more likely to utilise the aid more efficiently (World Bank 1998). This has been specifically found to be true in cases of low-income countries that have sound policies and institutions. Using the index of economic policy, Burnside & Dollar (2000) show that when institutions and policies are sound, the growth rate per capita is higher than when institutions and policies are weak. Botswana in the 1960s and Bolivia and Ghana in the 1990s with high quality government institutions and management and Uganda and Vietnam in the 1990s with good economic policy reforms are some examples of poor countries with sound governance practices that have shown massive growth and development as a result of receiving foreign aid. World Bank (1998) found that in a country with sound governance practices, 10 billion in foreign aid is very likely to have a positive impact on the poverty levels of nearly 25 million people, while in a weak environment, the impact is only on 7 million people. Similar is the impact of foreign aid on infant mortality. When countries are committed to improving their governance practices, this also attracts private investments in form of foreign direct investment. For every 1 unit of aid, 2 come in the form of private funding because private investors are more confident in earning a good return on their investment when institutions, policies and practices are thorough.

6.3 Governance Theories

Governance theories are designed to enable understanding of the workings of the world we live in. Every theory takes a different lens and serves a different purpose. Some theories discuss different actors private, public and civil - their role, and how they govern at different levels and in different countries. Others discuss how jurisdictions, levels and institutions interact with each other to exchange knowledge and ideas, and collaborate for decision-making. Some others explain how governance works and has evolved over time, and measure its impact and effect on society, public service, and economic and social life. The reach of governance theories is very wide. For the purpose of this thesis only country-level governance theories that apply to the modern world are discussed below.

6.3.1 New Public Governance Theory

Public governance theory lays down "ways in which stakeholders interact with each other in order to influence the outcomes of public policies" (Bovaird & Löffler 2003, p. 316). The significance of public governance is limited to the "public". The word "public" here means the publicness of the meaning of governance, use of public resources, public interest and management of public affairs. The definition of public governance, thus, is smaller than the definition of governance. New public governance theory, on the other hand, is a theoretical archetype that is more adapted and appropriate to the contemporary world. Significance of the word "new" refers to adaptation of modern public affairs. It focuses on management concepts like poly-centric governance, multi-level governance, organisational governance, global governance, etc. The theory is participatory and networked in nature. It is based on collaboration, interdependence and trust between the government and external entities within the community for the purpose of policy making and public service (Torfing & Triantafillou 2013).

The theory states that power must be dispersed instead of being concentrated only in the hands of the government. For several decades, governments ignored the right of other participants such as organisations to participate in the management and problem-solving of public affairs. New public governance theory puts emphasis on the role of other participants such as the market and public and private organisations in dealing with public interests and affairs, thereby, placing emphasis on dispersion of power. For a long time governments were the focus of public policy, administration, formulation and implementation, but new public governance theory emphasises the coordinating role of the government. It suggests that governments should create a dialogue with the public, and harmonise public resources and social interests, as this is the only way to gain more information and utilise it to meet the demands of the public and solve social problems. The theory also emphasises the role of social public organisations. It explains that social public organisations act in the interest of the public. They provide goods and services, not for profit-making, but for helping with social problems. These organisations provide public service to the citizens, which aligns with the objective of new public governance. Thus, in summary, the new public governance theory rejects the traditional concept of domination of public administration and emphasises the impact of coordination of governments, organisations, both, private and public, groups, communities and individuals (Osborne 2006; Torfing & Triantafillou 2013).

While this notion sounds promising, it still remains theoretically underdeveloped. According to

Torfing & Triantafillou (2013), there is not enough empirical support for this concept. A thorough examination of the social, political, and administrative forces that drive this theory is required. Exploration of variability of this theory across nations is also essential to explain the institutional and structural path dependencies. The contribution of this theory to public service and solving social problems also needs further examination.

Further research could also address some criticisms of this theory. For example, one of the criticisms of this theory is that it does not address concerns related to accountability. Dispersion of power from the hands of the government to several other entities within the community can create accountability problems. Decentralisation of power also creates inefficiency in dealing with social problems. Osborne (2006) explains that the new public governance theory is firmly grounded in organisational sociology and social network theory. When these two are put together, they create the problem of pluralism. In a plural state, there are many actors with inter-dependent roles and they work together to contribute towards public service. In a pluralist state, there are multiple processes that advise policy making. Pluralism, therefore, can lead to inefficiency in tackling social issues.

6.3.2 Good Governance Theory

As discussed in section 6.2.1, good governance is still an evolving concept. Its earliest origins can be traced back to the documents published by the United Nations Development Program and the World Bank. The definition of good governance laid down by the World Bank (1992) emphasises accountability, rule of law, information and transparency, while that of the United Nations Development Programme (2014) emphasises accountability, openness and transparency, addressing corruption and curbing illicit financial flows, justice and rule of law and curbing violence. A detailed discussion of these characteristics is provided in section 6.2.1. The usage and importance of good governance sprang up in the 1990*s*. At that time, good government was a more acceptable term than good governance. Good government focuses only on the role of the state. It emphasises that the state cannot interfere in the actions of firms, communities, clubs, associations and the international community. Good governance, on the other hand, is essential to firms, communities, clubs, associations and the international community. With globalisation becoming more widespread, the influence of transnational and supranational organisations has increased and that of state and national governments has decreased. It is due to this increasing importance of the international community, that the importance of good governance, over good government, for maintaining public order and authority has increased.

The general objective of good governance is to formulate best processes so that correct decisions are taken and a better outcome is achieved (Victorian Local Governance Association and Municipal Association of Victoria and Local Government Victoria and Local Government Professionals 2012). The term "good governance" is used in literature to explain the efficiency with which state institutions and regulatory environments operate. It is also used to define the role and tasks of the state. The role of the state is to create conditions for good governance while its task includes creating a link between the public sector and public affairs. Good governance takes place when there is active cooperation between the state and its citizens. When enough power is given to the citizens to participate in political elections, administration, and policy-making, only then they can collaborate with the state to improve public order and authority. This is only possible in a democratic environment as there is free and equal political power in the hands of the citizens. Good governance theory is, therefore, a breakaway from the traditional thinking of public versus private sector, state versus civil society, and state versus international community. A detailed discussion on the different definitions of good governance and how it is different from bad governance is provided in section 6.2.1 and section 6.2.2.

6.4 Governance Practices in Developed, Emerging and Frontier Markets

Governance practices in emerging markets (EMs) and frontier markets (FMs) are different to those experienced in developed markets (DMs) (Claessens & Yurtoglu 2013). This section provides an overview of the current situation of governance of a few developed, emerging and frontier markets through the investigative work of Human Rights Watch (Human Rights Watch 2019), Transparency International (Transparency International 2018a, 2017) and the World Bank's 2017 Worldwide Governance Indicators (WGI) (World Bank 2017).

6.4.1 Developed Markets

- Canada (CAN): There have been noteworthy changes in Canada since Prime Minister Justin Trudeau assumed office in 2015. The government's biggest challenge is reducing the systemic discrimination against Indigenous people. In 2018, the government made changes to how Indigenous rights and land title are recognised with the intention of developing a legal framework to improve governance. Their efforts have also been towards reducing violence against Indigenous girls and women; however, their actions have not been well communicated and timely for the victims' families. This has also led to call for improvement in their legal framework and urgent action to address the issue of violence against Indigenous girls and women. In June 2018, in a report issued by the Senate Committee, it was noted that Canada places more emphasis on its export laws and foreign policies and less on human rights. As a result, the committee called for an amendment to its Export and Import Permits Act (1947) in order to place more emphasis on human rights while issuing export permits. Prevention of abuse of locally made good and services was also a part of the recommendation. In regard to corruption, the country is ranked 9th out of 180 countries in Transparency International's Corruption Perceptions Index (Transparency International 2018a) and ranks 96 out of 100 on World Bank's 2017 WGI, where 0 indicates lowest control of corruption (CC) and 100 indicates highest control of corruption (CC) (World Bank 2017). However, these good scores are not an indication that the country is without corruption. They have found a big loophole in the country's legal framework which allows the possibility of money laundering via the real estate sector. The provisions of the anti-money laundering law are designed in a way that, although the law covers real estate agents, brokers, developers, notaries in British Columbia and accountants, it does not cover lawyers, law firms and notaries in Quebec. As a result, due diligence is not a requirement for these professionals. Also, identification of the beneficial owners of customers at the time of closing a real estate deal is not a requirement in the case of a non-financial professional. This is another loophole through which the beneficial owner can gain control of the customer and conduct money laundering activities. If there is a breach of the money laundering act, criminal penalty applies such as non-reporting of large cash transactions can attract up to CAN\$$500,000$ for a first time offence and CAN\$1 million for repeat offences. In spite of this provision, there have been no reports of any criminal penalties being issued to any real estate agent. In other areas of governance, defined by the World Bank's WGI, Canada scores the highest on RegQ, 98, and lowest on PV, 89.

- Singapore (SGP): In an interview in June 2019, Prime Minister Lee Hsien Loong announced that the citizens of Singapore are free to speak and publish whatever they like with the intention of promoting thr right to freedom of speech. However, in his interview with CNN's Chief International Correspondent Christiane Amanpour, Loong (2018) clarified that "You are still subject to the laws of sedition, libel and contempt, but you say what you want." On exploration, Human Rights Watch (2019) found that these laws inflict severe restrictions on speech in Singapore. In regard to freedom of expression and peaceful assembly, although the Public Order Act allows citizens of Singapore to organise "cause-related" public assembly with proper police permits, when such applications are made, it is common for the request to be denied. For instance, a request for a one-person silent protest by Terry Xu was refused on the grounds of causing public disorder and property damage even though it was for a late weekend night in the central business district. Also, if one fails to obtain a permit then they may face criminal charges. A performance artist, Seelan Palay, was sentenced to two weeks in prison as he refused to pay a fine of S$2,500 on October 3, 2018. He was convicted for carrying a piece of art in public in memory of Chia Thye Poh, who was detained in 1966 for carrying out pro-communist activities against the Singaporean government. Media, including all films and videos, even those that are received on computer screens and mobile phones, is subject to scrutiny in Singapore. All films and videos must be approved by the Board of Film Censors before they are released to the public, otherwise the release amounts to a criminal offence. Given the amount of control that the government of Singapore exerts on the right to expression, the country ranks a mere 41 out of 100 in VA as per World Bank's 2017 WGI (World Bank 2017). Singapore is also not welcoming to foreign migrant workers. These workers do not have access to the Employment Act and many work benefits such as leave and work hour limitations. Also, their work permits are tied to a specific employer, which leaves then susceptible to exploitation. In other areas of governance, the country is one of the best performing in the world. Based on World Bank's 2017 WGI, Singapore ranks 99 out of 100 on PV, 100 on GE, 100 on RegQ and 97 on RL (World Bank 2017). In terms of corruption, it is one of the least corrupt countries in the world. It ranks 3rd on Transparency International's Corruption Perceptions Index (Transparency

International 2018a) and ranks 98 on World Bank's 2017 WGI.

- Japan (JPN): Japan is the world's third largest economy with a liberal democracy, rule of law and a dynamic civil community. It is one of the three member countries of the Organisation for Economic Co-operation and Development (OECD) that have the death penalty. In July 2018, 13 members of Aum Shinrikyo, including the group leader, were executed for the 1995 sarin chemical attack in Tokyo. Death penalty prisoners have also raised complaints about insufficient legal help and no prior notice of their execution. Japan also does not have laws to protect its citizens from discrimination against race, ethnicity, religion, sexual preference and gender, although discrimination on the basis of gender is not acceptable when it comes to employment. In the same vein, it was only in May 2018 that Japan announced its first national law to encourage recruitment and participation of women as political candidates. In spite of this anti-discriminatory law, several universities and institutes were found to be in violation. One of the most prestigious university in Japan was found to manipulate entrance exam scores of female candidates specifically in order to reduce their chances of qualifying for a position. With regard to disability rights, in August 2018, Japan's national tax agency and Ministry of Justice were among several government agencies that were found to have manipulated the number of disabled staff in order to meet the requirements set by the act for disabled people's employment protection. In order to overcome the problem of labour shortage, the Foreign Technical Intern Training Program was introduced. The intent of recruiting employees, mainly from South East Asia, has met with complaints of sub-par wages, overtime, forced return to home countries and threatening and unsanitary work conditions. One of the good measures taken by Japan is the 2016 Child Welfare Act. The act guarantees providing foster care and adoption facilities to children who cannot live with their birth parents. Although placement in these facilities is difficult, local governments are being encouraged to increase their efforts. Their aim is to ensure that more than 75% of the pre-school children that are in need of this service are placed in seven years' time. In terms of foreign policy, Japan proudly states that it follows "diplomacy based on the fundamental values of freedom, democracy, basic human rights, and the rule of law". However, it has been rather inconsistent. For example, in June 2018, Japan supported the formation of a committee by Myanmar to examine the 2017 abuses by Rohingya military and Myanmar security forces but it was probably a diversion from the genuine need for international scrutiny. In regard to corruption, Japan ranks poorly as compared to Singapore and Canada. It is ranked 18th in the world on Transparency International's Corruption Perceptions Index (Transparency International 2018a) and ranks 90 out of 100 on World Bank's 2017 WGI (World Bank 2017). Japan has performed similar to Canada in PV but less in all other governance areas, specifically VA, GE, RegQ and RL.

6.4.2 Emerging Markets

- Brazil (BRA): Violence and corruption are big issues in Brazil. Violence by gangs, police violence, political violence, and domestic violence are widespread. According to 2017 statistics of Human Rights Watch (2019), there were approximately 64,000 killings in that year. Many of these were undertaken by the police, either in self-defence or extrajudicial. 2017 statistics compiled by a non-profit Brazilian forum show that 5144 executions were conducted by police officers, both on- and off-duty and among the total killings, 367 were on- and off-duty police officers too. Unlawful violence by police only feeds the wave of violence further. With regard to investigating these executions, it is common for domestic violence cases to go un-investigated. There were more than 1.2 million cases that were pending investigation as of 2017. According to international norms, scrutiny of extrajudicial killings by police are subject to trial in civilian courts and should be investigated by civilian authorities; however, these are examined by the members of the police itself in Brazil, which is clearly in violation from an international perspective. In terms of corruption, Brazil ranks 105 out of 180 on Transparency International's Corruption Perceptions Index (Transparency International 2018a). Corruption is one of the biggest roadblocks in the country's progress. In World Bank's WGI, the CC indicator shows that corruption levels in the country are on the increase since 2011. The country was ranked 63 in 2011 and ranks 36 in 2017 (World Bank 2017). Operation Carwash uncovered some of Brazil's biggest corruption scandals, which involved several businesses and politicians from around the world (Transparency International 2019a). This has eroded the trust of Brazilians in their institutions. Another major issue in Brazil is related to prison conditions and slave-like treatment of prisoners. There are more prisoners than the capacity of the prisons. In 2016, there were more than 726,000 adult prisoners but the capacity of the prisons was less than half. Under-staffing is another problem and when combined with overcrowding it creates an environment for exploitation and gang recruitment. Those awaiting trial are at times held in prisons with convicted prisoners, which leaves then susceptible to violence. There are also barely any facilities provided to inmates, especially in regard to health care. There were 266 deaths in 2017 due to treatable illnesses like diabetes, hypertension and respiratory problems. Educational and work programs are also negligible, with less than 15% inmates having access to them. Freedom of expression, speech and press are also quite restrictive in Brazil even though the Brazilian constitution guarantees to provide this freedom. In that, not only journalists and reporters are harassed, threatened or even attacked for covering any news that the government feels is "unworthy" but also military police officers themselves, who can face suspension or prison sentences for criticising a senior officer or condemning a government decision. Labour rights and conditions are also of significant concern in Brazil. In 2018, between January and October, 1,246 labour abuse cases were identified by the Ministry of Labour. The treatment of labour is very poor, forced labour is common and workers are often made to work like a slave in humiliating working conditions.

- The United Arab Emirates (ARE): Speaking about human rights issues is a serious risk in ARE. The government at will detains and by force makes individual who speak against the authorities disappear within the country. In May 2018, an award-winning human rights activist, Ahmed Mansoor, was sentenced to 10 years in prison for exercising his freedom of expression. He was held in an undisclosed location prior to sentencing without legal counsel and limited access to family. According to Human Rights Watch (2019), detention, imprisonment and torture are different forms of punishment that are used. Many people, as a result, prefer to leave the country. In another instance, a prominent academic was imprisoned for 10 years in 2017 for peaceful criticism of the authorities. In May 2018, a British PhD candidate, Matthew Hedges, was arrested under suspicion of being a British spy. He was not allowed legal counsel until October that year, which was five months after he was arrested. On 21 November 2018, he was sentenced to a life term but he was pardoned five days after due to international outrage and diplomatic pressure. Lack of the right to freedom of expression in ARE is clearly evidenced in World Bank's VA score of the country, a mere 18 out of 100. ARE is also involved in unlawful attacks and possibly war-related crimes as a leading member in the Saudi-led coalition in Yemen, according to Human Rights

Watch (2019). Although there is not enough information to confirm that ARE is solely responsible for these attacks, as coalition members have not disclosed their specific roles, there is sufficient investigation carried out by Human Rights Watch (2019) to indicate ARE's involvement. Another prominent issue in ARE is related to migrant workers. Around 88.5% of the work force are from overseas (Human Rights Watch 2019). Because work visas of employees are tied to employers, under the kafala system, it creates the opportunity for abuse. Employees that leave their employers can face fines, imprisonment and deportation. Many are paid poorly and are susceptible to forced labour. Domestic workers have suffered the most, at least until 2017, when the domestic labour protection Bill was signed, as the labour laws did not protect domestic workers from a range of abuses such as unpaid work, house confinement, work without breaks, physical or sexual abuse. Under the new Bill, domestic workers are allowed rest days, 30 days of paid annual leave, sick leave etc. The Bill also permits inspection of offices, recruitment agencies and residences. In regard to governance measures other than VA, ARE is relatively lower in PV, scoring 68, as compared to other WGI indicators.

- India (IND): Although the Indian constitution is anti-discriminatory, religious minorities, tribal communities and Dalits face violence, discrimination and poor treatment on a regular basis. In November 2018, there were 18 attacks on Muslim religious minorities by extremist Hindu groups, in which eight people died. Mob violence by these extremist groups is frequent. In another instance, the Assam government published a draft of the National Register of Citizens for the purpose of identifying legitimate Indian residents due to concerns of migration from Bangladesh. More than four million people were identified to face expulsion, of which several were Muslims. Mistreatment and discrimination of Dalits in education and work opportunities is ever-increasing in spite of having education and work quotas for them. In April 2018, clashes between Dalits and police in the Northern states led to nine deaths. The Supreme Court ruling, which ordered investigation by senior police officials, was overturned by the Parliament after widespread protests. The parliament passed amendments to the Scheduled Castes and the Scheduled Tribes (Prevention of Atrocities) Act.

6.4.3 Frontier Markets

- Vietnam (VNM): Human rights issues in Vietnam are severe. In 2018, threat to freedom of expression worsened further. Anyone publishing web articles highlighting political issues is harassed, intimidated and sometimes even arrested. As reported by Human Rights Watch (2019), a minimum of 12 people were sentenced to 4 – 12 years in prison in 2018 for "conducting propaganda against the state". This included bloggers and activists, who are frequent recipients of physical assaults from government officials or connected thugs. For example, the house of a labour activist, Do Thi Minh Hanh, was attacked by rocks and a handmade incendiary device. Activists Pham Doan Trang, Nguyen Tin, and Nguyen Dang Cao Dai were beaten up by security agents following a raid, while another activist, Ngo Thanh Tu, was detained and beaten repeatedly and brutally. In the following month, another activist, Huynh Cong Thuan, was assaulted by men in plain clothes on his way home. These attacks took place in Ho Chi Minh City. The country also restricts freedom of the press and access to information. Independently or privately owned media services are prohibited. Radio, TV stations and printed press are closely monitored. It is criminal to publish against the government or encourage "reactionary" ideas. Any media sources that are deemed politically sensitive are closed down. A cybersecurity law that was passed in 2019 requires service providers to take down sensitive or unacceptable materials within 24 hours of being notified by the Ministry of Public Security or the Ministry of Information and Communications (Human Rights Watch 2019). Freedom of assembly and association is also not encouraged. Labour unions or any organisation organising such events face harassment and intimidation. There are restriction on religious groups as well. They are required to be registered and obtain approval from the government to operate. Religious events that are deemed as a threat to national interest and public order are prohibited.

- Jordan (JOR): Freedom of expression, association and assembly are of concern in Jordan. Freedom of expression is considered to be a criminal offence if speech is critical of the king, government officials, religion, foreign nations and any speech that defames anyone. For example, on 17 January 2018, the editor and editor-in-chief of the Jfranews website were arrested, but later given bail, for writing about alleged tax evasion by the finance minister. The 2015 Electronic Crimes Law that criminalises hate speech was modified in 2018 to state: "any word or action that incites discord or religious, sectarian, ethnic, or regional strife or discrimination between individuals or groups". Even controversial views or online articles can be considered to be hate speech and penalised. Lack of freedom of expression is evident in the rank the country has received in the World Bank's VA, that is, 27. Even political stability and absence of violence/terrorism (PV) is weak in Jordan as its 2017 WGI score is 28. Women's rights in Jordan are also restrictive and discriminatory, specifically provisions of the laws related to divorce and child custody, and although this has been amended in 2010, it does not give the same rights to women as compared to men. For example, a marriage between a Muslim woman and non-Muslim man is not acceptable. On a positive note, amendments to the Public Gatherings Law in 2011 do not require citizens of Jordan to seek permission to hold public meetings and demonstrations, even though many continue to request it. One of the other issues faced by Jordanians is the influx of a large number of Syrian refugees into their country. According to data collected by the The United Nations High Commissioner for Refugees (UNHCR) (Human Rights Watch 2019), more than 670,000 Syrians sought protection in Jordan between 2011 and 2018. It was only in 2018 that the country started refusing entry to Syrians seeking refuge in Jordan, with the exception of White Helmet rescue workers[46] and their families. With such a large number of refugees in the country, the daily lives of Jordanians are being affected as the Jordan Compact, which aims to improve the lives of the refugees, is providing the refugees with work permits.

- Sri Lanka (LKA): Sri Lanka has been a victim of political tensions several times. In a recent circumstance reported by Human Rights Watch (2019), in 2018, the country plunged into a constitutional crisis. The prime minister, Ranil Wickremasinghe, was abruptly dismissed and replaced by the former president, Mahinda Rajapaksa, even though he was linked to several abusive practices. Wickremasinghe dismissed the current president's, Maithripala Sirisena, decision calling it unconstitutional, which led to a constitutional crisis. The parliament was dissolved and new elections were called for. There were several protests and lawsuits against the president, which came to a conclusion when the supreme court also declared the president's act unconstitutional. Mahinda Rajapaksa was dismissed and Ranil Wickremasinghe was reinstated as the prime minister,

[46]White Helmet rescue workers are humanitarian volunteers of Syrian Civil Defence. For more information: `https://www.whitehelmets.org/en/`

thus ending the constitutional crisis. Violence against Muslim minorities is also quite prevalent in Sri Lanka. There have been several anti-Muslim attacks linked to ultra-nationalist Sinhalese Buddhist groups in recent times. Clashes in the eastern district of Ampara and Kandy, and destruction of mosques, homes, businesses and vehicles of Muslim minorities occured. Several arrests were made after the attacks but there was no police action at the time of the attacks. The government has also failed to address discrimination against women, which is also a major concern in Sri Lanka. Several recommendations to tackle issues concerning violence against women were made before the UN committee during the 2017 hearings but actions were not taken (Human Rights Watch 2019). Similarly, no progress has been made on the laws impacting Muslim women's rights around marriage and divorce.

Due to differences in the level of development of these countries' public and private sectors, ownership structures, political influences, and human rights issues, the level of development of their financial markets and access to financing varies. Claessens & Yurtoglu (2013) demonstrate that the average GDP per capita of developed markets is significantly higher than emerging and frontier markets. Although the country classification criteria of this thesis is different to Claessens & Yurtoglu (2013), in that some countries - like Hong Kong and Singapore - are identified as a developed market in this thesis but an emerging market in Claessens & Yurtoglu (2013), the GDP per capita (purchasing power parity (PPP) constant in 2005) of these countries still remains higher than emerging and frontier markets. From Section 2.3, it is evident that this is the case even today. Section 2.3 also evidences that annual GDP growth rates of emerging and frontier markets are substantially higher than developed markets, which is expected as there is enough room for these countries to grow and develop. Good governance practices, as discussed in Section 6.2.1, are thus expected to bring improvements in the political, social, economic and financial areas of these markets.

6.5 Relationship between Governance and Performance

Theoretically, governance practices should matter. If this holds, then it can be implied that good governance leads to good outcomes and that good governance in frontier markets will lead to good outcomes for frontier markets. Good outcomes can be in the form of improved performance, improved investor perception, investor confidence, increased investment prospects and possibly increased returns for Australian investors through portfolio diversification. However, a substantial body of academic literature, on both corporate and country-level governance, evidences that the link between good governance and good performance is ambiguous. That is, empirical studies have found positive, negative and even no relationship between governance and performance. The following sections review literature on corporate and country-level governance in order to understand the nature of its relationship with performance.

6.5.1 Corporate-level Governance and Performance

The impact of corporate governance practices can be measured using external and internal factors. External factors that affect firm performance include: legal system, market competition, government ownership and protection of minority rights, while internal factors include: ownership concentration, board independence, executive compensation and transparency in financial reporting. There are several other factors using which corporate governance can be measured. However, since the main focus of this study is to measure and examine the impact of country-level governance practices on country-level performance, only a few corporate-level external and internal factors are reviewed below, as the main purpose of this review is to establish the relationship between governance and performance.

6.5.1.1 External Factors

Legal environment plays an important role in the type of governance practices that companies adopt. A weak legal system leaves plenty of room for variation in firm practices. In some companies, insiders seek to benefit from personal gain while in others, they conduct good practices in order to attract investors. Companies that practice good corporate governance in countries where legal systems are less established and less investor-friendly experience a positive impact on their firm performance. Durnev & Kim (2005) found a positive relationship between higher governance and transparency rankings and higher growth prospects of companies. This shows that in countries where this good corporate governance is scarce, companies that practice good governance are held in high regard and rewarded positively (Durnev & Kim 2005). This relationship is also observed for companies that have profitable investment opportunities, need for external financing and control over cash flow because they are less inclined to behave poorly and lose the opportunity at hand. The above view is also supported by Klapper & Love (2004), who examine the impact of shareholder rights and efficiency of the legal system, of 495 firms across 25 emerging markets, on firm performance in emerging markets. Their results show that companies in countries with weak legal system have weak governance practices and corporate governance practices play a very important role in countries with weak shareholder protection and judicial systems. This is the case because a good legal system is of more importance to companies that are not well-governed as they experience more agency conflicts than the well-governed companies. Irrespective of the quality of governance followed at corporate level, companies in countries with weak legal systems generally have lower governance rankings as the lack of a strong legal system cannot be compensated for by good firm enforcement. Russia is considered to be governance challenged as it suffers from weak corporate law, less emphasis on insider activity and weak impact on firm reputation as a result of insider activity. Using data of 21 firms, Black (2001) examined the impact of governance rankings, developed by two Russian investment banks, on market value of Russian firms. A value ratio was also used to measure this relationship. A high degree of correlation, $r = 0.90$, was found between value ratio and corporate rankings to suggest that the governance behaviour of the market has a strong impact on firm value. This finding is similar to the findings of Gompers et al. (2003) for the US. Weak legal systems are found to affect governance rankings, which in turn affect firm performance. Also, this relationship is found to be stronger in countries with weak legal systems.

The impact of government ownership on firm performance is debatable. Too much ownership can lead to too much interference while too little government ownership can mean very little support especially in the time of financial difficulties. A few studies (Bishop & Kay 1989; Lin & Fu 2017; Megginson et al. 1994; Wei & Varela 2003) argue that government ownership is less efficient than private ownership while others (Kay & Thompson 1986; Pillai & Al-Malkawi 2018; Sun et al. 2002; Vernon-Wortzel & Wortzel 1989) recommend that some percentage of government ownership is beneficial to firms. Most of these studies, however, have been unsuccessful in determining an optimal level of government ownership. Megginson et al. (1994) found that both full and partial privatisation strongly improve financial and accounting performance of 61 firms in their sample. Specifically, sales, profit level, capital investment, output per employee and firm size increased as a result of privatisation. These firms also experienced a decrease in debt levels and increase in dividend payouts. They found the same impact on competitive and uncompetitive firms and also in various sub-samples. In the same vein, Wei & Varela (2003) found a negative relationship between state ownership and firm performance in their sample of Chinese firms. Firms that were newly privatised benefited from the receipt of additional capital, high market value and increased stock returns. However, according to their results, firm size and industry status seem to be determinants of state ownership rather than performance. Bishop & Kay (1989) also favour the impact of privatisation over government ownership on performance, specifically for firms in the UK. Benefits of privatisation are several. For instance, the paper found that privatisation led to faster growth and development of firms in their sample as compared to government owned firms. However, the firms that were privatised were already in better performing industries of telecom, cable and wireless. The poor performing firms of rail, coal and steel were not privatised, with the exception of British Steel, which despite privatisation, did not prosper. Privatisation also led to an increase in profit levels. Lin & Fu (2017) also found support for institutional/private ownership. In their study, they found that institutional owners have better capability in monitoring and supervising firms, reducing information asymmetry and lowering agency problems than the government. However, this finding is in the context of China, which had an under-developed legal framework, and negligible attention to accounting standards and investor protection prior to privatisation. As a result of privatisation, the government adopted internationally accepted accounting standards such as Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS), which improved their accounting performance. In contrast, according to Vernon-Wortzel & Wortzel (1989), ownership does not affect performance: rather, lack of goals, objectives, and motivation, as well as a weak reward system affect the performance of state-owned enterprises. Although privatisation is not the remedy, since it has been found to create a culture wherein the goals and objectives are rewarded, privatisation can foster growth and good performance. With respect to China, Sun et al. (2002) examined the impact government ownership makes on the performance of partially privatised Chinese state-owned enterprises. Contrary to the above studies, this paper found that government ownership makes a positive impact on firm performance. A positive relationship between the two variables is not surprising in the Chinese context because many of these state-owned enterprises were suffering from poor performance and debt obligations. A balance between government and private ownership has been beneficial to these companies. In Gulf countries of Bahrain, Qatar, the United Arab Emirates, Saudia Arabia, Oman and Kuwait, Pillai & Al-Malkawi (2018) found that government shareholding is positively related to firm performance, measured by return on assets. Specifically, government intervention is expected to have a positive impact on firm performance in developing economies as it is found to reduce monopolistic competition and information asymmetry, protect the interest of minority shareholders and encourage economic development.

6.5.1.2 Internal Factors

Ownership structure when enforced by individual owners affects the way contracts are enforced and incentives are used. Ownership concentration allows owners to use incentives as a tool to bargain and enforce contracts with all stakeholders for the purpose of increasing firm performance (Claessens & Fan 2002). According to Shleifer & Vishny (1997), the effects of large ownership concentration are observed mainly in companies based in developing countries. The reason for this is ownership structures are not enforced effectively by the state as these countries are affected by weak legal systems, poorly defined property rights law and a higher level of corruption. Ownership structure affects the manner in which day-to-day business is conducted, which determines the degree of agency conflict between shareholders and managers. In concentrated ownerships, these conflicts tend to be higher. The agency theory explains why agency conflicts occur. The origin of the agency theory lies in the risk-sharing problem, discussed by Arrow (1971) and Wilson cited in (Eisenhardt 1989), which arises when the cooperating parties to a contract have differing views towards risk. Jensen & Meckling (1976) introduced the agency theory in order to explain these conflicting objectives or views of cooperating parties, which is identified as the agency problem. Specifically, the theory puts forth an explanation as to why the actions of the managers, also called agents, are different to the objectives of the owners or shareholders, also called the principal. The objective of the shareholders is profit or wealth maximisation. The manager's objective, however, is not the same because managers are not the shareholders of the firm, instead they are employees that are hired by the shareholders to work and perform service on their behalf Fama (1980) and Jensen & Meckling (1976). Increasing the value of the firm is therefore not the primary interest of the managers. In a principal-agent relationship like this, there is delegation of decision-making by the principal to the agent and this transfer of power creates conflict unless both parties are working towards the same goal. However, when parties are acting from a utility maximisation perspective then there is a likelihood of conflict. One way to deal with this agency problem is for the principal to introduce control mechanisms such as offering compensation or incentive contracts to the agent. Incentives can be in form of shares of the company at a reduced price, long-term compensation contracts, or performance bonuses in order to align the financial interest of the shareholders and the agent Fama (1980) and Jensen & Meckling (1976). Use of incentive contracts is a common practice and has been found successful in aligning the interests of the agents to a certain extent. When agents own a small portion of the firm's shares then they have more incentive to efficiently utilise the resources of the firm as there is a personal benefit attached to their decisions. Well-structured compensation contracts encourage the managers to increase their risk exposure and diversify outside the firm, which reduces investment-related agency costs and problems (Belghitar & Clark 2015). Higher compensation has thus been found to have a positive impact on reducing agency problems (Hubbard & Palia 1995; Mustapha & Che Ahmad 2011; Nor & Sulong 2007) and thereby improve firm performance. Empirical evidence relating to ownership structure and firm performance is quite consistent. Claessens et al. (2002) found that firm value increases when ownership, also called in the paper cash-flow rights, is with the largest shareholder. This evidence is also supported by Lins (2003). Using a sample of 1433 firms from emerging markets, Lins (2003) found that the firm value is higher when controlling rights are lower than ownership rights. A similar result is found by Joh (2003) for 5829 public and private Korean firms. The study found that higher controlling ownership increases firm profitability while low ownership concentration reduces profitability. However, this relationship is not linear, in that firm performance decreases first and then increases only to decrease again. A recent study by **?** also confirms this finding. Using a sample of 200 listed and Shariah-compliant firms in Malaysia, the study found a significant positive relationship between ownership structure and firm performance. A meta-analysis of 69 studies, by Iwasaki & Mizobata (2019), also confirms the positive and significant effect of ownership concentration and firm performance. Balla & Rose (2015) explain that a positive relationship between ownership concentration and firm performance occurs when shareholders are able to enforce effective control over the firm, as it allows them to influence decision-making and corporate policies.

The role of the board of directors also becomes handy in mitigating the agency problem and influences firm performance. The board of directors is responsible to monitor the activities of the top management and therefore when the interests of the board of directors are aligned with those of the shareholders, agency conflicts can be resolved. Incentivising can be successful when the chair of the board of directors is independent of the management. Instead, when the chair holds a dual position in the firm, that is as the chief executive officer (CEO) as well, then the shareholders' interests are sacrificed to a certain extent in favour of the management (Donaldson & Davis 1991; Martin et al. 2016); this is because of the self-interested behaviour of people in general. CEO duality can be tackled using an appropriate incentive system, such as offering long-term compensation, along with basic salary, to the CEO. Although there is mixed evidence, several studies (Conyon & He 2011; Kato & Long 2006; Mengistae & Xu 2004; Song & Wan 2019) have found that incentive mechanisms employed on CEOs are successful. That is, when incentives are offered to the CEOs to act in the interest of the shareholders, there is a positive impact on firm performance. For example, Ozkan (2011) found that among UK firms, an increase in share returns by 10% is linked to an increase in CEO compensation by 0.75% and this is higher in cases of total compensation, which includes cash, stock options and long-term incentive contracts. However, when compensation exceeds expectations it can lead to more agency problems. Core et al. (1999), Brick et al. (2006), and Dah & Frye (2017) found a negative relationship between excessive CEO compensation and firm performance. Large, complex firms and firms with higher investment in research and development have been found to use equity compensation to overpay their board of directors. Overpaying the board of directors is found to have a negative effect on their monitoring activities as it is believed that the directors may not be motivated to protect the shareholders' interests as a result of this unexpected financial gain. The effect of overpaying the directors is also considered to be a sign of board entrenchment, which reflects in the performance of the CEO as the CEO not only gains immunity or job security but also excess compensation.

The proponents of stewardship theory have a different view on the relationship between CEO duality and firm performance. The theory posits that agents are motivated by the need to achieve and to gain satisfaction by performing challenging tasks, by a sense of duty, responsibility and authority, and by the wish to gain recognition from colleagues and superiors (Etzioni 1975; Herzberg et al. 1959). The theory believes that managers do not need any motivation to align their interests to that of the shareholders; that is, they are already motivated to maximise the firm's success as their achievement is defined by the success of the firm (Davis et al. 1997; Smallman 2004). The theory infers that superior shareholder returns are not a result of financial incentives offered to the CEO when the CEO holds a dual position, while under the agency theory, higher returns are explained using financial incentives. Stewardship theory thus supports CEO duality. CEO duality is very common in US firms. Of the 1300 firms surveyed by Heidrick & Struggles cited in Kesner & Dalton (1986), 74.4% of the CEOs are also the firm's chairman. In 1985, Heidrick & Struggles reported a greater than 13% rise in CEO duality among the Fortune 1000 and 300 leading non-industrial firms between 1980 – 1985 in the US. There are several studies that have found a positive link between CEO duality and firm performance and shareholder returns, and hence support (Vance 1978) the appointment of a single individual as the CEO and the chair of the board. Pfeffer & Salancik (2003) argued that duality will empower the CEO by providing a broader power base and more control and, as a result, will weaken the relative power of other interest groups. A single leader with more power will be able to handle and implement strategic decisions with more efficiency and is more likely to surpass organisational passivity. From a sample of 192 firms from 12 industries, Boyd (1995) found that neither the agency theory nor the stewardship theory fully explains the ramifications of CEO duality. However, under specific industry conditions, resource scarcity, complex business environments, and duality can have a positive effect on firm performance. The study is unable to lend strong support to either of the two theories; however, it does not disregard the positive impact of CEO duality on firm performance. In the same vein, Peng et al. (2007) found strong support for stewardship theory in Chinese firms, especially under environmental dynamism. CEO duality is also found to be of benefit to firms during turbulent times such as the Asian financial crisis or economic policy changes. Tan et al. (2001) also found firm value to be significantly related to CEO duality during the Asian financial crisis. Unification of two important roles in a firm, during difficult times, benefits the firm because duality leads to strong leadership structure and faster and unified corporate responses, and thus outweighs the costs that come with possible CEO entrenchment. In situations of regulatory shocks such as an economic policy uncertainty, Chang et al. (2019) found that the benefits of CEO duality outweigh the costs. Specifically, after the introduction of the Sarbanes-Oxley Act (2002), performance of the firms that had adopted separate roles for the CEO and the chair of the board declined while for those firms that chose to merge these roles and appoint a single individual to the job, their performance improved. A recent study by Bhagat & Bolton (2019) emphasises the positive relationship between governance and performance. In particular, the study places emphasis on using director stock ownership as a measure of corporate governance. It is the only variable which showed a significant positive relationship with firm performance in spite of the key events that took place during their study period, such as the GFC, the introduction of the Sarbanes-Oxley Act (2002) and the Dodd-Frank Act (2010).

Board size, board competency and board meetings are also found to affect firm performance. Education level of board members is found to affect firm performance. **?** found that a bachelors' or masters' degree, or any type of educational qualification of board members, influences a firm's return on assets and return of equity. This finding is in line with the resource dependence theory. Since higher education is positively correlated with better skill-set and abilities such as critical thinking, problem solving, innovation and creativity, it is found to impact firms positively. Hausman (2005) found that small and medium scaled businesses, in particular, benefit from higher education levels and training of the managers, as those two attributes are directly linked to innovativeness, which can translate into new products, services and technology. Managers with business, accounting and financial knowledge have better knowledge of financial alternatives and are able to manage start-ups efficiently. Financial decision-making skills also plays an important role when it comes to managing such investment projects. This finding of Seghers et al. (2012) is based on the analysis of 103 start-ups in Belgium. Strong financial networks also showed a positive impact on the performance of these start-ups. This finding is also supported by Darmadi (2013). Examining a sample of 160 firms listed on the Indonesia Stock Exchange, the study found evidence for the impact of education level of the board and CEO on firm performance. They found that firms in which CEOs were highly educated from reputed domestic universities performed better than firms in which the CEO was not as qualified. Empirical evidence on an appropriate board size in inconclusive. According to Pillai & Al-Malkawi (2018) large board size is found to result in disputes and inefficiency while limiting board size to 8 – 11 leads to good firm performance. From an Indian perspective, examination of 20 industries by Arora (2016) found that many companies in their sample did not comply with the guidelines and regulations prescribed by Indian authorities, which could be the reason for a negative relationship between board size and return on assets. Board meetings, on the other hand, showed a weak positive relationship with firm performance while CEO duality had no impact. Their results suggest a weak link between governance and performance although they believe that it is because board independence is a relatively new concept for many Indian companies. As the position of the independent director is filled by the same person in many companies there is a large possibility of bias in the judgement and decision making which can have an impact of firm performance. The paper recommends the compliance of good governance practices in improving accounting and market performance of companies and the industry as a whole.

The general finding of all the literatures suggests that companies that adhered to and/or went beyond the standard governance provisions that are considered the norm in the industry or country, are highly rewarded with higher market valuation (Chhaochharia & Laeven 2009). However, those companies that did not adopt sound governance provisions were found to be affected by agency problems arising due to concentrated ownership, government control, weak legal systems and sizeable free cash-flows.

6.5.2 Country-level Governance and Performance

The connection between country-level governance and performance, mainly economic performance or economic development, has been extensively examined. Kaufmann et al. (1999) explain that good governance is built over time and with resources. As a result, it is expected that countries with better resources are likely to have better governance. However, governance is also dependent on a country's historical, social and political environment. In particular, countries that have inherited institutional frameworks as a result of the colonial system are expected to have weak governance as colonial powers did not provide much incentive to set up good institutional frameworks in their colonies (Acemoglu et al. 2001). Hall & Jones (1999) examine the link between governance and national output. They find that national output is impacted by differences in social infrastructure, which is the manner in which government policies affect the economic environment of a country. Differences in capital accumulation, education level and level of productivity across countries are found to impact national output.

Many academics and policy-makers have examined specific dimensions of governance. Long run linkage between governance and per capita income, discussed above, has been examined (Acemoglu et al. 2001). Using six WGI indicators, Kaufmann et al. (1999) empirically examined the relationship between governance and economic development for a sample of 178 countries. They found a strong positive association between governance and economic outcomes; that is, that governance has a strong positive impact on GDP per capita. When good governance is practised then it is found to improve income levels of a country. Governance also has a positive association with adult literacy; that is, countries with strong governance have higher levels of adult literacy compared to countries with weak governance. They also found that governance has a negative impact on infant mortality, thus evidencing that governance matters. Goncalves (2014) examined the impact of governance on human development. Specifically, the author examined the impact of Brazil's participatory budgeting on government expenditure and living situation of its residents. They found that when more emphasis was placed on sanitisation and health services there was a decline in infant mortality rates. The outcome showed that good governance is important.

Blaydes & Kayser (2011) analysed the impact of government regimes on economic growth and standard of living. They found that democratic governments experience better economic growth, which in turn creates more opportunities for the poor. Democratic governments pay higher wages and focus more on development of human capital, which creates a better environment for the poor to take advantage of than autocratic governments. This argument is also supported by Ravallion & Datt (2002) and Baum & Lake (2003). Democracy is also found to lead to better living conditions. For example, Besley & Kudamatsu (2006) found that democratic governments place more emphasis on health policies than non-democratic governments, which is found to improve life expectancy at birth. From another viewpoint, Blaydes & Kayser (2011) contend that possibly competitive elections, which are possible in democratic governments, create more benefits for the poor as candidates vie for support from the poor by offering rewards. This creates a link between government regimes and redistribution of wealth. This finding is also supported by Calvo & Murillo (2004), who assert that it is more effective to target the poor than targeting the upper or middle class for votes. This strategy is successful because the pay-off of even a small reward to the poor outweighs the worth of voting for a particular political party (Stokes 2005). Han et al. (2014) examined the impact of WGI on economic growth measured by GDP per capita. Their analysis shows that governance affects economic growth more severely in Asia, the Middle East and North Africa than the rest of the world. Countries with higher governance scores in GE, RegQ and CC experienced higher GDP per capita growth than those with lower scores, especially in developing Asia, whereas in the Middle East and North Africa, countries with higher governance scores in PV, GE and CC grew at a faster rate. The impact of GE, RegQ, CC and PV on economic growth was higher than VA and RL, thus supporting the idea that governance impacts economic growth and development.

Economic freedom is also found to impact economic and financial growth of a country. According to Stocker (2005), there is a significant relationship between economic freedom and financial returns. He finds a direct relationship between the two variables and an inverse relationship between starting level of economic freedom and equity returns. This means that countries that have higher levels of economic freedom are expected to yield higher equity returns and countries with less economic freedom have more scope for increase in economic freedom. Thus, in their view, investors seeking higher returns on their investment should invest in countries that are expected to experience higher economic freedom. In another paper, Stocker (2006) argues that economic freedom is related to socio-economic conditions. An increase in economic freedom improves socio-economic conditions, leading to an increase in investment returns. However, the relationship between economic growth and stock market returns stands disputed. Ritter (2005) argues that the relationship between these two variables is negative, especially for emerging markets. In emerging markets such as Asia, high rates of savings and efficient utilisation of labour are the main factors that create economic growth and these two do not necessarily translate into dividends or higher returns for shareholders (Krugman 1994; Young 1995). Ritter (2005) found that, for 16 countries in their sample, there is a negative correlation between GDP per capita growth and equity market returns. Despite this contradiction, there are several other studies that suggest economic freedom creates a positive impact. From a banking perspective, Sufian & Habibullah (2010) found that economic and business freedom affects the performance of Malaysian banks positively. That is, higher economic and business freedom encourages banks to engage in activities that increases a bank's profitability while lower freedom reduces a bank's profitability.

Although there is strong support for the positive impact of economic freedom on economic growth (Cebula & Clark 2012; Dawson 1998; De Vanssay & Spindler 1994; Farr et al. 1998; Heckelman 2000; Scully & Slottje 1991), there are a few studies that find no relationship between the two variables (Carlsson & Lundström 2002; de Haan & Siermann 1998). For example, Scully & Slottje (1991) found a statistically significant relationship between nine economic liberty indices and GDP growth, implying that more economic freedom brings more economic growth. Heckelman (2000) employed Granger-causality tests on economic freedom indicators developed by the Heritage Foundation and annual GDP growth rates to measure the relationship between the two. They found that freedom relating to regulation, capital flows, property rights, and wage or price controls precedes economic growth, which implies that these types of freedom cause growth. Similarly, Farr et al. (1998) measured economic freedom and gross national product (GNP) per capita to find that the relationship between the two is significant. However, their results show that increase in GNP per capita increases economic freedom or their relationship is jointly determined, but not vice-versa. Another study, Cebula & Clark (2012), examined the relationship between the indicators of the Index of Economic Freedom and GDP per capita for OECD nations for the period 2004 – 2008. They found that seven economic freedom indicators, namely, business freedom, fiscal freedom, freedom from corruption, investment freedom, monetary freedom, property rights freedom, and trade freedom, are significant and positively associated. They also found modest evidence that financial freedom, government size and labour freedom also affect economic growth positively. Contrary to the above-mentioned studies, de Haan & Siermann (1998) suggest that the relationship between economic freedom and economic growth depends on the measure used. Results may differ due to this. In their study, they did not find any relationship between the two. Heckelman (2000) explains that researchers have their own interpretation of economic freedom as the term is highly subjective. What variables should be included in the measure and what should not will vary depending on the researchers' definition of economic freedom. Carlsson & Lundström (2002) assert that the choice of economic freedom measure makes a difference, although they find that overall economic freedom impacts economic growth but argue that does not imply that increase in economic freedom will increase growth. The reason for this, they argue, is that not all variables of economic freedom are significant, and a few have negative impact. They find that only freedom to use alternative currency, legal structure and private ownership have a significant positive impact on growth.

In regard to trade freedom or trade openness, which is an indicator of economic freedom, Asamoah et al. (2019) found a significant and positive relationship with economic growth of sub-Saharan Africa. In fact, their study reports 71.10% increase in growth due to trade for 34 sub-Saharan African countries for the period 1996 – 2016. However, this finding contradicts the "Spaghetti Bowl" effect, introduced by Bhagwati & Krueger (1995), which posits that trade openness imposes additional constraints and costs, particularly on developing nations. When an overlapping number of free trade agreements are offered to a country, it limits their chances to experience full economic integration, as it imposes several trade restrictions and transaction costs on them. This ripple effect slows down their trade relations and thus trade flows. From this perspective, trade openness can have a negative impact on economic growth.

Researchers have also studied the relationship between governance systems and financial or stock market performance. Hooper et al. (2009) examined the association between the quality of government institutions and stock market performance. They found a positive association between the two variables, implying that countries with better institutional systems provide higher stock market returns. This finding supports the view that better quality governance is a requirement for financial market development and performance; however, it does not consider the diversification benefits that arises from countries with weak governance. Continuing the discussion on the positive link between quality of governance and stock market performance, it is considered that better government institutions reduce agency problems and transaction costs, and thus lead to higher stock market returns. However, from another viewpoint one can also assume that countries with superior governance systems will command equity premiums compared to countries with less superior governance systems which will in turn erode away the expected higher stock market returns. Huang (2010) also found a positive relationship between the quality of institutions and financial markets, especially for low income countries in the short-run. From a banking perspective, Law & Azman-Saini (2012) found that the quality of institutions is very important for financial development of a country. However, financial development, and within that especially stock market development, is achievable only when the threshold level of institutional development has been achieved. This condition is more applicable to low income countries. What this means for low income countries is that if they are able to achieve a certain level of governance then they can achieve stock market development too.

Better and supportive legal systems are also found to impact stock market returns positively. Such systems create inflow of investment funds even from risk-averse investors due to increased trust in a country's legal system. Aggarwal et al. (2005) found that fund managers (or institutional investors) prefer to invest in countries with a strong legal system, high quality accounting and auditing, disclosure policies, and strong investor protection rights. Development of London as a financial hub is believed to be due to the fairness of England's legal system and common law (Rosenberg & Birdzell 1986). La Porta et al. (1997) found that countries with a weak legal system to protect investors and poor quality of law enforcement suffer from smaller capital markets. They also found that, among developed nations, France has the least developed financial market and the weakest investor protection system in place. Controlling for income, they also found France suffers from poor law enforcement. On the other hand, common law countries are found to give more emphasis to investor protection and, hence, are highly valued by investors. These countries, as a result, have larger financial markets. This finding is also supported by La Porta et al. (1998).

Political risk and political stability are strongly related to stock market performance. Lehkonen &

Heimonen (2015) found that higher political risk decreases stock market returns and vice-versa. However, this relationship holds only after a certain level of democracy has been achieved by a country. Once the threshold level of democracy is reached, the level of political risk declines and, as a result, the impact on stock market performance increases, leading to higher returns on investment. However, given that emerging markets are segmented, one measure for democracy does not apply to all. The study suggests that the impact on stock market performance may vary depending on the choice of measure for democracy. Their study also finds that changes in exchange rates, GDP per capita and private sector credit supply impact stock market returns, but negatively. Similar results are found by Erb et al. (1996), Diamonte et al. (1996), and Perotti & van Oijen (2001). Diamonte et al. (1996) explain that political risk is a more important variable for determining stock market performance in emerging markets than in developed markets as changes in political risk in emerging markets have a large impact on their stock market returns. The paper also suggests that if one can forecast political changes in emerging markets then one can estimate its impact on stock market returns easily, while in the case of developed markets, it is advisable to spend resources on stock market forecasting. However, in recent times, developed markets seem to carry more political risk than emerging markets. Examples such as Brexit, conflict between Russia and the Ukraine, and Trump's controversial statements towards China, Mexico etc. have increased thepolitical risk of developed nations. Political tensions such as the 2011 Arab Spring, which started in Tunisia but then spread across Libya, Egypt and a few other countries in the region, have impacted their financial performance. Egypt's broad market index dropped 10% towards the end of January 2011 (Lehkonen & Heimonen 2015). Even large nations in the Americas, Europe and Asia were impacted by this situation because investors anticipated that tensions would continue to spread to other countries. Perotti & van Oijen (2001) attribute privatisation to improvements in stock market performance. Privatisation is expected to strengthen institutional and legal systems, which in turn impacts stock market returns. Strong institutional and legal systems increase investor confidence due to which more investments flow in to stock markets.

Literature discussing the impact of corruption on economic growth and stock market performance is mixed. Mauro (1995) evidences a negative relationship of corruption with investment and economic growth. They found that poor countries, in particular, have higher levels of corruption and are politically unstable. If efforts are made to improve institutional inefficiency then economic growth can be improved.

For example, their findings shows that by improving integrity and efficiency of bureaucracy, Bangladesh could bring improvement in its investment rate by 5% points, which would contribute to a 0.5% point increase in its annual GDP growth rate. Similarly, Méon & Sekkat (2005) also found a negative relationship between corruption and investment, and economic growth. However, unlike previous studies, they did not find any dependence between investment and growth. Instead, they argue that it is the quality of governing institutions that impacts corruption, which affects economic growth. Differing quality levels have different impacts. Specifically, when governments are inefficient, RL is weak and there is lack of PV, then the impact of corruption on investment worsens. Similarly, when there is high corruption in countries with weak governance then it slows down economic growth. Countries that give less emphasis to disclosure and transparency are also expected to be impacted negatively. Less international investment is expected to flow in and, during turbulent times, these funds are expected to flow out faster (Gelos & Wei 2002). Thus, it would be beneficial for countries with weak governance to put effort towards decreasing corruption.

Aidt et al. (2008), on the other hand, shows that economic growth of countries with weak governance is not much impacted by corruption, while economic growth of countries with good governance is affected if corruption increases. Méon & Weill (2010) confirm that the impact of corruption is not as much in countries where institutional governance is already weak. In saying that, it does not mean that corruption should not be dealt with. Increase in corruption in such countries can further worsen institutional and legal frameworks, which will only deteriorate its governance levels, thus creating a vicious circle of bad governance. Another study, by Heckelman & Powell (2010), refuting a negative relationship between corruption and growth, explains that corruption impacts growth negatively only when improvements are made in government regulations and government size. When these two variables are weak then corruption enhances growth instead. What this means for policy-makers is that efforts should be towards improving institutional governance rather than reducing corruption as it may not always be beneficial. A recent study by Spyromitros (2020) confirms that corruption may not necessarily be harmful to stock markets, especially in developed and emerging markets. They find a negative relationship between corruption and stock market volatility for 16 countries for the period 2010 – 2016. The author, however, warns that this outcome should be considered with caution as it is based on perception, via Transparency International's Corruption Perception Index, and not experience.

According to a report by Hedberg (2014), those that understand the significance of good governance are usually companies and countries that are very well managed and better positioned to provide attractive returns in the long-term. In her experience, she has found that, since frontier markets have a less developed legal framework and hence weak rules and practices, they often demonstrate gaps both in their policies and implementation. Country-level good governance aims at attaining improved legal and institutional structures primarily to increase investor confidence in capital market operations, protect the interests of shareholders and conform to international standards. Bad governance, on the other hand, leads to bad outcomes such as the agency problem. The agency problem argues for the conflict of interest between insiders and managers as a result of having differing objectives and interests. Frontier markets, which are focus of this research, are challenged by weak governance practices, which is evident in their WGI score and ranking in the Index of Economic Freedom. At corporate level too, very few businesses have realised the importance of good governance. For example, a Botswana-based lender, Letshego, has set an example of improved transparency by publishing a 145 page annual report comprising of both a sustainability report and one on corporate governance. Their previous annual reports were usually 37 pages long and contained minimal financial information, (Smith 2014), showing lack of importance given to disclosure.

6.6 Summary

As good governance and good performance may be linked, what has been established for other countries may well be true for "governance-challenged" frontier markets; thus, the impact of good governance practices on frontier markets may be analysed. Hence, the two research questions this study attempts to answer are:

> RQ 2a: Do country-level good governance practices improve country-level performance of developed, emerging and frontier markets?
>
> RQ 2b: Which country-level good governance indicators impact the performance of developed, emerging and frontier markets?

Chapter 7

Data and Methodology

7.1 Overview

The objective of this chapter is to discuss the research objectives and research questions of this study, type of data used and its characteristics, sample and variable selection process and definitions, hypotheses development and models used for hypothesis testing. Accordingly, the structure of this chapter is as follows. Section 7.2 summarises the research objectives and research questions of this study. Section 7.3 discusses the nature of panel data, its characteristics, benefits and limitations and some econometric issues related to it. The sample selection process, definition and measurement of variables is discussed in Section 7.4. The development of hypotheses is explained in Section 7.5 and Section 7.6 explains the econometric modelling and estimation methods used for analysing the data. Section 7.7 provides the econometric model estimating the relationship between country-level good governance practices and performance. Finally, Section 7.8 concludes the chapter by providing a summary.

7.2 Research Objectives and Research Questions

As explained in Section 1.2, the research objective of the second study is to examine the impact of country-level good governance practices in developed, emerging and frontier markets on their country-level performance. The primary research objective is to understand whether adapting good governance practices by countries that are identified as frontier markets (see Table B.1), in particular, can provide financial gains to international investors in the form of either higher return or lower risk. The secondary research objective is to identify the specific country-level governance indicators that affect the performance of frontier markets and whether these are different to the indicators impacting the performance of developed and emerging markets. If found as hypothesised (refer to Section 7.5), then it can be suggested that countries that practice good governance are potential candidates for international portfolio diversification. According to the literature review (discussed in Section 6.5), the chances of financial gains from diversification in countries that are showing signs of improvement in governance practices are likely to be higher than countries that do not pay attention to or have weak governance practices.

Based on the above mentioned research objectives, this study attempts to answer the following two research questions:

RQ 2a: Do country-level good governance practices improve country-level performance of developed, emerging and frontier markets?

RQ 2b: Which country-level good governance indicators impact the performance of developed, emerging and frontier markets?

7.3 Panel Data

7.3.1 Panel Data and its Characteristics

This study uses panel data to measure the impact of country-level good governance practices on country performance of developed, emerging and frontier markets. According to Baltagi (2008), when cross-sectional units, also referred to as individuals, such as households, countries, firms, industries and such, designated with subscript i, are observed over multiple periods of time, designated with subscript t, panel data is created. A panel can be a balanced panel or an unbalanced panel. A balanced panel is one in which the number of time periods over which each cross-sectional unit is observed is the same for each cross-sectional unit, while in an unbalanced panel some cross-sectional units can have fewer or a different number of time observations (Brooks 2008). In this study, a balanced panel is used. A panel can either be a short or long panel. In a short panel, also called a micro panel, the number of cross-sectional units, indicated by N, is greater than the number of time periods, indicated by T, whereas, a long or macro panel is one wherein T>N. In this study, a short panel is used because the number of countries in each market, for analysing RQ 2a and RQ 2b, is greater than the number of time periods for which the data is available. A panel can either be static or dynamic. A dynamic panel involves including a time lag of the dependent variable as an explanatory variable in the regression equation in order to capture the impact of the lagged term on the dependent variable (Keele & Kelly 2006). A static panel does not include lag of the dependent variable. Since the objective of this study is to examine the impact of country-level good governance practices on performance and not to examine the impact of the lagged dependent variable on the dependent variable, for performance in this case, a static panel is used.

7.3.2 Benefits, Limitations and Econometric Issues in Panel Data

One of the many benefits of using panel data, as discussed in Hsiao (2005), is that the use of panel data results in more accurate parameter estimates than those obtained from only cross-section data or time series data. In cross-sectional data, the number of time periods over which the cross-section unit is observed is equal to one. For a time series data, the number of cross-section units is equal to one. Panel data combines the characteristics of both cross-sectional and time series data and therefore offers more variability and information. Another advantage of using panel data is that it suffers less from the issue of multi-collinearity among the explanatory variables and allows for more degrees of freedom. Panel data also controls for heterogeneity in the cross-sectional unit, thus preventing the risk of obtaining biased results. For example, when examining issues relating to debt repayment, attitudes related to lending and borrowing that are determined by country-specific factors such as colonial history, financial institutions, religious beliefs and political system should be taken into account. Ignoring these country-specific factors would lead to serious misspecification (Hajivassiliou cited in Baltagi (2008)). Panel data also allows for an examination of complex behavioural patterns that is not possible using cross-section or time series data alone. This is because panel data can be structured to have clusters or pecking order (Hsiao 2005). For example, a variable can be measured in city j of state l of country i at time t. Cross-sectional data does not allow this distinction and thus does not allow the measurement of participation rate at different intervals of time. Panel data, on the other hand, is able to capture this information. Another benefit of panel data is that it enables the measurement of changes in variables when observed over longer time periods. Baltagi (2008) mentions that panel data is well-suited to measure economic variables such as unemployment. This means that when a variable is observed over long periods of time, it is possible to see the impact of changes in economic policies on the said variable.

Some of the limitations of panel data, especially in panel surveys, are issues in designing, data collection and management of these surveys (Kasprzyk et al. cited in Baltagi (2008)). These issues can occur due to several reasons, such as lack of coverage, poor co-operation from respondents or no response, errors in the responses received from respondents, errors made by the interviewer, frequency and spacing of the interviews and such. Measurement errors also create distortion in the panel data. These types of errors happen due to ambiguous questions, intentional falsification of responses etc. (Kalton et al. cited in Baltagi (2008)). Sample selection can also pose problems in the panel data. For example, when respondents refuse to participate, if they are unavailable for the interview, they have relocated, died or find it expensive to respond, there is a problem of missing data which reduces the effectiveness of the results (Baltagi 2008). Although panel data does not overcome all the problems of cross-sectional and time series data, it certainly offers a richer data set, particularly when the cross-sectional units are observed over longer periods of time, say, five to ten years or longer (Baltagi 2008).

Serial correlation and non-stationarity are two main concerns when dealing with panel data. It is important to pay attention to the problem of serial correlation because of the time component in the panel data. One way to deal with it is to take the first difference of the data or use the first differences estimation method (explained in Section 7.6) at the time of performing regression, which wipes out any time-invariant effect in differencing. Another way is by conducting the unobserved effects test which is built in the "plm" package (Croissant & Millo 2008)[47] in R Studio (RStudio Team 2016). This package has been developed specifically for the purpose of estimation of linear panel models. The function "plm" within the package supports five estimation methods, specifically, pooled OLS, between estimation, first differences estimation, fixed effects and random effects, which are explained in Section 7.6. The unobserved effects test, also referred to Wooldridge, is a semiparametric test wherein the null is that there are no unobserved effects in the residuals (Wooldridge 2002). The function "pwtest" is used to perform this test and a rejection of null hypothesis suggests the presence of serial correlation (Croissant & Millo 2008). The Breusch-Godfrey test and Durbin-Watson test can also be applied on the residuals of

[47] Details of the "plm" function can be found on pages 81 – 86 of the package documentation, which is available on `https://cran.r-project.org/web/packages/plm/plm.pdf`

the panel data. These tests can also be conducted in the "plm" package (Croissant & Millo 2008) using functions "pbgtest" and "pdwtest". Testing for non-stationarity, although not of much concern in the case of small or micro panels, that is, panels with fewer time periods, needs to be examined and solved for in the case of macro panels, where the time dimension is sufficiently large to have an impact. In this study, a micro panel is used; hence the need for examining for non-stationarity is not critical.

7.4 Sample Selection and Variables Description

The sample comprises 22 developed, 21 emerging and 17 frontier markets countries that are identified as candidates for this research in Section 4.3. Sample selection is based on the JCC (see Table B.1) that is created for the purpose of this research and discussed in detail in Section 4.3.1.1.

As one of the objectives of this research is to examine the impact of country-level governance practices on a country's financial performance, country-level variables are used to represent performance and governance. In this study, a country's financial performance is measured by returns earned by its broad market index[48]. Closing price data, in local currency, for each country's index is obtained from Thomson Reuters's Eikon database and prices are converted into returns for comparability. Country-level governance is measured using two sets of data. One, is the World Bank's Worldwide Governance Indicators (WGI) which measure country-level governance in six areas, namely, voice and accountability (VA), political stability and absence of violence/terrorism (PV), government effectiveness (GE), regulatory quality (RegQ), rule of law (RL) and control of corruption (CC); and the second is the Open Market Indicators of the Index of Economic Freedom, which measure governance in the areas of trade freedom (TF), investment freedom (IF) and financial freedom (FF). Each of these variables is discussed in Section 7.4.1. Data for both performance and governance variables[49] are gathered on an annual basis because the governance variables are updated by respective databases annually. The study period remains the same as followed in RQ 1, that is, from 2006 – 2017. The association between performance and governance is also measured in sub-periods, that is, during the GFC period which

[48] There are several indicators of financial performance; however, this study uses stock market performance for it. In the first study, the impact of diversifying superannuation assets in international equities of developed, emerging and frontier markets is examined. The equity performance of these countries is measured by the performance of their broad market indices. The second study, therefore, uses the same measure as a proxy for financial performance.

[49] Data on WGI is collected from `https://info.worldbank.org/governance/wgi` and on Open Market indicators is collected from `https://www.heritage.org/index/`

includes 2006 – 2009, and the post-GFC period from 2010 – 2017. Regional association is also measured for each market based on the regional classification presented in Table B.6.

7.4.1 Variable Description

Table 7.1 shows the list of variables used in the literature to measure the relationship between country-level governance and performance. The selection of dependent, independent and control variables used in this study is motivated by previous literature, data availability and hypothesis development, discussed in Section 7.5.

7.4.1.1 Dependent Variable: Financial Market Performance

In this study, the impact of country-level governance practices on the performance of a country's financial market is examined. The results of this study are useful in determining whether there is a positive effect of practising good governance and whether such practices should be encouraged. Financial market performance is the dependent variable which is represented by returns earned by a country's broad market index. Index returns are used as a proxy for a country's financial markets performance in order to keep it similar to the variable used in RQ 1 for examining portfolio diversification benefits for Australia's superannuation funds from developed, emerging and frontier markets.

7.4.1.2 Independent Variables: Governance

As discussed in Section 7.4, there are two sets of data that serve as country-level governance measures in this study, namely, WGI and Open Market indicators.

1. Worldwide Governance Indicators (WGI): The Worldwide Governance Indicators (WGI) were created by Daniel Kaufmann and Aart Kraay in the year 1999 under the World Bank's Worldwide Governance Indicators (WGI) project. The WGI is a data set that gives a quantified view on the quality of governance in developed and developing countries. This data set measures the governance of more than 200 countries and territories in six dimensions: VA, PV, GE, RegQ, RL and CC. Each indicator is measured on the basis of the data gathered from several data sources, such as households and firms, survey institutes, public enterprises, non-governmental and international

organisations (Kaufmann et al. 2010). WGI is used for this study because it is widely recognised for its reliability, mainly due to the authors' efforts to make the data and methodology accessible, use of a statistically sound approach and the importance placed on margin of error (Thomas 2010). The data set is also easily and freely accessible through the World Bank's database.

These six indicators are grouped in three clusters. The first cluster measures how a country's government is selected, monitored and replaced:

(a) voice and accountability (VA): measures whether a country's citizens have the right to select their government, and their right to freedom of expression, association and media. Some of the individual variables which go into the making of this measure are the democracy index, the political rights, civil liberties, and press freedom index, media sustainability index, open budget index and transparency in government policy making.

(b) political stability and absence of violence/terrorism (PV): captures citizens view on the likelihood of political tension or violence in the country. It specifically looks into social unrest, interstate and civil war, political terror scale, cost of wars and terrorism, security risk rating and ethnic problems.

The second cluster measures the ability of a country's government to formulate and implement policies:

(c) government effectiveness (GE): measures quality of public and civil service, level of political pressure, quality of policy formulation and implementation and government's commitment and credibility. The individual variables considered in this measure are institutional effectiveness, red tape, quality of education, public transportation and infrastructure.

(d) regulatory quality (RegQ): measures how competent a country's government is to formulate and implement policies and regulations that are in the interest of its private sector development. The measure looks into unfair competitive practices, price controls, tax discrimination, ease of setting up a new business, strength of local competition, barriers to entry, regional integration, access to capital markets and labour laws, among many other variables.

The third cluster measures how citizens and institutions uphold the rules and laws of the state:

(e) rule of law (RL): measures the level of confidence citizens and institutions have in the rules of the country and whether the rules are followed or not. Specifically, property rights, faith in police and courts, timeliness and speediness of the judicial system, liberal component index and contract enforcement is measured.

(f) control of corruption (CC): measures the extent of use of public power for personal gain. The measure looks at corruption among government officials, trust in politicians, deployment of public funds, corruption index, level of transparency in the public sector and rural areas to name a few.

2. The Index of Economic Freedom: The Index of Economic Freedom is a data set on 186 countries published annually by The Heritage Foundation. It measures each country's economic freedom, by looking at economic and political developments in four areas over which governments exercise control. These areas are the four pillars of economic freedom: rule of law (RL), Government Size, Regulatory Efficiency and Open Markets. Each of these four pillars is sub-divided into three measures of economic freedom. rule of law (RL) comprises property rights, government integrity and judicial effectiveness; Government Size comprises government spending, tax burden and fiscal health; Regulatory Efficiency comprises business freedom, labour freedom and monetary freedom, and Open Markets comprises trade freedom (TF), investment freedom (IF) and financial freedom (FF). Each country is given a score between 0 and 100 on each of these twelve economic freedoms. For the purpose of this study, the Open Markets pillar is used, in addition to WGI, as a measure of country-level governance. Open Markets captures a country's level of openness to international trade, international capital flows and investment rules and regulations. Growth in the level of trade, investment and financial freedom are measured as discussed below.

   (a) trade freedom (TF): captures tariff and non-tariff barriers imposed by countries that affect their level of imports and exports. Trade barriers can be in the form of tariffs, quotas, trade bans, and export taxes to either discourage imports or reduce the level of exports. Sometimes these barriers can be in the form of regulatory restrictions placed on health and safety, use of advanced technology and such, which can limit the level of economic growth and development of a country. The TF score is based on the trade-weighted average tariff and non-tariff barriers. It is measured using the following equation:

$$TradeFreedom_i = 100(Tariff_{max} - Tariff_i)/(Tariff_{max} - Tariff_{min}) - NTB_i \quad (7.1)$$

Where $Tariff_{max}$ and $Tariff_{min}$ are the upper and lower bounds for tariff rates and NTB_i is a penalty imposed for non-trade barriers. The penalty is based on a scale[50] which depends on the type of restriction imposed by the country: restrictions can be imposed on quantity, price, customs, regulatory restrictions such as licensing, sanitary and safety standards, advertising and media regulations, and direct government interventions such as the use of subsidies, aid, industrial policies, research-related benefits etc.

(b) investment freedom (IF): measures the extent of restrictions on inflow and outflow of capital across borders. Countries with no restrictions receive the highest score of 100. However, most countries have some form of restriction imposed on cross-border investments. Restrictions can be in the form of discrimination between domestic and foreign investments, limited access to foreign exchange, limits on payments, transfers and capital transactions or no access to foreign capital markets. Under this measure, different type of restrictions have different penalty points which are deducted from 100 to arrive at the final score. There are seven types of restrictions that can attract penalty points depending on the extent of restriction imposed. For example, under foreign exchange controls, 25 penalty points is applied if a country provides no access to foreign exchange for its residents or foreigners and 5 points are deducted if access is provided with a lesser number of restrictions (Miller et al. 2017, p. 464).

(c) financial freedom (FF): measures the efficiency of the banking sector, degree of government regulation, state intervention, development of financial and capital markets and openness to foreign competition. When banks and financial institutions are owned by the state, the level of competition reduces and so does access to credit. This is, therefore, not an ideal banking environment for banks and financial institutions and for the economy to thrive. Under this measure, the index scores each country in five areas, namely, extent of government

[50] A detailed methodology of trade freedom (TF) is discussed in Miller et al. (2017, p. 464).

regulation of financial services, degree of state intervention in banks and other financial firms through direct and indirect ownership, government influence on allocation on credit, extent of financial and capital market development, and openness to foreign competition. Countries are scored between 0 to 100 depending on the level of government interference. Minimal inference receives a score of 90 while repressive, defined as a situation when the banking system is designed in a way that does not allow the participation of private financial institutions in the market, is scored as 0 (Miller et al. 2017, p. 465).

7.4.2 Control Variable

In this study, annual GDP growth rate is used to control for macro-economic effects on the financial market performance. GDP is an indicator of a country's overall economic health. An increase in a country's GDP is a result of profitable performance of its business sector. When businesses earn and produce more, their profit levels rise and as a result their stock returns increase. Increase in stock returns is an indication that the shareholders view the company as a profitable one. When most businesses perform well, the overall returns of a country's stock market index increase and this is reflected in an increase in its GDP. This study controls for the effect of GDP on financial market performance in order to isolate and identify governance variables that influence the performance of financial markets.

Table 7.1: List of Variables and Variable Definition for RQ2

Variables	Definition
	Dependent Variable: Financial Market Performance
index_returns	returns earned by broad market indices of each country defined in Table B.1
	Independent Variables: Worldwide Governance Indicators
VA	Voice and Accountability
PV	Political Stability and Absence of Violence/Terrorism
GE	Government Effectiveness
RegQ	Regulatory Quality
RL	Rule of Law
CC	Control of Corruption
	Independent Variables: Open Markets
TF	Trade Freedom
IF	Investment Freedom
FF	Financial Freedom
	Control Variable
GDP	annual Gross Domestic Product growth rate (%)

7.5 Hypotheses

Based on review of theories and literature, discussed in Section 6.3 and Section 6.5, the following hypotheses are developed to test RQ 2a and RQ 2b:

$H2_a$: Country-level good governance practices improve country-level performance of developed, emerging and frontier markets.

$H2_b$: Country-level good governance indicators, voice and accountability (VA), political stability and absence of violence/terrorism (PV), government effectiveness (GE), regulatory quality (RegQ), rule of law (RL), control of corruption (CC), trade freedom (TF), investment freedom (IF), and financial freedom (FF) have positive impact on country-level stock market performance of developed, emerging and frontier markets.

7.6 Model and Estimation Methods for Hypothesis Testing

In order to examine RQ 2a and RQ 2b, this study has obtained panel data on governance variables, which is discussed in detail in Section 7.4.1, for all the countries identified in Table B.1 as developed, emerging and frontier markets. This data is collected for the period 2006 – 2017. To analyse panel data, this study uses the basic linear panel data model and five estimation methods which are explained in detail below.

The basic linear panel model is built on the following equation:

$$y_i t = \alpha_{it} + \beta_{it} x_{it} + \mu_{it} \tag{7.2}$$

Where $i = 1, ...n$ is the individual (country in the case of this research) index, $t = 1, ..., T$ is the time index and μ_{it} is the random disturbance term for country i at time T, with zero mean.

There are a number of assumptions that are made about parameters, error term and exogeneity of the regressors. The most common assumption about the parameter is of homogeneity which means that $\alpha_{it} = \alpha$ for all i, t and $beta_{it} = \beta$ for all i, t. This results in the following model:

$$y_i t = \alpha + \beta x_{it} + \mu_{it} \tag{7.3}$$

This is the standard linear model pooling all the data across i and t.

To model individual heterogeneity, the assumption is that the error term has two separate components one is specific to the individual (countries in this research) and does not change with time. This is called the unobserved effects model, which is written as:

$$y_i t = \alpha + \beta x_{it} + \mu_{it} + \epsilon_{it} \tag{7.4}$$

The choice of estimation method depends on the properties of the two error components in the above model. The error term ϵ_{it} is called the idiosyncratic error. This error term is normally assumed to be independent from the regressors x_{it} and the error of the individual, μ_{it}. The individual component may or may not be independent from the regressors. If it is not independent, that is, the individual component is correlated to the regressors, then using an OLS estimator for β under such circumstances will be inconsistent. Instead, a fixed effects estimation method (also known as within estimation or least squares dummy variables) is employed. That is, the fixed effects method treats the individual error term μ_{it} as a further set of n parameters to be estimated and gives consistent estimates of β. In cases where the individual component is uncorrelated from the regressors, a random effects estimation method is used. The pooled OLS estimation is consistent in this case when the error term, μ_{it}, is also uncorrelated with the regressors but it is not efficient because of serial correlation. Pooled OLS is the most efficient method for estimating β when the individual component is missing altogether (Croissant & Millo 2008; Wooldridge 2002).

The unobserved effects model can also be estimated using the first differences estimation method. In this method, the time-invariant individual components, the intercept and the individual error term, are removed by first-differencing the data, that is, by lagging the model and subtracting. The model thus looks as follows:

$$\Delta y_{it} = \beta \Delta x_{it} + \Delta \mu_{it} \tag{7.5}$$

Where $\Delta y_{it} = y_{it} - y_{i,t-1}, \Delta x_{it} = x_{it} - x_{i,t-1}$ and $\Delta \mu_{it} = \mu_{it} - \mu_{i,t-1} = \Delta \epsilon_{it}$ for $t = 2, \ldots T$ can be estimated using pooled OLS estimation method. The first differences estimation method is preferred when the errors μ_{it} are persistent in time, because then the $\Delta \mu_{it}$ will be serially uncorrelated.

The between estimation method considers the individual effects and averages out the time component of the data. That is, it considers only individual, or cross-sectional, information. This method is consistent in some situations such as non-stationarity and is preferred while estimating long-run relationships (Croissant & Millo 2008; Wooldridge 2002).

7.7 Econometric Model: Relationship between Good Governance and Performance

Based on the hypotheses developed in Section 7.5 and panel regression model and estimation methods discussed in Section 7.6, the following is the base econometric model that examines the impact of country-level good governance practices on country-level performance for developed, emerging and frontier markets.

$$index\_returns_{it} = \alpha_0 + \beta_1 \mathrm{VA}_{it} + \beta_2 \mathrm{PV}_{it} + \beta_3 \mathrm{GE}_{it} + \beta_4 \mathrm{RegQ}_{it} + \beta_5 \mathrm{RL}_{it} + \beta_6 \mathrm{CC}_{it} + \beta_7 \mathrm{TF}_{it} + \beta_8 \mathrm{IF}_{it} + \beta_9 \mathrm{FF}_{it} + \beta_{10} \mathrm{GDP}_{it} + \mu_{it} \quad (7.6)$$

Where,

VA_{it} = Voice and Accountability for country i and time t

PV_{it} = Political Stability and Absence of Violence/Terrorism for country i and time t

GE_{it} = Government Effectiveness for country i and time t

$RegQ_{it}$ = Regulatory Quality for country i and time t

RL_{it} = Rule of Law for country i and time t

CC_{it} = Control of Corruption for country i and time t

TF_{it} = Trade Freedom for country i and time t

IF_{it} = Investment Freedom for country i and time t

FF_{it} = Financial Freedom for country i and time t

GDP_{it} = annual Gross Domestic Product growth rate (%) for country i and time t

7.8 Summary

This chapter summarises the research objectives and questions that are established in Section 1.2 and Section 1.3. It describes in detail the nature and characteristics of panel data, its advantages, limitations and a few key econometric issues with this data type. With respect to sample selection, the study uses the same sample of countries that is used to examine RQ 1. A country classification methodology was specifically built for this research as discussed in Section 4.3.1.1 (see Table B.1 and Table B.6) which is followed in this second study. Selection of good governance variables, the control variable and the dependent variable is explained in this chapter. Because of the nature of the data, a panel regression model and estimation methods were employed at the time of data analysis. The rationale, model and methods are explained in detail. A static panel is used in this study instead of a dynamic panel because the emphasis of this study is to examine the impact of country-level governance practices on performance, which is the dependent variable in this study, rather than the impact of a lagged dependent variable, on the dependent variable which is the purpose of using a dynamic panel. The basic panel regression model which is used for testing the hypotheses is also presented in this chapter.

The following chapter explains the descriptive statistics and empirical results obtained from estimating the regression model explained above. Regression is conducted for the full study period from 2006 – 2017. It is conducted for the full sample of developed, emerging and frontier markets and also based on regional classification in each market. Results are also reported and discussed for the GFC sub-period from 2006 – 2009 and the post-GFC sub-period from 2010 – 2017.

Chapter 8

Analysis of Data and Empirical Results

8.1 Overview

The objective of this chapter is to report and discuss descriptive statistics and empirical results obtained from analysing the impact of country-level good governance practices on the performance of countries in DMs, EMs and FMs. Analysis is conducted for the full study period from 2006 – 2017 and sub-periods which include the GFC period from 2006 – 2009 and the post-GFC period from 2010 – 2017. Regional analysis, based on the regional classification presented in Table B.6, for developed, emerging and frontier markets, is also conducted. This chapter is structured is as follows: Section 8.2 briefly discusses the variables employed in this study and outlines the steps that were undertaken for analysing the data. Section 8.3 and Section 8.4 discuss descriptive statistics of each variable that is relevant to the hypothesis developed in Section 7.5. Section 8.5, Section 8.6 and Section 8.7 report and discuss results of panel regression analysis for each market. Within that, the sub-sections first discuss the regression results using all regressors. Then, correlation between the regressors and each variable's variance inflation factor (VIF) are reported and discussed. The sub-sections also report and discuss results of panel regression analysis after eliminating multicollinearity, which is identified using correlation estimates and VIF, between the regressors. Section 8.8 concludes this chapter by summarising the findings.

8.2 Econometric Analysis

In order to gain insights on the impact of country-level good governance practices, a balanced panel data set is examined for the full period from 2006 – 2017, GFC (2006 – 2009) and post-GFC (2010 – 2017) sub-periods and across regions for developed, emerging and frontier markets, according to Table B.1 and Table B.6. In the base model of this study, the broad market index return of countries in each market is the dependent variable and the World Bank's WGI and three indicators from The index of Economic Freedom are the independent variables, with GDP growth rate as the control variable. This is discussed in detail in Section 7.4.1. The World Bank's WGI are measured on a scale of −2.50 to +2.50 where higher values correspond to good governance practices while lower values indicate weak or poor governance. The Index of Economic Freedom grades each economic freedom on a scale of 0 to 100 to arrive at each country's overall score, where 100 is the highest possible score for any country. The base model remains the same across all countries, sub-periods and regions. However, when multi-collinearity is determined between independent variables, then highly correlated regressors and those that have higher VIFs are taken out of the model and panel regression analysis is performed on the new model. This study uses the "plm" package (Croissant & Millo 2008) in R Studio (RStudio Team 2016) for the purpose of estimation of linear panel models.The basic linear panel model and each of these estimation methods, specifically, pooled OLS, between estimation, first differences estimation, fixed effects and random effects, are discussed in Section 7.6. Accordingly, the following hypotheses are tested in this chapter.

> $H2_a$: Country-level good governance practices improve country-level performance of developed, emerging and frontier markets.

> $H2_b$: Country-level good governance indicators, voice and accountability (VA), political stability and absence of violence/terrorism (PV), government effectiveness (GE), regulatory quality (RegQ), rule of law (RL), control of corruption (CC), trade freedom (TF), investment freedom (IF), and financial freedom (FF) have positive impact on country-level stock market performance of developed, emerging and frontier markets.

8.3 Descriptive Statistics for Full Period: 2006-2017, Sub-Periods: GFC 2006-2009 and Post-GFC 2010-2017

Descriptive statistics for developed, emerging and frontier markets for the full period from 2006 to 2017 are presented in tables Table B.11, Table B.12 and Table B.13. This section reports and discusses descriptive statistics of developed, emerging and frontier markets in the full period, GFC and post-GFC sub-periods. As discussed in Section 7.4.1, the impact of country-level good governance practices on performance of each market is measured in this second study. Performance, which is the dependent variable of this study, is measured using returns earned by broad market indices of each country in the sample. The World Bank's six Worldwide Governance Indicators (WGI) and three indicators from the Index of Economic Freedom, namely, TF, IF and FF, are the independent variables that are used in this study. GDP growth rate is the control variable that is used.

8.3.1 Developed Markets

In developed markets, in general, the data presents a problem of skewed distribution. From Table B.11, except for annual GDP growth rate, all variables show negative skewness. More specifically, GDP shows positive skewness of 1.8460 while other variables range between −0.3808 and −1.9573. Except for IF, RegQ and FF, all variables display positive excess kurtosis which means that the distribution of these variables is peaked and has fatter tails than a normal distribution. More specifically, excess kurtosis of IF is 0.0171, which is very close to a normal distribution while that of RegQ and FF are a negative −0.5009 and −0.6633 respectively. GDP growth rate is the only variable to exhibit very heavy tails. Thus, it can be concluded that the data is not normally distributed.

The highest increase in the dependent variable, index returns, is 0.75 and the lowest is −0.66. Average annual return in the full period is 0.0572, indicating a positive increase in the future, with a standard deviation of 0.2222. The mean return during the GFC period is surprisingly positive (0.0368) with a standard deviation of 0.3295 while in the post-GFC period, average return is only slightly higher (0.0673) but with a lower standard deviation of 0.1412.

The maximum increase is in the independent variables; specifically, the World Bank's WGI ranges from 1.59 to 2.47, and the largest decrease is negative for three variables; specifically, VA (−0.39), PV

(−1.63) and CC (−0.03). The average score achieved by developed market countries during the full period in VA is 1.2106, PV is 0.8170, GE is 1.6162, RegQ is 1.5221, RL is 1.5883 and CC is 1.6744. The Index of Economic Freedom indicators, TF, IF and FF, have a large difference between their maximum increase and largest decrease. The maximum score achieved by countries under TF and IF is 95.00 but the minimum score under TF is 79.20 and under IF is 50.00. Maximum score in FF is 90.00 and the minimum is 50.00. The average GDP growth rate in the full period was 1.7871 with a minimum of −8.27 and maximum of 25.56 and standard deviation of 2.9816.

In the sub-periods, there is not much difference in the governance scores as compared to the full period scores. The minimum value of most variables in the full period, except RegQ and RL, are similar to the scores in the GFC period while the maximum corresponds to the post-GFC period. That is, the minimum under RegQ (0.63) and RL (0.27) in the full period matches the minimum score of the post-GFC period. Similarly, the maximum score of TF during the GFC sub-period is 95.004 and in the post-GFC period it fell down to 90.00. Mean scores for GE, TF, IF and FF have slightly improved in the post-GFC period. Similarly, average annual GDP growth rate (2.1373) of developed market countries also show improvement in the post-GFC period. However, performance in VA and CC have declined in the post-GFC period.

8.3.2 Emerging Markets

From table Table B.12, in emerging markets, except for IF, all other variables are either positively skewed or negatively skewed. The distribution of IF represents a normal distribution as its skewness is 0.0060. Four variables, specifically, VA, TF, FF and GDP growth rate, exhibit negative skewness while the rest are positively skewed. In terms of excess kurtosis, three variables, TF (6.3277), GDP growth rate (1.4802) and index returns (2.5471) demonstrate positive excess kurtosis, which indicates the presence of fat tails. For index returns this means that they are prone to extreme positive or negative fluctuations, which is a sign of risky investments. Negative excess kurtosis indicates flat tails and less outliers, which is the case for VA (−0.7157), PV (−1.1565), GE (−0.7956), RegQ (−0.7829), RL (−0.9659), CC (−0.0739), IF (−1.1026) and FF (−0.5463).

The dependent variable, index returns, has reached a high of 1.68 and low of −0.72 while keeping the mean return at a positive 0.1190 during the full period. Positive mean returns indicate an increase in future performance of the market. The mean return during the GFC is positive (0.2104), which is similar to developed markets, but the standard deviation (0.5228) is much higher. In the post-GFC period, the mean return (0.0733) is lower than what is earned during the GFC but that is probably because the risk levels are also lower after the crisis, which is represented by a lower standard deviation (0.2216).

The maximum values of all World Bank's WGI range between 1.11 and 1.58 and the minimum scores range between −0.88 and −2.00. Mean values of WGI vary in terms of their relationship with the dependent variable. That is, countries have scored negatively in PV (−0.3044) and CC (−0.0328) while positive in other areas. Low scores in PV and CC is a bad sign as it indicates that in emerging markets the level of a government's control on corruption is weak and political stability is poor. When compared to average scores of developed markets, emerging markets are lower in all areas of governance. In areas other than PV and CC, the mean score of emerging markets is positive and scores range between 0.0493 and 0.3618, however they are on the lower end of the WGI scale. According to WGI, countries are given a score between −2.5 and +2.5, wherein −2.5 indicates weak governance performance and +2.5 indicates strong governance performance. Emerging market countries also score lower than developed markets in the three indicators of The Index of Economic Freedom, namely, TF, IF and FF. The average score in TF is 77.6397, IF is 53.1548 and FF is 54.2460. The maximum increase in these areas has been 88.00 for TF and 90.00 for both IF and FF, however, the largest decrease is substantially lower than for developed markets. Specifically, the lower scores are 24.00 for TF and 20.00 for IF and FF. The standard deviation in all these three variables is much higher than what is observed in the case of developed markets for the full period. The average GDP growth rate, on the other hand, is much higher (3.8401) than developed markets during the full period but with a higher standard deviation of 3.5204. Between sub-periods, it is noticeable that countries' performance has improved in the post-GFC period in areas of PV, GE, RL, TF, IF and FF as the mean scores are higher than the GFC period but scores of VA, RegQ and CC have declined. GDP growth rate of emerging markets has also experienced a decline from 4.0011 in the GFC period to 3.7596 in the post-GFC period.

8.3.3 Frontier Markets

Descriptive statistics for frontier markets are presented in Table B.13. Except index returns, which exhibit positive skewness of 0.6586, all variables have negative skewness. The data is not symmetric and hence does not represent a normal distribution. The results of kurtosis is similar to what is observed for emerging markets, that is, variables TF (8.0634), GDP growth rate (6.9424) and index returns (2.4859) demonstrate presence of fat tails while the remaining variables exhibit negative excess kurtosis.

The mean of the dependent variable, index returns, in the full period is 0.0906 with a standard deviation of 0.3203. On comparing the performance of frontier markets in the sub-periods, it is evident that frontier markets gave higher returns during the GFC period (0.1447) as compared to the post-GFC period (0.0635). The risk levels were also higher during the GFC period (0.4697) than later (0.2064). The highest return earned during the full period is 1.44 while the lowest is −0.80.

With regard to the World Bank's WGI, frontier market countries have scored on an average negatively in VA (−0.1155), PV (−0.1105) and CC (−0.0519) in the full period and positively in the other governance areas such as GE (0.1345), RegQ (0.2599) and RL (0.1233). It is only in RL where the score of frontier markets (0.1233) is higher than emerging markets (0.0919). In areas where the score is low and negative, countries are said to suffer from weak governance. Even the highest score in these areas (1.21 for VA, 1.10 for PV and 1.30 for CC) during the full period is substantially lower than developed markets; however, quite surprisingly, they are similar to emerging markets. The average score of frontier markets in the three governance areas of The Index of Economic Freedom is lower than emerging markets in TF (75.5167) but only slightly better in IF (57.3438) and FF (55.4688). The maximum values are the same as emerging markets but the largest decrease is substantially lower in the case of TF (0.00) and IF (15.00). Such low scores exhibit the weakness of governance practices in frontier markets. The average GDP growth rate (4.0754) during the full period is higher than emerging markets (3.8401) and much higher than developed markets (1.7871); however, higher returns come with higher risk (3.6537). During sub-periods, both GFC and post-GFC, frontier markets have not performed well in governance areas of VA, PV and CC. The average score in all these variables during the sub-periods is negative, which is a sign of weak governance, although the average score in TF, IF and FF are similar to emerging markets in both sub-periods. The average GDP growth rate during GFC (4.6227) is higher than the post-GFC period (3.8018).

8.4 Descriptive Statistics of Regional Classification of Developed, Emerging and Frontier Markets: 2006-2017

Descriptive statistics of regional classification of developed, emerging and frontier markets for the full period from 2006 to 2017 is presented in Table B.14, Table B.15 and Table B.16.

8.4.1 Developed Markets

- Americas: From Table B.6, it can be seen that two countries, CAN and United States (USA), are identified to lie in the region, the Americas. Data for these two countries represents a non-normal distribution in all governance and performance variables. Data of seven variables is negatively skewed while the remaining four variables are positively skewed. All variables also exhibit excess kurtosis. TF (4.6923), IF (2.9107), GDP growth rate (2.9254) and index returns (1.5012) exhibit excess positive kurtosis, which means that they have a peaked distribution and fatter tails. Remaining variables exhibit negative kurtosis. Average index returns is 0.0638 with a standard deviation of 0.1675 in the full period. Maximum return earned is 0.31 and minimum possible is -0.38. In regard to the World Bank's WGI, the average score of RL (1.7125) is the highest, followed by GE (1.6642), CC (1.6563) and RegQ (1.5738). Both countries together have scored less in VA (1.2613) and PV (0.8054) over the full period. In terms of the indicators of the Index of Economic Freedom, both countries have scored on an average 86.9417 in TF, 73.3333 in IF and 76.25 in FF with a high standard deviation, especially in the case of IF (7.1728) and FF (5.7578). The average GDP growth rate is 1.6708 with a standard deviation of 1.6127.

- Europe, Middle East and Africa (EMEA): According to Table B.6, 16 developed market countries fall in the EMEA region. All variables used in the analysis, except GDP growth rate, exhibit negative skewness. In regard to excess kurtosis, RegQ (-0.7078) and FF (-0.5706) show negative excess kurtosis and the remaining variables have positive excess kurtosis, which means that there are many observations in the tails of the distribution, hence creating fatter tails. Excess kurtosis for CC resembles a normal distribution (0.0134) while that of GDP growth rate may have outliers (21.0397). Average return from EMEA indices is 0.0523 with a standard deviation of 0.2256. The largest return possible is 0.75, which is higher than the Americas, and the lowest is -0.66 during $2006-2017$.

In areas of governance, the average score of countries on WGI range between 1.6125, being the highest in CC, and 0.7307, which is the lowest in PV. The maximum possible score, which is equal to +2.5 on the WGI scale, is achieved by the EMEA region in the area of CC, that is, 2.47. This clearly indicates that the level of corruption in the countries that lie in this region is low. EMEA countries have scored 86.4740 in TF with a standard deviation of 2.2127, 80.2083 in IF and 72.1354 in FF but in both these areas of governance the standard deviation is greater than 10, which is quite high as compared to the Americas. The average GDP growth rate is 1.5163 with a standard deviation of 2.9959.

- Asia-Pacific: There are four countries that are identified in the Asia-Pacific region in Table B.6. The data, similar to other regions, is asymmetric. This is confirmed from the estimates of skewness in the table, where three variables, PV, GE and GDP growth rate, are positively skewed and the remaining are negatively skewed. There is a slight difference in excess kurtosis compared to the other two regions. Within that, two variables, GDP growth rate (3.7265) and index returns (0.5905) have positive excess kurtosis but the remaining variables exhibit negative excess kurtosis, which means flat tails, less outliers and most observations are closer to the mean. For index returns, a positive excess kurtosis indicates a risky investment. The average index return in the Asia-Pacific region is 0.0733 during 2006 – 2017 with a standard deviation of 0.2351. In World Bank's WGI, countries in this region have scored the highest in CC (1.9313), followed by GE (1.8560), RegQ (1.7490) and RL (1.6558). Average scores are lower in PV (1.1679) and VA (0.7179). GE and CC are the governance areas in which countries from this region have performed very well. Countries in the Asia-Pacific region have performed similarly to the other two regions in TF (86.9625). The scores in IF (78.0208) and FF (72.0833) are also quite competitive; however, standard deviation in these two variables is also higher than in the other two regions. The average GDP growth rate (2.9285) is higher for countries in this region than the other two regions.

8.4.2 Emerging Markets

- Americas: In the emerging markets category, there are five countries, Brazil, Chile, Colombia, Mexico and Peru, that lie in the Americas region. Results of regional descriptive analysis are provided in Table B.15. From the table, it can be noted that four variables, specifically, PV, TF, FF and GDP growth rate, are negatively skewed, although the distribution of PV is closer to a normal distribution and its skewness estimate is −0.0423. The remaining variables are positively skewed, indicating that there is asymmetry in the distribution of the majority of the variables used in this study. In regard to excess kurtosis, estimates of RL (0.0267) and CC (0.0965) show positive excess kurtosis; however, these estimates are very close to zero which resembles a normal distribution. The other three variables that also suffer from positive excess kurtosis are IF, FF and GDP growth rate. Among these, the excess kurtosis estimate of GDP growth rate (4.1097) indicates the presence of a large number of observations in its tails. The average index return that was earned during the full period of 2006 – 2017 was 0.1307 with a standard deviation of 0.3660. Average GDP growth rate was 3.4887 with a maximum of 1.68 and minimum of −5.29. In regard to the WGI of the World Bank, countries in this region have scored negatively in PV (−0.5132) and RL (−0.0647). In other areas of governance, the average score ranges between 0.1713 and 0.5055. In the governance areas of the Index of Economic Freedom, the average performance is between 61.6667 in FF and 77.6367 in TF during the full period. The standard deviation is the highest for IF (12.6723) while it is around 7.00 for the other two variables.

- Europe, Middle East and Africa (EMEA): From Table B.6, it can be noted that nine countries lie in the EMEA region. The results of their descriptive statistics show that, except FF (0.0608) and index returns (0.1984), all other variables are negatively skewed. In that, the skewness estimate of FF is very close to zero, that is, of a normal distribution. TF, FF and GDP growth rate have positive excess kurtosis and the remaining variables have negative excess kurtosis, which means that most of the observations are closer to the mean. The performance of broad market indices in this region has been 0.0823 on average in the full study period from 2006 – 2017 with a standard deviation of 0.3405. The average GDP growth rate during this period has been 2.6458 with a high of 11.11 and a low of −9.13 and a standard deviation of 3.7385. The performance of this region with regard to the World Bank's WGI is better than the Americas. Within that, the average score in all areas of governance is positive and in the range of 0.0124 and 0.4538, although standard deviation of most variables is higher than what is observed for the Americas. The average score in the governance areas of the Index of Economic Freedom is higher for TF (79.9657) as compared to the Americas but lower for IF (55.00) and FF (55.7407). Their standard deviation is also higher than in the Americas.

- Asia-Pacific: Seven countries lie in the Asia-Pacific region (Table B.6). For these seven countries, the distribution of four variables, specifically, VA (-0.5661), TF (-2.5525), FF (-0.0291) and GDP growth rate (-0.00471) are negatively skewed, while those of the remaining variables are positively skewed. In terms of excess kurtosis, TF (10.7846) has positive excess kurtosis with a large number of observations in its tails compared to the other variables, CC (0.00289), GDP growth rate (0.6986) and index returns (2.60), which also have positive excess kurtosis. The remaining variables have negative excess kurtosis. The average index return of this region during 2006 – 2017 is 0.1579 with a standard deviation of 0.3697. The highest possible return during this period is 1.62 and the lowest return earned is -0.66. The average GDP growth rate (5.6267) in this region is much higher than both the Americas and EMEA regions. In regard to governance practices, out of the six areas of WGI, the average score in four areas, VA, PV, RL and CC, is negative. Only in areas of GE (0.3674) and RegQ (0.1410), have countries that lie in this region scored positively. The performance of countries in the areas of the Index of Economic Freedom is weak, except in the case of TF, where the average score is 74.6512. The average score in IF is 42.3810 with a standard deviation of 14.3005 and FF is 47.0238 with a standard deviation of 12.1020.

8.4.3 Frontier Markets

- Europe, Middle East and Africa (EMEA): From Table B.6, it can be noted that there are 13 countries that are in the EMEA region. All variables used in this study exhibit negative skewness in the case of frontier markets in EMEA. Four variables, specifically, RegQ, TF, GDP growth rate and index returns have positive excess kurtosis, indicating the presence of observations in the tails of the distribution. However, in the case of RegQ (0.0105) excess kurtosis is very close to zero, resembling a normal distribution. The remaining variables have negative excess kurtosis however, in that, GE (-0.0517) and RL (-0.0635) resemble a normal distribution as excess kurtosis is very close to zero for both variables. Mean return from indices in EMEA for the period 2006 – 2017 is 0.0658 with a standard deviation of 0.2782. The highest possible return during this period is 0.75. The average GDP growth rate for the full period is 3.5992, the maximum being 11.34, with a standard deviation of 3.8536. In terms of governance, the average score of all predictor variables is positive. The average score of the World Bank's WGI range is between 0.0153 and 0.4465 on a scale of -2.5

and +2.5. The maximum possible score is in the area of RegQ, 1.7. In regard to the indicators of the Index of Economic Freedom, the average score ranges between 60.9615 and 78.3269 within a range of 10.5094 and 17.0530 standard deviation. The highest and lowest scores achieved are in IF and FF with the highest being 90.00 and lowest being 30.00.

- Asia-Pacific: In the Asia-Pacific region, there are three countries, Bangladesh, Sri Lanka and Vietnam, that are a part of frontier markets (Table B.6). Five of the eleven variables that are used in this study exhibit positive skewness, although, in that, PV resembles a normal distribution as it skewness estimate is 0.0032 while the remaining variables are negatively skewed. This shows that the data is not normally distributed. With regard to excess kurtosis, TF (5.3084) shows heavy positive excess kurtosis indicating that several observations lie in its tails. GDP growth rate (0.3830) and index returns (0.9664) also have positive excess kurtosis but not as high as TF. The other variables have negative excess kurtosis, which means that in these variables most of the observations lie closer to the mean and not in their tails. The average index return in the post-GFC period is 0.1981 with a standard deviation of 0.4499 and average GDP growth rate is 6.1389 with a standard deviation of 1.3020. With regard to the World Bank's WGI, the average score in all areas of governance, namely, VA (−0.7697), PV (−0.6556), GE (−0.3486), RegQ (−0.5486), RL (−0.4086) and CC (−0.6161), is negative, which indicates that the performance of the three countries that lie in this region is poor. The highest score is in PV (0.40) but is still quite low on the scale of −2.5 and +2.5. Performance of these countries in the areas of TF, IF and FF is also poor. The average score in TF is 63.3389 (standard deviation 18.5130), IF is 31.5278 (standard deviation 12.5823) and FF is 31.6667 (standard deviation 7.3679). The highest and lowest of TF is 83.10 and 0.00 while that of the remaining two variables is slightly better.

8.5 Panel Regression Analysis: Developed Markets

This section reports and discusses the results of panel regression analysis for developed markets for four groups: full period 2006 – 2017, GFC 2006 – 2009 sub-period, post-GFC 2010 – 2017 sub-period and regional classification as presented in Table B.6. Within the developed markets category, panel regression analysis is performed for each group mentioned above using all regressors discussed in Section 7.4.1.

Correlation between these regressors and VIF of each variable is estimated for the purpose of identifying multi-collinearity. After adjusting for multi-collinearity, panel regression analysis is performed again. Results are reported in the following sections.

8.5.1 Full Period: 2006-2017

Results for the full sample period are presented in Table B.17, Table B.18, Table B.19 and Table B.20. Table B.17 compares results of pooled OLS, between, first differences, fixed effects and random effects estimation methods. On examining the F-statistic, it is evident that the first differences model (F-statistic is 2.117198) is the best fitted model. F-test is used to identify the appropriateness of the model. F-statistic shows whether all the variables in the model are jointly significant or not, that is, whether or not all the coefficients are different than zero. When the p-value of the F-statistic is less than 0.05 then the said estimation method is significant at 5% level. The p-value of the F-statistic of the first differences estimation is 0.0022247 which is less than 0.05 and 0.01. This indicates that the first differences estimation method is significant at both 5% and 1% levels. In this model, independent variables PV and GDP growth rate show strong significance at 1% level, although the direction of both variables is not as expected. Increases in PV and GDP growth rate are expected to have a positive impact on broad market index returns of a country. However, from Table B.17 we can see that PV (−0.652654) and GDP growth rate (−0.018722) have a negative relationship with index returns.

In order to examine multi-collinearity in the model, Pearson's correlation between all regressors is calculated and reported in Table B.18. Each regressor's VIF is also calculated in Table B.19. VIF indicates the amount of variance caused by a variable in the regression model, thus pointing towards multi-collinearity. Results of Pearson's correlation reveal that there is high correlation between GE, RegQ, RL and CC, which lies in the range of 0.80 and 0.92. Correlation between PV and RL (0.63), PV and CC (0.65) and RegQ and FF (0.63) are also moderately high but by eliminating only RegQ, RL and CC from the above and examining their VIFs, the problem of multi-collinearity is mitigated. After adjusting for multi-collinearity, panel regression analysis is performed again using the following independent variables: VA, PV, TF, IF, FF and GDP growth rate. The results of this regression are presented in Table B.20. The results are the same as before adjusting for multi-collinearity. That is, the first differences estimation method is the best fit at 1% significance level for this data (p-value is 0.00031698)and the variables PV and GDP growth rate are also significant, also at 1% significance level. Both variables have a negative relationship with index returns.

8.5.2 GFC Sub-Period: 2006-2009

For the GFC sub-period of 2006 − 2009, the results of panel regression analysis are presented in Table B.29, Table B.30, Table B.31 and Table B.32. Table B.29 reports the results when all regressors are used in the model. F-statistic of two estimation methods, between estimation (p-value is 0.00026176) and first differences estimation (p-value is 0.033069), are significant. The between estimation method shows strong significance at 1% level wherein four regressors, namely, PV (−0.088037), CC (0.182363), TF (0.026930) and FF (−0.002646) are significant. From these regressors, PV and TF are very strongly associated to index returns as they are significant at 1% level. PV shows a negative relationship to index returns, while TF shows a positive relationship, which is as expected. As countries open their markets to international trade, increase in TF is expected to have a positive impact on their economy and financial markets. CC is also significant and has a positive impact on index returns. This means that as the level of corruption decreases, there is a positive impact on the overall performance of their financial markets. FF, on the other hand, has a significant negative relationship with index returns, which means that less governmental interference and more participation by private institutions does not necessarily result in positive financial performance of an economy. However, FF does not show strong significance, at 10% level. The first differences estimation method is also a good fit with significance at 5% level. In this estimation method, PV (−1.543883) and RegQ (−1.984047) are significant at 5% level and GDP growth rate (−0.071945) is significant at 10% level and all three variables have a negative association with index returns.

Correlations estimates between all regressors in Table B.30 show that GE, RegQ, RL and CC have strong correlation among them, which ranges between 0.73 and 0.92. There is moderately high correlation between PV and RL (0.63), PV and CC (0.66) and RegQ and FF (0.65) but by eliminating RegQ, RL and CC the multi-collinearity issue is managed. These four predictor variables also have high VIFs (Table B.31), hence eliminating them is essential. After adjusting for multi-collinearity, the model is tested again. Results of the regression analysis are presented in Table B.32. Estimation methods between (p-value of F-statistic is 0.000068) and first differences (p-value of F-statistic is 0.041901) are appropriate, with between estimation being the best fit method at 1% significance level. First differences estimation is significant at 5% significance level. PV is a significant predictor variable under both methods and has a negative relationship to index returns. GDP growth rate is also a significant predictor variable but it has a positive impact on index returns when estimated using the between estimation method and a negative impact under first differences estimation. As per the results of between estimation, we can also see that TF (0.022936) and FF (−0.002075) are significant. TF has a positive relationship to index returns and has a strong significance at 1% level while FF has a negative relationship and is significant at 5% level.

8.5.3 Post-GFC Sub-Period: 2010-2017

Results of the post-GFC period are presented in Table B.41, Table B.42, Table B.43 and Table B.44. From Table B.41, according to the F-statistic, there are four estimation methods that are a good fit to the data. However, in that, the adjusted R square of the fixed effects estimation method is negative. Theoretically, a negative adjusted R square indicates that the independent variables in the regression model are not suitable for explaining the proportion of variance in the dependent variable even after adjusting for degrees of freedom, hence it has been excluded from further discussion in this section.

Pooled OLS estimation method is significant at 5% level (p-value is 0.010375) and first differences (p-value is 0.000022) and random effects (p-value is 0.007135) estimation methods are significant at 1% level. The independent variable that is commonly significant at 1% level in all three regression results is TF. Not only is the significance level strong but also the direction of its relationship with the dependent variable is the same in all four regressions. TF has a negative relationship with index returns. TF measures the degree of tariff and non-tariff barriers that affect a country's imports and exports. Countries using more and higher non-tariff barriers are extensively penalised under this measure as the objective is to encourage international trade. Countries scoring higher in TF are those that have less or low non-tariff barriers, that is, these countries have achieved higher levels of economic freedom. However, the regression results show that increased international trade does not necessarily lead to improvement in their performance. This is specifically observed in the post-GFC period. VA is also significant across all three estimation methods; however, the level of significance is 5% only in the case of first differences estimation. It is significant at 10% level under the remaining two methods. The association between VA and index returns is positive, which means that increased levels of freedom of expression, freedom of association and media improve the perception of the country, which has a positive impact on their financial performance as a result. The results of the first differences estimation method also find PV (−0.251904) and IF (−0.012618) to be significant. PV is significant at 10% level and negatively related to index returns while IF is significant at 5% level and surprisingly is also negatively related to index returns. Higher IF is expected to have a positive impact on index returns as higher IF indicates that there are no restrictions on flow of investment capital.

With regard to correlation estimates, correlation between GE, RegQ, RL and CC is very high, between 0.83 and 0.93 (Table B.42). Their VIFs (Table B.43) are also above 5. Correlation between PV and RL (0.62) and PV and CC (0.64) and RegQ and FF (0.68) are moderately high. Thus, eliminating highly correlated variables from the regression model can help mitigate the issue of multi-collinearity. The VIFs of other variables in the regression model are between 1 and 3, which is acceptable. After eliminating highly correlated regressors, the results of the new regression model, presented in Table B.44, show that all estimation methods are a good fit to the data; however, since the adjusted R square of fixed effects estimation is negative, it is excluded from further discussion. Pooled OLS (p-value is 0.009186), first differences (p-value is 0.000017) and random effects (p-value is 0.0072679) estimation methods are significant at 1% level and the between estimator (p-value is 0.029463) is significant at 5% level. TF is a significant predictor variable at 1% level under all estimation methods except between estimation. Similar to the regression result obtained prior to adjusting for multi-collinearity, the direction of the relationship between TF and the dependent variable is negative. IF is another variable that is significant in all three estimation methods except between estimation; however, the significance level and direction of its relationship with the dependent variable is different under different methods. Specifically, IF is significant at 10% level under pooled OLS and random effects estimation and the nature of association with index returns is positive. The result is different using the first differences estimation method. In this, IF has a negative association with the dependent variable at 5% significance level. PV is positive and significant under pooled OLS and random effects estimation only, while VA is significant and in the positive direction under the between and first differences estimation methods. GDP growth rate is significant only when the between estimation method is used and it is positively related to the dependent variable.

8.5.4 Regional: Americas, Europe, Middle East and Africa (EMEA) and Asia-Pacific

In this study, in total 22 countries are identified in the developed markets category and this classification is based on the regional country classification presented in Table B.6. This country classification is specifically constructed for the purpose of this thesis using the country classification criteria of MSCI, FTSE and S&P Dow Jones indices, which is discussed in detail in Section 4.3.1.1.

Out of these 22 developed market countries, only two countries, specifically, Canada (CAN) and the United States (USA) lie in the Americas region. Results of regression analysis before and after adjusting for multi-collinearity, presented in Table B.53 and Table B.56, show that none of the estimation methods result in a good fitting model as the F-statistic is not significant. With regard to between and random effects estimation, the number of observations and cross sectional variables is not sufficient; hence there are no results to report in the tables. The situation is similar in the case of the Asia-Pacific region. Four countries out of the 22 lie in the Asia-Pacific region and their regression results, reported in Table B.61 and Table B.64, find that none of the estimation methods lead to a good fitting model. In the EMEA region, on the other hand, the first differences estimation method is significant at 1% level when all regressors are employed in the model (Table B.57). This is apparent from the F-statistic (p-value is 0.0027743) which shows that this estimation method is appropriate and the four predictor variables, PV, TF, GE and GDP growth rate are significant at 1%, 5% and 10% levels. We see that PV (−0.683445), TF (−0.036338) and GDP growth rate (−0.015782) have a negative relationship with index returns while GE (0.58602), although significant at 10% level, has a positive impact on index returns. After eliminating independent variables that are highly correlated with each other, that is, VA, GE, RegQ, RL and CC, the regression results, presented in Table B.60, provide that the first differences estimation method still shows strong significance, at 1% level (p-value is 0.00040983). Although the fixed effects estimation method is also significant, at 10% level, its adjusted R square is negative. In the fixed differences estimation, PV (−0.608110) is significant at 1% level, TF (−0.035599) and GDP growth rate (−0.017708) are significant at 5% level. The direction of the relationship of all three regressors with the dependent variable is negative.

8.6 Panel Regression Analysis: Emerging Markets

This section reports and discusses the results of panel regression analysis for emerging markets for four groups: full period 2006 – 2017, GFC 2006 – 2009 sub-period, post-GFC 2010 – 2017 sub-period and regional classification as presented in Table B.6. Within the emerging markets category, panel regression analysis is performed for each group mentioned above using all regressors discussed in Section 7.4.1. Correlation between these regressors and VIF of each variable is estimated for the purpose of identifying multi-collinearity. After adjusting for multi-collinearity, panel regression analysis is performed again. Results are reported in the sections below.

8.6.1 Full period: 2006-2017

Table B.21 presents results of regression analysis before multi-collinearity is adjusted for. From the table, it can be noted that the first differences estimation method is the most appropriate as it is significant at 1% level. Within that, GDP growth rate is significant at 1% level and is negatively associated with index returns. The between estimation method is also a good fit as it is significant at 5% level and in that, again, GDP per capita is the significant predictor variable at 1% level. However, its relationship with the dependent variable is positive. The fixed effects estimation method is significant at 10% level wherein GE (−0.468267), TF (−0.0096) and GDP growth rate (−0.018284) are all significant and negatively associated with index returns. However, its adjusted R square is negative, which means that the predictor variables are not adding any value to the model. Table B.24 presents results of regression analysis after removing predictor variables that have high correlation between them and have VIFs higher than 5. Specifically, GE, RegQ, RL and CC are eliminated from the regression model. Although VIFs of IF and FF are less than 5, correlation between the two is high, 0.74. Eliminating both these predictor variables does not make a significant impact to the model. Hence, the regression analysis is performed with predictor variables VA, PV, TF and GDP growth rate. The results show that, after eliminating multi-collinearity, estimation methods between and first differences are both are significant at 1% level and in both methods, GDP growth rate is the significant predictor variable. The only concern is that the direction of its relationship to the dependent variable is positive in between estimation while it is negative in first differences estimation. The fixed effects method shows weak significance at 10% level. Under this method, TF (−0.012141) is significant at 5% level and GDP growth rate (−0.014929) is significant at 10% level; however, the adjusted R square obtained is negative.

8.6.2 GFC Sub-Period: 2006-2009

From Table B.33, it can be noted that only the between estimation method best fits the data at 5% significance level. In that, RL, FF and GDP growth rate are significant predictor variables. GDP growth rate (0.056288) is significant at 1% level, RL (−0.490092) is significant at 5% level and FF (−0.010847) is significant at 10% level. VIF and correlation is checked to identify the issue of multi-collinearity and accordingly predictor variables GE, RegQ, RL, CC and IF are eliminated from the regression model. Correlation estimates between these variables range from 0.70 to 0.87, which is very high (Table B.34). VIF of GE (7,3601), RegQ (20.3802) and RL (10.0343) also suggests multi-collinearity in the regression model. Hence, these predictor variables are removed from the model. The new regression results, presented in Table B.36, show that the between estimation and first differences estimation methods are significant at 5% and 10% levels respectively. Under both estimation methods, GDP growth rate is the only significant predictor variable, that is, the other predictor variables in the model do not have a significant impact on the dependent variable. Under between estimation, GDP growth rate (0.053759) is significant at 1% level and is positively related to the dependent variable, while under first differences estimation, GDP growth rate (0.090974) is significant at 5% level but negatively related to the dependent variable.

8.6.3 Post-GFC Sub-Period: 2010-2017

In the post-GFC period, the regression results using all predictor variables are not successful in providing a best fit model. The results in Table B.45 show that the between estimation method is weakly significant at 10% level. None of the other methods are a good fit. Under between estimation, CC (0.107593), FF (0.003402) and GDP growth rate (0.011562) are significant. However, only GDP growth rate shows significance at 5% level; the other two are significant at 10% level. All three predictor variables have a positive relationship with the dependent variable. With regard to multi-collinearity, predictor variables GE (12.8960), RegQ (17.8419), RL (13.1609) and CC (7.6377) have high VIFs (Table B.47). Correlation estimates (Table B.46) among these variables are also very high, between the range of 0.84 and 0.90. Hence, these are eliminated from the regression model. IF and FF are also removed from the regression analysis because they have high correlation with each other (0.75). TF and IF also have high correlation of 0.69. Both variables are also excluded. Regression analysis is conducted again with predictor variables VA, PV and GDP growth rate. The results are presented in Table B.48. Even after eliminating multi-collinearity, between estimation is a good fit, significant at 5% level. GDP growth rate (0.011939) is the only variable that is significant at 5% level and has a positive relationship with the dependent variable.

8.6.4 Regional: Americas, Europe, Middle East and Africa (EMEA) and Asia-Pacific

According to the regional country classification presented in Table B.6, there are 5 countries in the Americas, 9 in EMEA and 7 in Asia-Pacific that are identified together as emerging markets. Results for the Americas are presented in Table B.65 and Table B.68. From Table B.65, it is evident that the first differences estimation method is the best fit as it is significant at 5% level. However, in this estimation method only GDP growth rate is the significant predictor variable at 5% level. The direction of association between GDP growth rate (-0.052892) and index returns is negative. The results of the regression analysis show that even the fixed effects estimation method is significant but the level of significance is at 10% level and in that the predictor variable GE (-1.058092) is significant, also at 10% level. However, after eliminating highly correlated predictor variables (Table B.66 and Table B.67), Table B.65 provides that first differences and fixed effects estimation methods are significant at 1% and 5% respectively. Under both estimation methods, GDP growth rate is the significant variable and the direction of its relationship with the dependent variable is negative. The first differences estimation method is also the best fit in the EMEA region under both circumstances, when regressing with all regressors and after adjusting for multi-collinearity (refer Table B.69 and Table B.69). GDP growth rate is significant in both regression results at 1% level and the direction of its relationship with index returns is negative. Another variable that is found to be significant, but prior to eliminating multi-collinearity, is CC (1.395334) at 5% significance level. However, since CC is one of the predictor variables that has high correlation with other predictor variables (Table B.70), it has been removed from the model. In the Asia-Pacific region, none of the estimation methods fit the data, both before and after adjusting for multi-collinearity, and this is because there is not enough cross-sectional data to conduct a regression analysis (Table B.73 and Table B.76). Hence, significance of the predictor variables cannot be determined.

8.7 Panel Regression Analysis: Frontier Markets

This section reports and discusses the results of panel regression analysis for frontier markets for four groups: full period 2006 – 2017, GFC 2006 – 2009 sub-period, post-GFC 2010 – 2017 sub-period and regional classification are presented in Table B.6. Within the frontier markets category, panel regression analysis is performed for each group mentioned above using all regressors discussed in Section 7.4.1. Correlation between these regressors and VIF of each variable is estimated for the purpose of identifying multi-collinearity. After adjusting for multi-collinearity, panel regression analysis is performed again. Results are reported in the sections below.

8.7.1 Full period: 2006-2017

Results of regression analysis before and after adjusting for multi-collinearity for the full period 2006 – 2017 are presented in Table B.25 and Table B.28. Before adjusting for multi-collinearity, it can be noted that the random effects estimation method is more appropriate than fixed effects and pooled OLS as the method is significant at 5% level. However, in all three estimation methods, TF is not only the only predictor variable that is significant but also shows very strong significance at 1% level. TF, however, is negatively related to the dependent variable. To mitigate the issue of multi-collinearity, predictor variables that are highly correlated and those that have higher VIFs, namely, GE, RegQ, RL, CC and FF, are eliminated from the regression model. TF and IF also have high correlation, 0.70, between them but it does not impact the regression results significantly, hence both variables are retained for further analysis. Once multi-collinearity is handled, the regression results show that all estimation methods are statistically significant; however, because the adjusted R square of the fixed effects estimation method is negative, it is not considered for further discussion. Pooled OLS, between estimation and random effects estimation are significant at 1% level. First differences is significant at 5% level. Across all four estimation methods, PV shows significance at 5% level except when the first differences estimation method is used, when it is significant at 10% level. PV has a positive relationship with the dependent variable under all four estimation methods. TF (−0.007072) is another variable that shows strong significance at 1% level under pooled OLS and random effects estimation; however, the direction of its relationship with the dependent variable is negative under both regressions. When between estimation is used, VA (0.079871) and IF (−0.003364) also show strong significance. When first differences estimation is used, GDP growth rate (−0.020411) is also a significant variable, besides PV, which is significant at 1% level.

8.7.2 GFC Sub-Period: 2006-2009

During the GFC period, in frontier markets, the regression results when all regressors (Table B.37) are used show that the three methods are significant. Specifically, between estimation, first differences and fixed effects estimation methods are all significant at 5% level. PV is the only predictor variable that is commonly significant across all three estimation methods; however, it shows weak significance at 10% level under between estimation but is strongly significant under first differences and fixed effects estimations at 1% level. The relationship between PV and the dependent variable, that is, index returns, is positive in all three methods. The only other variable that is also significant under the first differences method, in addition to PV, is the GDP growth rate (−0.047874). It is significant at 5% level. Under fixed effects estimation methods, besides PV, predictor variables VA (2.700999), TF (−0.018234), FF (0.034650) and GDP growth rate (−0.032831) are also significant. Among these, except VA, all variables are significant at 5% level, while VA is significant at 10% level. VA and FF are positively related to index returns, while TF and GDP growth rate are negatively related. After regression analysis is performed with all predictor variables, the model is checked for multi-collinearity. Six predictor variables, specifically, GE, RegQ, RL, CC, IF and FF, exhibit high VIF and correlation among them and therefore are removed from the model. Regression results after adjusting for multi-collinearity, presented in Table B.40, show that all five estimation methods are a good fit. However, as the adjusted R square of the fixed effects method is negative, it is not considered suitable for further discussion. Pooled OLS, between estimation and random effects methods, are significant at 10% level which indicates weak significance, while first differences estimation gives the best fit as it is significant at 1% level. Under first differences estimation, PV (2.118842) and GDP growth rate (−0.055526) are significant predictor variables, significant at 1% and 5% levels respectively. Under the remaining three estimation methods, TF is the only predictor variable that is significant and the level of significance is 1%. It shows a negative relationship to the dependent variable.

8.7.3 Post-GFC Sub-Period: 2010-2017

In the post-GFC period, when regression is performed using all predictor variables, none of the estimation methods are a good fit to the data (Table B.49). However, once predictor variables with high level of correlation and VIF are removed from the model, two methods, specifically the between estimation and first differences estimation methods, are found to be significant at 10% and 5% levels respectively. Predictor variables with high correlation and VIF are GE, RegQ, RL, CC, TF and FF (Table B.50 and Table B.51). Once these variables are removed from the model, regression results, presented in Table B.52, show that the first differences estimation method is significant at 5% level and between estimation is significant at 10% level. Under first differences estimation, VA (−0.381830) and IF (−0.019598) are significant while under between estimation only VA (0.066466) is significant. The direction of the relationship between VA and the dependent variable under both estimation methods, however, is contradictory. That is, from the results it can be noted that there is a positive relationship between the two variables when between estimation is used, while the relationship is negative when first differences estimation is used.

8.7.4 Regional: Europe, Middle East and Africa (EMEA) and Asia-Pacific

Under frontier markets classification (refer to Table B.6), there are 13 countries in the EMEA region and 3 in the Asia-Pacific region. Regression results of the EMEA regions are in Table B.77 and Table B.80. Before adjusting for multi-collinearity, we can see that the first differences estimation method is significant at 1% level and in that, three predictor variables have a significant relationship with the dependent variable. The three predictor variables are: RegQ (−0.810155) and FF (0.019291) at 10% significance level and GDP growth rate (−0.015723) at 5% significance level. After eliminating predictor variables that are highly correlated with each other (Table B.78) and have high VIFs, specifically, GE, RegQ, RL and CC, we can see that the regression results in Table B.80 show that four estimation methods are a good fit. Between estimation gives the best fit at 5% significance level. The other three methods, pooled OLS, first differences and random effects, are significant at 10% level. When between estimation is applied, two predictor variables, specifically VA (0.061352) and TF (−0.004482), are significant at 5% and 10% levels. VA is positively related while TF is negatively related to index returns. TF is also significant when pooled OLS and random effects estimation methods are applied and the direction of its relationship to index returns is also negative. The results of first differences estimation is different to the rest of the methods. Under this method, FF (0.017247) and GDP growth rate (−0.019308) have a significant relationship to index returns. In the Asia-Pacific region, none of the estimation method are significant, both before and after adjusting for multi-collinearity, and this is because there is not enough cross-sectional data to conduct a regression analysis (Table B.73 and Table B.76). Hence, significance of the predictor variables cannot be determined.

8.8 Summary

This chapter reports the results and discusses the findings obtained from examining the impact of country-level good governance practices on country-level performance for developed, emerging and frontier markets. The analysis is performed on a full sample for the period 2006 – 2017, sub-periods of which comprise the GFC period from 2006 – 2009 and the post-GFC period from 2010 – 2017. Regional analysis is also conducted, which is based on the regional classification presented in Table B.6 for the full period 2006 – 2017. The results of all the findings of this study are discussed in detail in this chapter. The analysis reveals that several good governance variables have a significant impact on country-level performance in developed, emerging and frontier markets; however, the direction of some of the variables in association with the dependent variable is not as expected. Specifically, with respect to the hypotheses presented in Section 8.2, it can be noted that all good governance variables are expected to be positively related to index returns; however, this is not what is found in this study, although there are possible reasons for it, which is discussed further in Chapter 9. The results provide evidence that governance matters. Good governance leads to good performance-better governance improves the performance of broad market indices of developed, emerging and frontier markets. However, it must be noted that this relationship may vary depending on the levels of development of a country and the impact of other external factors.

The following chapter summarises the findings of this study and also of the first study, establishes linkages with literature discussed in the earlier chapters and provides a conclusion to this research.

Chapter 9

Discussion and Conclusion

9.1 Overview

Superannuation is the cornerstone of Australia's retirement income system. It was introduced for the purpose of providing supplementary income to the Age Pension so that retirees can enjoy a modest standard of living in their years post-retirement. In 1992, Australia introduced the mandatory employer superannuation contribution (SG) because a large percentage of Australia's workforce was fast approaching their retirement age, see Figure A.5. This was done for the purpose of reducing financial strain on the government in the forthcoming years for providing for its ageing population. The SG and Age Pension combined with voluntary contribution is thus meant to cater to the financial needs of Australia's ageing population.

The superannuation industry is growing at a fast pace. As identified in Section 1.2, the total assets under superannuation as of 2018 is \$2.7 trillion, which is a 140% increase since 2008. In the last year, between 2018 – 2019, these assets have grown by 6.2% (Australian Prudential Regulation Authority 2019b). One of the issues in regard to superannuation is its asset allocation structure. As discussed in Section 1.1, around 60% of the superannuation assets are invested in the domestic market. Within that, 22.4% of the assets are invested in a heavily concentrated domestic stock market wherein the top ten stocks of the market control 48.4% of the market performance. Whether it is franking credits or factors such as familiarity, information asymmetry, or geographical proximity, a large home bias exists in the Australian superannuation industry (see Section 1.1). Drawing on this issue of home bias, this thesis explores the potential of international diversification in developed, emerging and frontier markets and associated good governance practices of these markets that may lead to improved performance. Specifically, the research objective of this thesis is two-fold. One, the thesis empirically examines and measures international portfolio diversification benefits for Australian superannuation investors in frontier markets and compares the outcome with developed and emerging markets. Two, the thesis empirically examines the impact of country-level good governance practices on country-level performance for developed, emerging and frontier markets. The intention is to identify good governance variables that have a positive impact on country performance and those that have a negative impact.

The remainder of this chapter is organised as follows. Sections 9.2 and 9.3 discuss major findings of both studies in light of the research objectives, research questions, Markowitz's MPT and public governance theory. Section 9.4 concludes this thesis. Section 9.5 explains the theoretical and practical contributions of this thesis which will be useful to investors, academics, practitioners, and policy-makers. Section 9.6 highlights the limitations of this thesis and Section 9.7 provides avenues for further research.

9.2 Summary of Major Findings and Discussion: Portfolio Diversification (Study 1)

The research objective of Study 1 is to examine and measure the benefits of international portfolio diversification for Australian superannuation investors in developed, emerging and frontier markets. For this purpose, the study seeks to identify whether the current level of international portfolio diversification of superannuation funds is optimal or further diversification can lead to gains in terms of higher returns or lower risk. Based on this research objective, as mentioned in Section 1.3, the following RQ was designed.

> RQ 1: Does portfolio diversification in developed, emerging and frontier markets yield risk-returns benefits to Australia's superannuation funds?

From the results discussed in Chapter 5 it is evident that Australia's superannuation funds can benefit, either in terms of higher returns or lower risk or both, from increasing their exposure to frontier markets stocks compared to developed and emerging markets. This finding is consistent with the evidence that literature presents in Chapter 3. A detailed discussion of the major findings is presented in the following sub-sections.

9.2.1 Superannuation and Developed Markets

There are three major findings for this sub-section:

i. The study reveals that correlations among developed markets, during the full study period from 2006 to 2017, are quite strong. This result is true for the GFC and post-GFC period as well, although correlations have fallen slightly in the post-GFC period.

   This finding is consistent with the international portfolio diversification literature on developed markets (discussed in Section 3.4). Correlation between developed markets has been increasing since the 1990s, although it is much higher today. Prior to the 1990s, Grubel (1968), Levy & Sarnat (1970), Solnik (1974), Lessard (1976) and Watson & Dickinson (1981) found that correlations between developed markets were low, and as a result, benefits from diversifying in them were larger. Grubel (1968) found that diversification in developed markets could have earned American investors a monthly return of 12.6% instead of the 7.5% without diversification. Solnik (1974) also found support for diversification in developed markets. From an Australian context also, investment in international markets, especially Japan, was found to be beneficial, both in terms of higher return and lower risk (Watson & Dickinson 1981).

   Since the 1990s, correlations have increased, however, signs of increasing correlation were noticeable as early as the 1960s. Levy & Sarnat (1970) found benefits from investing in developed markets but their recommendation states that gains will be larger if emerging (developing) markets are also included in the portfolio. A similar suggestion was offered by Solnik et al. (1996), who found larger diversification benefits between 1958 – 1995 if emerging markets were added to the portfolio. Both these studies imply that due to increasing market integration among developed markets, correlations between their assets are increasing. As a result, international portfolio diversification in them is not likely to be as beneficial as it was when markets were segmented. Further evidence on increasing correlations shows that correlation between developed markets has increased from 66% to 75% during 1971 – 1998 (Solnik & Roulet 2000). The pace at which correlations are increasing is slow but it is certainly increasing. Another observation is that short-term benefits from diversification in developed markets is declining while long-term benefits are still achievable. This is confirmed by Asness et al. (2011), de Santis & Gerard (1997), and Ibrahim (2006) but contradicted by Zhong et al. (2014), who points out that trade ties among developed markets have increased. Further into the 2000s, Zhang et al. (2013) demonstrate that correlations have increased permanently, especially after the GFC, among BRICS nations. That is, correlations are not likely to go back to the lower levels of the 1990s, particularly for developed markets.

ii. The study also reveals that unconditional correlations between Australia's superannuation funds and developed markets are low throughout the study period from 2006 to 2017. Conditional correlations suggest that correlations between these two variables are low but increasing over time. Results of unconditional and conditional correlations show some negative correlation as well. Correlations are negative with Israel, Sweden and Singapore using both models, however, unconditional correlation also finds a negative relationship with Hong Kong. Correlation between superannuation funds and remaining countries in the developed markets sample is positive. It is also found that correlations are negative with most countries during the GFC period, but they improve in the post-GFC period.

Literature on international diversification of superannuation and pension funds is scant in comparison to that on equities. A review of literature on pension funds (Jorion 1989; Kumara & Pfau 2011; Leibowitz & Kogelman 1991; Pfau 2011) asserts that investing in international markets is beneficial to pensioners. Pfau (2011) and Kumara & Pfau (2011) found that correlation between different assets that make up pension funds, and world stocks and bonds, is low. Specifically, their results show that on an average correlation between local stocks and world stocks, and local bank deposits and world stocks is around 0.30. Correlation between local stocks and world bonds, according to Pfau (2011) is -0.11, and according to Kumara & Pfau (2011) is -0.26. Correlation between local bank deposits and world bonds, according to Pfau (2011) is 0.39, and according to Kumara & Pfau (2011) is 0.17. Low correlation between pension fund assets and international assets indicates large diversification benefits. Leibowitz & Kogelman (1991) also state that pensioners can benefit by up to a 55% increment in their pension portfolio returns by investing in international assets. Jorion (1989) also supports this outcome.

This result, however, is in contradiction to the developed markets literature on international diversification. From Section 3.4.1, it can be understood that correlation among developed markets was low until the 1990s but it has increased since then. Today, correlations are increasing and very strong among developed markets. Australia is categorised as a developed market, in spite of which correlation between Australian superannuation funds and other developed market equities, according to the findings of this study, is very low. The main reason for low correlation is the nature of superannuation funds. Most studies, discussed in Section 3.4.1, examine correlation between two or more equities or bonds returns of developed markets: that is, between the same asset classes. A superannuation fund, however, is a fund which allocates superannuation contributions to multiple asset classes at a time, such as equity, fixed income, cash, property and infrastructure, commodity, etc. Correlation between Australian equity and developed markets equity is high but when more than one asset class is involved then the association becomes scattered.

iii. Portfolio optimisation results show that, during the full study period from 2006 – 2017, the best risk-return combination can be achieved through either the between 0 – 90% or the unrestricted portfolio. That is, both portfolios recommend 10% investment in international equities. These portfolios yield higher returns at a lower risk than the superannuation portfolio. This is when Pearson's correlation is used as an input to construct optimal portfolios. Canada, Switzerland, Hong Kong, New Zealand, and Singapore are the countries that provide international diversification benefits to Australian superannuation funds. When ADCC GARCH correlation is used as an input, none of the constructed portfolios are optimal, although, for a risk-taker, higher returns than the superannuation portfolio are achievable through the between 0 – 20% portfolio. For this benefit, 80% of the investment should be in international equities of Canada, the USA, Israel, Sweden, New Zealand, and Singapore. Regional portfolio construction shows that diversification in the Americas and EMEA is not beneficial but Asia-Pacific is. Anywhere between 40 – 60% investment in New Zealand and Singapore, in particular, can provide higher returns than the superannuation portfolio.

The literature review presented in Section 3.4 shows similar results. That is, the literature supports the evidence presented in this study that international diversification in developed markets has some benefits. Bouslama & Ouda (2014) found that an unrestricted portfolio yields higher returns than a portfolio with restrictions on how much can be invested overseas. Further, if the objective is to lower portfolio risk, then it can be achieved by investing only 50% of the total portfolio in international equities. Clarke & Tullis (1999) evidence that up to 20 – 30% investment in long-term international equities of Europe, Australia and the Far East can lead to diversification gains. Similarly, for Dutch investors, Wilcox & Cavaglia (1997) found that a Dutch portfolio typically has 25 – 30% exposure in international developed markets equities at any given time. Specific to pension funds literature, Jorion (1989) and Leibowitz & Kogelman (1991) assert that international diversification is beneficial for pension funds. Up to 55% higher returns than a domestic only portfolio can be achieved by investing in international assets, according to Leibowitz & Kogelman (1991).

From the above discussion it can be concluded that there is consensus between the findings of this study and the literature that international diversification in developed markets still provides benefits, either in terms of higher return or lower risk. These benefits are larger for pension or superannuation funds than developed market equities due to lower correlation between them and developed markets. Although diversification benefits exist, due to increasing integration these benefits may decline over time. Specifically, as reported in Chapter 5, gains are larger from developed markets of the Asia-Pacific region than the Americas or EMEA.

9.2.2 Superannuation and Emerging Markets

There are three major findings for this section:

i. Results of the study reveal that average correlation among emerging markets is fairly moderate over the full study period from 2006 to 2017, that is, between 0.4 to 0.7. However, for a few countries, namely Greece, Hungary, and the United Arab Emirates, correlations are between 0.1 and 0.2. Correlations are more stable in the Americas region but varying in the EMEA and Asia-Pacific regions. During the GFC period, correlations have increased for some countries, especially those that are closely connected with each other due to trade and/or geographical proximity. For example, in the Americas region, correlations are higher between Brazil and Chile, Chile and Peru and Mexico and Peru, and in the Asia-Pacific region among China, India, Indonesia and Malaysia. This increase is also observed for Greece, Hungary, and the United Arab Emirates. Post-GFC correlations, on the other hand, are found to be lower for most countries than during the GFC period.

This finding is consistent with international portfolio diversification literature on emerging markets. Moderate correlations indicate that there are larger benefits from diversification in emerging markets than developed markets. Levy & Sarnat (1970), back in the 1970s, had suggested the inclusion of developing markets equities if one wanted to gain from international diversification. A similar suggestion was given by Divecha et al. (1992) and Solnik et al. (1996), who identified that correlation between emerging markets was quite low and, thus, recommended including these assets in the portfolio. Gilmore & McManus (2002) also suggested that diversification benefits from emerging markets are available to US investors. Emerging markets of the Czech Republic, Hungary and Poland, in particular, were found to provide both short-term and long-term gains to US investors. From an Australian viewpoint, Gupta & Donleavy (2009) also recommended diversification in emerging markets of Brazil, China, Greece, India, Korea, Malaysia, and the Philippines, as correlations with these countries were in the range of $0.1-0.4$. The lowest correlation was between Australia and Greece (0.196). This finding is supported by Bouslama & Ouda (2014) and Cha & Jithendranathan (2009). Cha & Jithendranathan (2009) show that diversification in emerging markets of Latin America and Asia, in particular, is beneficial as they have low correlation with equities of the US. Their study also shows that with 20% in emerging markets, lower portfolio risk and volatility can be achieved. Ibrahim (2006) advocates long-term diversification gains from the emerging ASEAN region, in particular.

Despite the above-mentioned gains from emerging markets, many recent studies have found that correlations between some emerging markets have increased over time, due to which diversification benefits in them have declined. For example, Speidell & Krohne (2007) point out that correlation between emerging markets and the S&P 500 index and emerging markets and the MSCI EAFE index have increased from 0.5 in the 1980s and 1990s to 0.93 and 0.87 in 2010. In the same vein, Zhong et al. (2014) also dismiss long-run diversification benefits for US investors from emerging BRICS countries. Christophe (2017) also recommends that is it is better, especially, for US investors to stay invested in the home market than diversifying in the Asia-Pacific and

Latin American countries. Over time, more and more markets have become integrated with the US market, which has chipped away diversification gains for US investors. Also, during times of financial crisis when diversification should be beneficial, increase in correlations further reduces the possibility of financial gains. Zhang et al. (2013) explain that over time and especially due to crises such as the GFC correlations between emerging markets, such as BRICS, and developed markets have increased and are not likely to go back to lower levels. They show that economic shocks cause structural changes in the long-run behaviour of equity markets. A similar study, conducted by Gupta & Guidi (2012), which examined the impact of two crises, namely, the Twin Towers attack and the GFC, also found that correlations tend to increase after the crisis and do not go back to original levels.

ii. The study also reveals that unconditional correlations between Australian superannuation funds and emerging markets are low and negative for many countries, except the Czech Republic, Greece, Poland, and the United Arab Emirates, for the full study period from 2006 to 2017. These values are closer to zero and negative with many countries during the GFC period, except Greece. Greece continues to be positively correlated with superannuation funds in both sub-periods. The post-GFC results show a mix of positive and negative correlation which is lower than the GFC period. Conditional correlations also show that correlation between superannuation funds and emerging markets is low and negative in general. A significant decline is seen during the GFC period but correlations increase in the post-GFC period, although they is still low and ranges between −0.2 and +0.2 (see Figure 5.2).

As mentioned in the previous sub-section, literature on international diversification of superannuation and pension funds is scant. Most studies examine diversification benefits for domestic equities or bonds in international equities or bonds. In addition, as discussed in Section 1.1, superannuation contributions are invested in multiple asset classes, due to which correlation between them and emerging markets equities is low. A review of pension funds literature, presented in Section 3.4.4, ascertains that international diversification, in general, can add value to pension fund investments. Despite this well-established diversification phenomenon, in many emerging markets there are limits or restrictions on international investments. For example, in Greece, pension funds can invest up to 23% in domestic equities and the remaining in domestic bonds and cash (Angelidis & Tessaromatis 2010). There is no exposure to international assets. Latin America, on the other hand, employs draconian regulations (Srinivas & Yermo 1999). This policy is slightly less restrictive than Greece's as exposure to international assets is permitted but it is heavily controlled, in that the pension account holders cannot nominate their risk-return preferences or re-balance their portfolios, thus preventing them from achieving sufficient levels of diversification. Similarly, China's Pillar 1B and Pillar 2 pension funds invest only in domestic assets such as government bonds, bank deposits, equities and corporate bonds (Hu et al. 2007).

These restrictions are in place in order to protect pension holders' savings from being eroded away by weak investment decisions or market risk but several studies (Clarke et al. 2002; Jorion 1989; Kumara & Pfau 2011; Leibowitz & Kogelman 1991; Pfau 2011) have found international diversification to be beneficial for pension funds. Pfau (2011) finds that international diversification can provide benefits in terms of risk reduction and/or increased returns to emerging market pension funds. Within that, pension portfolios of Argentina and Brazil, due to a highly volatile domestic market, prefer to invest in cash and only international assets. Without international diversification, emerging market pension funds of Chile, Mexico and Russia would lose around 21.3% in portfolio returns. However, this strategy would also reduce portfolio risk by 20.7% which, might not be favourable to risk-takers. Diversification in international markets would reduce portfolio risk of Chinese pension funds by 60%. In the same vein, Kumara & Pfau (2011) also advise investing at least half of the portfolio of emerging market pension funds in international markets. They find this strategy to benefit 17 out of 25 countries in their sample. Pension funds of China, Israel, Pakistan and Sri Lanka accomplish better results when 80% of the portfolio is invested in international assets while pension funds of Argentina, Chile, South Africa and Turkey perform better with at least 40% in international markets.

iii. Portfolio optimisation results using Pearson's correlation show that, for the full study period from 2006 to 2017, the between 0 – 80%, between 0 – 90% and unrestricted portfolios provide the best risk-return gains. All three portfolios have a Sharpe ratio that is higher than the superannuation only portfolio and require only 10 – 20% investment in international markets. According to these portfolios, investment in Brazil, Chile, Colombia, Mexico, Peru, Greece, South Africa, the United Arab Emirates, China, and Malaysia will provide better financial gains to Australia's superannuation investors. Results of regional portfolio optimisation shows that diversification gains in terms of higher return and lower risk is achievable from the Americas, EMEA and the Asia-Pacific region through the between 0 – 90% and unrestricted portfolios. Both portfolios require between 8 – 10% investment in international regional markets. Results using ADCC GARCH correlation show that the between 0 – 60%, between 0 – 70%, between 0 – 80%, between 0 – 90%, and the unrestricted portfolios provide higher risk-return benefits than the superannuation portfolio. This outcome requires allocation of between 30 – 40% in international markets of Mexico, Peru, the United Arab Emirates, Malaysia, Taiwan, and Thailand. These portfolios not only provide higher returns than the superannuation portfolio but also reduce portfolio risk. Regional portfolio optimisation results show that the Americas, EMEA and the Asia-Pacific regions have the potential of providing higher returns than the superannuation portfolio; however, risks attached to them are also higher, especially in the Americas and EMEA regions. The Asia-Pacific region, on the other hand, has the potential to provider a higher return at a lower risk than the superannuation portfolio. This outcome is true for the between 0 – 60%, between 0 – 70%, between 0 – 80%, between 0 – 90%, and the unrestricted portfolios.

The above finding is evidenced in literature (see Section 3.4) which shows that no more than 50% diversification is required to earn financial gains from emerging markets. From an Australian perspective, Gupta & Donleavy (2009) show that diversification of up to 50% but not more than 10% in one emerging markets of Brazil, China, Greece, India, Korea, Malaysia, and the Philippines is beneficial. If this strategy is followed, it could yield mean annual returns of 14.16% at a standard deviation of 15.54, which is a significant improvement over mean annual returns of 8.16% at a standard deviation of 13.99 from the Australian only portfolio. The authors tested the results of portfolio optimisation by increasing the risk-free rate, to find that it leads to a decrease in the total investment in the Australian market and increase in the emerging markets, whilst improving overall portfolio returns. They believe that most Australian investors tend to restrict their investments at much lower level and the reason behind this is their lack of familiarity with emerging markets. In another study, Cha & Jithendranathan (2009) show that with up to a total of only 20% in the 19 emerging markets selected for their study portfolio gains can be made. They find that investment allocation in each emerging market changes with the risk-level of each market. Among high risk markets, the highest allocation is in Israel (4.30%) and among low-risk markets, the highest allocation is in Peru (3.43%). They also find that less than 10% investment in emerging markets does not yield statistically significant results over the S&P 500 index. Bouslama & Ouda (2014) suggest that, although unrestricted diversification in emerging markets is likely to be beneficial, restricted diversification can lead to lower portfolio risk and volatility. They show that portfolios with up to 50% in emerging markets one can benefit from risk-reduction. Exceeding this limit, however, does not provide further risk-reduction benefits. Divecha et al. (1992) also found that only 20% investment in these markets is sufficient to yield higher returns at a lower risk.

From the above discussion it can be concluded that there is consensus between the findings of this study and literature that international diversification in emerging markets has significant benefits, either in terms of higher return or lower risk. These benefits are large for both pension or superannuation funds and emerging market equities due to low correlations among them.

9.2.3 Superannuation and Frontier Markets

There are three major findings for this section:

i. Results of the study reveal that average correlation, during the full study period from 2006 to 2017, among frontier markets, ranges between 0.2 and 0.6. A few countries have even lower or negative correlations, such as Tunisia, Botswana, and Bangladesh with most other frontier markets. Regional correlations in the Asia-Pacific region are on an average less than 0.2 while in the EMEA region they range between 0.3 and 0.6. During the GFC period, however, correlations are found to be higher than the full study period among several frontier markets, especially those that either share borders or are each other's trading partners like Estonia and Lithuania. This increase is also observed for Tunisia, Botswana, and Bangladesh, whose correlations are lower than 0.2 or negative in the full study period. In the post-GFC period, these correlations are lower not only than the GFC period but also than what is observed during the full study period. The only exceptions are Estonia and Lithuania, which have a correlation of 0.779, and Oman and Vietnam, whose correlation has increased from 0.193 to 0.508, in the post-GFC period.

The above finding is consistent with the findings of the studies reviewed in Section 3.4.3. Berger et al. (2011) and Berger et al. (2013) assert the possibility of substantial financial gains from diversification in frontier markets. Market integration among frontier markets is low and, as a result, correlation between their assets is also low. Low correlation, as we know, creates the possibility of diversification gains. Berger et al. (2013) show that adding frontier markets assets to an already diversified global portfolio can provide further gains in terms of reduced portfolio risk and volatility. Substantial diversification gains were identified from GCC countries and, in that, MENA, due to low correlation among their stocks (Yu & Hassan 2008). Correlations were found to be negative between a few countries, such as Bahrain and Saudi Arabia, Oman and Morocco, Oman and Saudi Arabia, Oman and Jordan, and also with the US, UK and France indices. This finding is also true for Australian and US investors. Sukumaran et al. (2015) show that correlations between Australian equity and 10 frontier market equities are not higher than 0.40. Correlation is negative with Jordan and Ecuador. Correlations between the US and frontier markets are also lower than 0.40. Similar results are found by Marshall et al. (2015) for American investors. According to their study, monthly correlations between US and frontier markets the pre-GFC period were between 0.15 – 0.30 and in the post-GFC period were between 0.49 – 0.61. Even though correlations have increased since the GFC, they are still lower than with emerging markets. Even recent studies confirm potential diversification gains from frontier markets. Mensi et al. (2017) found that Asian frontier markets, especially China, Sri Lanka, and Pakistan, have larger potential for diversification gains. Likewise, Pätäri et al. (2019) demonstrated that developed and emerging markets have become more integrated with time than frontier markets. In the pre-GFC period, correlation between US and frontier markets was 0.049 and in the post-GFC period it has increased to 0.361. Similarly, correlations between European developed markets and frontier markets was 0.083 and has increased to 0.462. Even though correlations have increased after the GFC, frontier markets still have substantial potential for diversification gains. As a result, they recommend allocating more in frontier market equities.

ii. The study also reveals that unconditional correlations, for the full study period, between Australia's superannuation funds and frontier markets are low, as observed for developed and emerging markets. Within this, some countries are positively correlated with superannuation funds while others are negatively correlated. Correlations are quite low and close to zero for all countries in the sample. Correlations are low in the GFC period, and they further decline in the post-GFC period. Conditional correlations also show that correlation between superannuation funds and frontier markets are low, but they are also time-varying. However, unlike unconditional correlations, only one country, Oman, is negatively correlated to superannuation funds. All other countries in the sample are positively correlated in the full study period. Also, unlike unconditional correlations, the conditional correlation model finds that superannuation funds have moderate correlation with a few countries, such as Mauritius and Bahrain. In the GFC period, most countries experienced negative correlation or a substantial decline in their relationship with superannuation funds but this improves slightly in the post-GFC period (see Figure 5.3).

From Section 3.4.4 it can be noted that there are very few studies examining portfolio diversification of superannuation and pension funds, in general. These studies examine pension fund diversification in developed or emerging markets and for pension funds based in developed or emerging markets. None of them have considered frontier markets in their data sample. As a result, there is no evidence whether diversification of superannuation or pension funds in frontier markets, in particular, will be beneficial or not. However, drawing from literature reviewed in Section 3.4.3, two outcomes are expected. One, frontier markets are at different levels of economic and financial development than developed and emerging markets, and consequently, not integrated with the rest of the world. As a result, investing in them is expected to be beneficial and yield unique financial gains. In addition, as superannuation funds invest in multiple asset classes (Section 1.1), such as equities, bonds, infrastructure, property, commodities and cash, correlations between them and frontier market equities are expected to be low. Low correlation is a good sign for international portfolio diversification. Two, the pension fund literature review (see Section 3.4.4) has evidenced that international diversification of pension funds is value adding. Leibowitz & Kogelman (1991) show that pension funds can yield 55% higher returns by diversifying internationally. This suggestion is also recommended by Jorion (1989) and Clarke et al. (2002). Pfau (2011) and Kumara & Pfau (2011) evidence that correlations between pension fund assets and world stocks and bonds are low and, thus, diversification is expected to be beneficial. Within this, pension funds in Chile, Mexico, Brazil and Russia can earn around 21.3% portfolio returns while

Chinese pensioners can experience risk-reduction by up to 60% by diversifying internationally. Kumara & Pfau (2011) found that out of 25 emerging market pension funds in their sample 17 pension funds are better-off through international diversification. Going by the outcomes of this literature and the findings of this study, it can be concluded that correlations between Australian superannuation funds and frontier markets are expected to be lower than with developed and emerging markets.

iii. Results of portfolio optimisation using Pearson's correlation shows that, for the full study period from 2006–2017, the between 0–70%, between 0–80%, between 0–90% and unrestricted portfolios provide optimal diversification gains. The Sharpe ratio of these four portfolios is higher than the superannuation portfolio. This means they are successful in providing higher returns at a lower risk than the superannuation portfolio. By only investing between 20 – 30% in frontier markets of Slovenia, Kenya, Mauritius, Tunisia, Botswana, Bahrain, and Oman these gains are achievable. Results of regional portfolio optimisation also indicate that between 20 – 30% diversification in frontier markets is beneficial to Australian superannuation investors. Between EMEA and Asia-Pacific, Asia-Pacific countries of Bangladesh, Sri Lanka, and Vietnam have the potential to offer superior returns than EMEA countries. According to ADCC GARCH inputs, portfolio optimisation indicates that all constructed portfolios are capable of providing higher returns than the superannuation portfolio. Except the equally weighted and between 0 – 10% portfolio, all other portfolios have a higher Sharpe ratio than the superannuation portfolio. That is, these portfolios have the capability of yielding higher returns at a lower risk. Among these portfolios, the between 0 – 50% portfolio offers the best risk-return combination. Results of regional portfolio optimisation using ADCC GARCH are similar to when Pearson's correlations is used to construct optimal portfolios. That is, similar to the previous result, in the EMEA region, all portfolios, except the equally weighted and between 0 – 10% portfolio, yield higher returns at a lower risk than the superannuation portfolio. Further, the Asia-Pacific region has the potential to provide superior returns than both the EMEA region and the superannuation portfolio.

The above finding is consistent with the literature review presented in Section 3.4.3. Sukumaran et al. (2015) found that with only 20% in frontier markets Australian equity investors can earn on an average 14.39% returns each year with a standard deviation of 12.56%. Holding an Australia-only portfolio, on the other hand, is riskier. Its mean annual return is 14.92% but standard deviation is 25.27%. Diversification in frontier markets helps reduce portfolio risk in this instance. Similar benefits are found for US investors. The US-only portfolio yields a mean annual return of 11.39% at a standard deviation of 22.10%. By investing a maximum of 20% in frontier markets, US investors can gain 13.29% annual returns at a standard deviation of 12.05%. Marshall et al. (2015) assert that, even after accounting for transaction costs, investing in frontier markets is worthwhile. While re-balancing portfolios every month will increase transaction costs, if it is done every three months or so, benefits of diversification will not erode. Sukumaran et al. (2015) also found diversification gains with only 10% in frontier markets. Australian investors can earn annual mean returns of 13.37% at a standard deviation of 13.01%, which is much lower than the Australia-only portfolio. Similarly, US investors can earn 11.35% annual mean returns at a standard deviation of 11.04%. Mensi et al. (2017) recommend Asian frontier markets for diversification over BRICS as they have the potential to offer more diversification benefits to developed market investors. The reason for this recommendation is based on higher trade linkages between developed markets and BRICS as compared to other Asian frontier markets.

In summary, the first study reveals that, despite globalisation, superannuation funds can benefit from international portfolio diversification. These benefits can be in the form of lower risk or higher returns. Low correlations between superannuation funds and equities of developed, emerging and frontier markets makes it possible to benefit from international portfolio diversification. Specifically, the study finds that diversification benefits are larger from the Asia-Pacific region of developed and emerging markets than the Americas and EMEA. Frontier market equities, on the other hand, have low correlations with superannuation funds throughout all regions, and hence, provide diversification benefits to superannuation funds from all regions. The study also reveals that portfolio diversification gains are achievable even during the GFC sub-period.

9.3 Summary of Major Findings and Discussion: Good Governance (Study 2)

Study 2 aims to examine the impact of country-level good governance practices on country-level performance of developed, emerging and frontier markets. The purpose of this research objective is to identify good governance variables that have a positive impact on country performance and those that have a negative impact. Based on this research objective, as mentioned in Section 1.3, the following RQs were designed to address the second research objective of this thesis.

RQ 2a: Do country-level good governance practices improve country-level performance of developed, emerging and frontier markets?

RQ 2b: Which country-level good governance indicators impact the performance of developed, emerging and frontier markets?

The major findings of the second study are:

i In the case of developed markets, the study finds that two variables, PV and GDP growth rate, are found to influence index returns in developed markets throughout the full study period and during both sub-periods. The direction of the relationship, however, changes during the sub-periods. That is, both variables have a negative relationship with index returns during the full study period. However, PV changes to positive during the GFC and post-GFC sub-periods while GDP growth rate remains negative during the GFC sub-period but becomes positive in the post-GFC sub-period. During the GFC sub-period, TF and FF are also found to impact index returns. TF makes a positive impact while FF makes a negative impact. The scenario is different during the post-GFC sub-period when, in addition to PV and GDP growth rate, VA is also found to impact stock returns positively. IF is also significant during this sub-period; however, it shows a positive impact under the pooled OLS and random effects estimation method but a negative impact under first differences estimation. In the case of regional analysis, examination is difficult for the Americas and Asia-Pacific regions due to small sample size. In the case of the EMEA region, PV, GDP growth rate and TF have a negative relationship with the region's index returns.

ii In the case of emerging markets, none of the governance variables have a significant association with index returns. Only the control variable, GDP growth rate, shows some form of association with index returns. During the full study period and both sub-periods, the direction of relationship between GDP growth rate and index returns is positive. However, when the association is examined for the Americas and the EMEA regions separately then the association is negative.

iii In the case of frontier markets, in the full study period, PV and VA show a positive association with index returns of frontier markets, while TF and IF show a negative association. During the GFC sub-period, PV has a positive relationship while TF has a negative relationship with index returns. In the post-GFC sub-period, IF has a negative relationship while VA shows a positive relationship under the between estimation method but a negative relationship under the first differences estimation method. Results for only the EMEA region are available and not for the Asia-Pacific region due to low sample size. In the EMEA region, VA and FF have a positive impact on index returns while TF has a negative impact. GDP growth rate is negatively associated with index returns during the full study period, GFC sub-period and for the EMEA region.

9.3.1 Relationship between PV and index returns

From the summary of major findings it can be noted that PV is a significant predictor of index returns for developed markets during the full study period, both sub-periods and also for the EMEA region of developed markets. PV is also significant for frontier markets during the full study period and GFC sub-period. It has a negative relationship with index returns of developed markets while there is a positive relationship with index returns of frontier markets.

As mentioned in Section 7.4.1.2, PV represents perceptions of the respondents of the survey, conducted as a part of the WGI project, about the chances of political instability, violence, protests and riots, terrorism and such. Each country is scored on a scale of −2.5 (weak governance) to 2.5 (strong governance). Higher scores indicate more political stability and lower scores indicate less political stability. From the literature, discussed in Section 6.5, the expected direction of the relationship between PV and stock market performance is positive. That is, countries with higher political stability are likely to yield higher stock market returns and countries with lower political stability are likely to yield lower stock market returns. The result for frontier markets is in the expected direction; however, that is not the case for developed markets. This is explained below.

Lehkonen & Heimonen (2015), Erb et al. (1996), Diamonte et al. (1996), and Perotti & van Oijen (2001) evidence that countries with higher levels of political stability or lower political risk have higher stock market returns. However, Lehkonen & Heimonen (2015) point out that a positive relationship applies only after the country has achieved a threshold level of democracy. That is, only when there is increased political stability do returns on investment increase: otherwise, higher returns cannot be expected. They also point out that this outcome depends on the variable considered to measure democracy, especially for emerging and frontier markets, as these markets are segmented. Different measures may have a different outcome. Similarly, changes in political stability affect developed, emerging and frontier markets differently. Diamonte et al. (1996) explain that political changes have a more severe impact on emerging or frontier markets than developed markets, also affecting their stock markets. So, although a positive relationship between PV and index returns is expected for those countries that have achieved democracy, turbulent times, crisis, or even perceived impact can change the direction of this relationship. For example, in 2011 when there were political tensions in Middle East countries, stock market returns of developed countries of the US, Europe and Asia also dropped due to its perceived impact (Lehkonen & Heimonen 2015). So, even though there is higher political stability in the US and European countries, events of other nations impacted their stock market performance. A similar situation was observed during the GFC: events of one country impacted the economic and financial performance of the rest of the world. This explains that a negative relationship between PV and index returns is also possible.

9.3.2 Relationship between VA and index returns

From the summary of major findings it can be noted that VA has a positive relationship with index returns of developed markets, frontier markets and the EMEA region on frontier markets. The direction of this relationship is as hypothesised.

As mentioned in Section 7.4.1.2, VA captures the perception of whether citizens of a country hold the right to select their government, freedom of speech, freedom of media, freedom of expression and freedom of association. Each country is scored on a scale of -2.5 (weak governance) to 2.5 (strong governance). Higher scores indicate higher levels of democracy and freedom and lower score indicate lower levels of democracy and freedom. This thesis hypothesises that the expected direction of the relationship between VA and stock market returns is positive. That is, countries scoring higher on VA are likely to yield higher stock market returns and countries scoring lower on VA are likely to yield lower stock market returns. The study finds a positive relationship between the two for developed and frontier markets. The results show that VA has a significant impact on index returns of developed and frontier markets in the post-GFC period, full period for frontier markets and also for the EMEA region of frontier markets.

Literature, however, is yet to establish a direct link between VA and stock market performance. It has found that democratic governments generally lead to a better standard of living for their citizens, give more emphasis to human capital, have higher economic growth and higher wages, and enable redistribution of wealth (Baum & Lake 2003; Besley & Kudamatsu 2006; Blaydes & Kayser 2011; Calvo & Murillo 2004; Ravallion & Datt 2002; Stokes 2005). A direct link between democracy and stock market performance is yet to be evidenced. The above-mentioned studies find that democratic governments create more opportunities for the poor, which leads to redistribution of wealth, thus uplifting their standard of living. Democratic governments also tend to focus more on human welfare and rights than autocratic governments. These factors contribute to improved economic growth. It is thus expected that public policies of democratic government are likely to be more effective and the gains in this area may transfer to the success of their stock markets as well.

9.3.3 Relationship between TF and index returns, FF and index returns, and IF and index returns

As discussed in Section 7.4.1.2, TF, FF and IF are the three variables that measure openness in the Index of Economic Freedom. From Section 7.4.1.2, TF measures the extent of tariff and non-tariff barriers imposed on import and exports. On a scale of $0 - 100$, countries that score higher have higher trade freedom, meaning that they impose less tariff and non-tariff barriers on their imports and exports. These countries favour international trade. Further, countries that score lower have less trade freedom. IF captures the amount of restrictions placed on flow of funds internally and externally. Countries that score higher have higher investment freedom, meaning less restrictions on flow of funds, whilst countries that score lower have low investment freedom, that is, there are more restrictions placed by the government on flow of funds, both domestically and internationally. FF measures the efficiency of the banking industry, and government control and intervention in the financial sector. Countries scoring higher have minimal government interference while countries scoring lower have heavier interference or are repressive. This thesis hypothesises a positive relationship between these variables and index returns of developed, emerging and frontier markets.

From summary findings, discussed above, it can be noted that

- For developed markets, TF is positively related to index returns during the GFC sub-period, but negatively to returns of the EMEA region. FF is negatively related but the result of IF varies depending on the estimation method used. Under first differences estimation, the relationship is negative and under pooled OLS estimation, the result is positive.

- For frontier markets, TF and IF are negatively related to the index returns but FF is positive for the EMEA region of frontier markets.

Literature, specifically, on TF, IF and FF is scant, however, substantial work has been done on the relationship between economic freedom and economic and/or financial growth. Economic freedom measures economic activity of a country with minimum government interference. Most literature has found that economic freedom increases economic and financial growth, thus establishing a positive relationship between the two. However, there are a few a studies that contradict this outcome. For example, Stocker (2005) and Stocker (2006) found that economic freedom impacts financial returns positively, however, they advise that it is more beneficial to invest in countries that currently have low economic freedom but are expected to reach higher levels in near future. In this way, investors can earn higher financial returns when higher economic freedom is achieved. From this, it can be understood that countries at the beginning level of economic freedom will have an inverse or negative relationship with financial returns. For this study, this means that certain developed or frontier markets that have a negative relationship with index returns are worth investing for future gains, only when a higher level of economic freedom is expected. Likewise, Scully & Slottje (1991), Heckelman (2000), Farr et al. (1998), and Cebula & Clark (2012) found a positive relationship between economic freedom and economic growth. Specific to TF, IF and FF, Cebula & Clark (2012) found that, in OECD nations, TF and IF are positively associated with economic growth and there is slight evidence for FF as well. For TF, Asamoah et al. (2019) found positive association with economic growth of 34 countries of sub-Saharan Africa. However de Haan & Siermann (1998), Carlsson & Lundström (2002), and Bhagwati & Krueger (1995) contradict this outcome. de Haan & Siermann (1998), Heckelman (2000), and Carlsson & Lundström (2002) explain that the direction of the relationship changes depending on the measure used for economic freedom as the definition of economic freedom is highly subjective. Carlsson & Lundström (2002) found that economic freedom affects economic growth but does not increase economic growth. Instead, they found that other economic freedom indicators, namely freedom to use alternative currency, legal structure and private ownership, impact economic growth in a positive manner. Bhagwati & Krueger (1995) explain why TF or openness will affect economic growth negatively using a phenomenon he calls the "Spaghetti Bowl". When countries, especially developing ones, engage in multiple trade agreements, their chances of experiencing full economic integration decreases as multiple competing trade agreements impose trade restrictions and costs on them. This creates a ripple effect and, eventually, slows down trade flows and consequently economic growth. Based on the "Spaghetti Bowl", it is understood that economic freedom is likely to affect economic growth negatively.

In summary, findings of the second study shows that good country-level governance improves country-level performance and vice-versa. It implies that good governance leads to good performance and bad governance leads to bad performance, thus, good governance matters. Higher levels of political stability is linked to higher stock market performance, which is evidenced in the case of developed markets. Frontier markets, on the other hand, demonstrate poor stock market performance due to poor governance. The study also shows that democratic governments attract more investor confidence as these countries are generally linked to higher economic growth, and thus is expected to have better stock market performance. The relationship between TF and index returns, found in this study, is contradictory to what literature has established. However, there is an explanation for this contradictory outcome, which can be understood through the "Spaghetti Bowl" phenomenon (Bhagwati & Krueger 1995).

9.4 Conclusion

A review of literature on international portfolio diversification indicates that portfolio diversification benefits from developed, emerging and frontier markets are still available to those who wish to either gain higher returns or lower their portfolio risk. Although these gains are larger from frontier markets than developed and emerging markets, both risk-takers and risk-averse investors can gain from international diversification. The review also indicates that superannuation funds and pension funds, in general, are under-diversified or focus predominantly on domestic assets, revealing that there is room for portfolio diversification. Benefits of international portfolio diversification for equity markets have been well-researched and well-established. However, whether such diversification will benefit superannuation funds and, consequently, superannuation members, is yet to be ascertained. The benefits that equity investors earn from diversification may be different to the benefits that superannuation funds can earn. Also, the markets and countries that benefit equity investors may or may not be beneficial to superannuation funds. Study 1 of this thesis examines and measures the benefits that developed, emerging and frontier markets bring to Australia's superannuation funds.

Tied with international portfolio diversification is the question of sustainability of these benefits. Frontier markets, in particular, have been criticised by media for being infested by authoritarian governments, corruption, lack of freedom, poor sanitation, etc. Literature shows that sustainability of portfolio diversification gains is possible only when good country-level governance is practised (de Brouwer 2003; Hall & Jones 1999). In reality, frontier markets are showing signs of improvement. According to CITI Bank's (2014) GDP growth forecast, these markets are expected to grow at a rate higher than developed and emerging markets for the next 30 years. Superior projections could mean substantial financial gains from these markets; however, from the literature, it can be noted that good governance leads to good outcomes and bad governance leads to bad outcomes. Whether country-level governance issues will erode away financial benefits from Australia's superannuation funds, if international portfolio diversification is considered is not yet known. Study 2 of this thesis examines the impact of country-level governance practices of developed, emerging and frontier markets on their country-level performance and identifies specific governance variables that make a significant impact on their performance.

The outcome of the first study shows that there is an overall consensus between the findings of this study and literature in regard to the benefits derived from international portfolio diversification. The results suggest that emerging and frontier markets have substantial potential to offer more diversification gains than developed markets. This finding is particularly important for Australia's superannuation funds as the study demonstrates that there is substantial room for making further financial gains from emerging and frontier markets. Gains are specifically larger from the Asia-Pacific region of emerging and frontier markets. Frontier markets have the capacity to provide higher returns and lower risk from diversification, which is suitable to both risk-takers and those who are risk-averse. With only between 10 – 50% diversification in these markets, superior financial gains can be achieved. Emerging markets also have the potential to offer substantial gains with 10 – 40% allocated in them. The Americas and EMEA regions of emerging markets are more suitable to risk takers but the Asia-Pacific region provides higher returns at a lower risk than the current superannuation portfolio. Developed markets, however, offer limited benefits: higher returns at a higher risk. This market is appropriate for a risk-taker and not a risk-averse investor. The results suggest that international markets, especially emerging and frontier markets, should not be overlooked during asset allocation. Presently, Australian superannuation funds invest more than 60% in the domestic market (Australian Prudential Regulation Authority 2019b). Within that, nearly 22.4% of the total assets are invested in listed Australian equities (Australian Prudential Regulation Authority) which are heavily concentrated in not more than 10 domestic companies. The performance for superannuation funds is, therefore, exposed to the performance and risks of these companies largely. Further diversification, especially in emerging and frontier markets, will certainly add higher returns or lower risk to Australia's superannuation funds.

Results of the second study are partially aligned with the literature, in that overall results suggest that governance matters. Good governance leads to good performance - better governance improves the performance of stock markets, but the relationship may vary depending on the levels of development of a country and impact of other external factors. For developed markets, PV has a negative relationship with index returns but for frontier markets, this relationship is positive. Generally, it is expected that equity markets of countries with higher political stability, like most developed nations, will perform better but this is not the case for developed markets. One possible reason for this outcome could be due to the impact of the events that took place during the study period (2006 – 2017): politically and financially difficult situations such as the GFC, Brexit, and the Arab Spring. Due to these factors, even those countries that are ranked higher in PV experienced negative financial returns from their stock markets. This relationship is positive for frontier markets. The majority of them score low in PV, suggesting that equity markets of countries with poor governance perform poorly. This shows that governance matters, especially for frontier markets. VA is positive for both developed and frontier markets, implying that democratic governments where citizens have the right to elect their leaders, and where there is freedom of speech, media and expression attract more investor confidence as these countries are generally linked to higher economic growth than autocratic governments or ones with less freedom. The three indicators of open markets of the Index of Economic Freedom - TF, IF and FF - have contradictory results. Although economic freedom, in general, is expected to improve economic growth, the literature is not conclusive on whether it improves financial market performance. The study finds that TF is negatively related to the index return of both developed and frontier markets. That is, higher levels of TF do not translate into improved equity market performance. According to Bhagwati & Krueger (1995), increased TF puts more pressure on developing nations as it increases their costs and trade restrictions instead. Similarly, IF has a negative impact on frontier markets index returns and FF has a negative impact on developed markets index returns. These results suggest that open markets have a worse impact on equity market returns.

9.5 Research Contributions

International markets can provide optimal places for investors to diversify their investments. Avoiding them reduces the available investment opportunities. The review of past literature has shown that many international markets have provided superior rates of return or risk reduction benefits than domestic markets. These reasons alone justify the benefits of international diversification. In addition, investigating the link between governance and performance of developed, emerging and frontier markets creates an understanding of their impact on Australia's superannuation funds and assists in taking better international asset allocation decisions. This thesis contributes to the existing body of literature on international diversification and governance-performance relationship by:

- first, creating the Joint Country Classification Matrix (JCC)(Table B.1). Different indices such as MSCI, FTSE and S&P Dow Jones use different methodologies for classifying countries into developed, emerging and frontier markets, which creates differences in their country classification matrices. This study finds that 28 countries are impacted due of the usage of different methodologies, which is presented in Table B.5. In addition, academic literature lacks discussion on the appropriateness or preference for a particular method or matrix. Therefore, in order to bring consistency in the country classification matrix and to ensure that the countries chosen in this thesis are classified in the same category across all three indices, this study creates the JCC.

- second, quantifying the potential benefits of international portfolio diversification for Australia's superannuation investors. Importance of portfolio diversification for Australian superannuation funds is discussed in Section 1.2. There are limitations inherent in attempting to diversify in the US or other developed markets in current times. Their short-run diversification benefits appear to be virtually non-existent and in the long-term all developed markets appear to be closely tied. Similar is the case of emerging markets as they are gradually moving closer to become developed markets. Frontier markets, on the other hand, are said to be unique in their characteristics in comparison to developed and emerging markets. They have been ignored in the diversification literature due to being perceived as unstable, struck by war, diseases and autocratic governments (Speidell & Krohne 2007). However, their circumstances have changed in the last few years and today they are showing strong potential for production, consumption and investment[51]. Global production and attention are expected to be directed to frontier markets, and due to lower costs and younger population, frontier markets have a huge growth potential and investments in them are likely to be more rewarding.

- third, providing a comprehensive view of the benefits derived from developed, emerging and frontier markets by using a sample of 59 countries for a 12-year period from 2006 to 2017.

- fourth, addressing the issue of good governance practices in frontier markets. So far academic research has delved more into governance issues in developed and emerging markets and less in frontier markets. Media usually paints a dark and distressful picture about frontier markets. They highlight issues like violence, slave-like working conditions, autocratic governments, etc. when discussing about frontier markets while discussions on their high growth rates, better growth prospects, demographic advantage, availability of resources, etc. are overlooked, even though there is substantial evidence for it. Such discussions bring forth the issue of investor confidence. Investor confidence is necessary for proper functioning of the economy. Improved investor confidence is expected to bring long term investment opportunities such as foreign fund inflows and foreign direct investments. Whether or not foreign capital is the prime source of finance in frontier markets, adherence to good governance practices will go a long way in improving domestic and

[51] Refer to Section 2.3 for a detailed review of frontier markets.

international investor confidence in these markets. This study contributes to the literature by examining country-level governance issues in frontier markets with the intention of identifying governance variables that affect frontier markets positively and those that affect it negatively. This study also compares the results with developed and emerging markets.

- fifth, bringing forth the issue of home biases in Australian superannuation funds. Superannuation is a retirement income that aims at providing a modest or comfortable standard of living in the years post retirement. Superannuation funds have been found to be under-diversified and suffering from home bias phenomenon; that is, superannuation funds predominantly invest in the domestic market. Home bias is easily visible in the superannuation asset allocation structure (Australian Prudential Regulation Authority 2019b). Approximately 61.6% of total superannuation assets is invested in the domestic market, out of which 22.4% is invested in listed domestic equities (as discussed in Section 1.2). The remaining is allocated to domestic fixed income, property and infrastructure, commodities, and others. With regard to SMSF, Phillips et al. (2007) provides evidence that these funds have negligible asset allocation in international markets. Even though in the case of SMSF, most of the investors are generally closer to their retirement age and hence risk-averse, it is not a sufficient reason for overlooking international markets in the investment portfolio when efficient diversification is achievable. By diversifying in a way where one can earn better returns at the same or low level of risk, one can achieve efficient diversification. Examining international markets will not only provide optimal places for Australian superannuation investors to diversify but also create awareness among them and other Australian investors about the hidden prospects of these markets.

The findings of this thesis adds value to existing literature and provides insights into the asset allocation structure of Australia's superannuation funds. As discussed in Section 1.2.2, $1/4^{\text{th}}$ of the total superannuation assets is invested in international equities, thus making it important for superannuation members and fund managers to have a strong understanding of international markets, underlying advantages and risk factors.

This thesis informs about the lack of publicly available data on the international asset allocation structure of superannuation funds. From Section 1.2.2, overall asset allocation structure of superannuation funds can be gathered; however, country breakdown of where 1/4th of the total superannuation assets is invested is not available. This data is of crucial importance and lack of it raises questions regarding transparency and misuse, which may be of interest to policy-makers. In addition, superannuation members that are keen to closely monitor the performance of their superannuation funds are unable to do so due to insufficient information. Lack of data also implies that members must trust the expertise of the fund managers. Another issue that stems from lack of data availability is about its misuse. Could lack of information and, thus weak accountability be used to make poor investment decisions or incentivised investment decisions? This question begs the attention of policy-makers.

The thesis also brings to light the home bias phenomenon. Superannuation funds are heavily home biased with nearly 60% of the total assets concentrated in the domestic market. This finding suggests that there is still substantial room for international diversification. To add support, the first study demonstrates that there are gains from diversifying in equities of emerging and frontier markets for both risk-takers and risk-averse investors. Therefore, policy-makers should pay particular attention to the asset allocation structure of superannuation funds and encourage the collection of data so that the impact of each international market can be periodically measured and, accordingly, asset allocation can be managed.

The first study informs that frontier markets should not be overlooked as they have substantial growth prospects which can provide diversification gains to both risk-takers and to those who are risk-averse. However, the second study informs that frontier markets largely suffer from weak governance, which translates into weak performance of their stock markets. This finding is of relevance to researchers, superannuation members, fund managers and SMSF investors that are seeking to explore and invest in frontier markets. It is also of relevance to policy-makers of frontier markets, as despite having strong growth potential, favourable demographics, abundant resources, poor governance practices not only gives them a bad reputation with media but also takes away investment and growth opportunities that could come their way. Policy-makers of frontier markets should attempt to improve their governance practices if they seek to attract foreign funds and foreign direct investments from international investors.

9.6 Limitations of the Research

The first limitation of this thesis is the problem associated with the unavailability of higher frequency superannuation data. Superannuation data is collected from APRAs "The Annual Fund-level Superannuation Statistics", as mentioned in Section 4.3.1.2. This data is available on an annual basis. Private data sources that maintain higher frequency data are available, however, the cost of obtaining data from them exceeds the research funds available to the researcher. Higher frequency data of daily, weekly, or monthly frequency is required for performing ADCC GARCH analysis. Hence, this is considered to be a major limitation of the thesis.

Second, in situations where higher frequency data is unavailable, interpolation can be performed on lower frequency data points, preferably using an indicator series, to generate higher frequency data points. This is discussed in Section 4.3.2. In this thesis, the Litterman maxlog interpolation technique is used. Using this technique, 133 monthly data points from 2006 – 2017 were generated. There are two limitations associated with interpolation. One, the choice of interpolation technique employed can have an impact on the results. Therefore, the results of this study should be interpreted cautiously. Second, conducting GFC and post-GFC analysis using the ADCC GARCH model is not possible as the model requires at least 100 data points in each sub-period to provide meaningful results.

Third, data availability for frontier markets, in particular, is limited. For many countries in the frontier markets category data is available only from 2006 as these markets have only recently opened up to international investors. This limits the scope of the analysis.

Fourth, the results of the first study cannot be generalised. That it, the results cannot be applied to other asset classes such as equities because a superannuation fund invests in several asset classes, including equities, and across several regions and markets. From the literature review, Section 3.4, it is evident that correlation between equities of developed and emerging markets has increased since the 1980s due to liberalisation and globalisation whereas in this thesis correlation between Australian superannuation funds and equities of developed, emerging and frontier markets is extremely low.

9.7 Avenues for Future Research

Based on the findings of this thesis, the following avenues for future research can be suggested. One, advanced estimation models such as asymmetric generalized dynamic conditional correlation (AGDCC) GARCH, copula GARCH, etc. can be used for measuring conditional correlations between Australia's superannuation funds and developed, emerging and frontier markets. Two, different portfolio optimisation models such as the single-index model, capital asset pricing model, mean-absolute deviation portfolio optimisation model, etc. can be used for creating optimal portfolios, and their results can be compared. Three, if research funding permits then data from sources that capture higher frequency superannuation data can be obtained instead of using interpolation. This will allow estimation of GFC and post-GFC results using GARCH models. Four, a comparative analysis can be conducted using US Pension Funds data to get a comprehensive understanding of the impact of international portfolio diversification on pension schemes. The results of the two studies, if similar, can be generalised for all pension schemes around the world. Five, different country-level governance and performance indicators can be used to measure the relationship between governance and performance. Six, the impact of international portfolio diversification can be examined for the different types of superannuation funds such as public sector funds, corporate funds, retail funds, and industry funds as each type of fund has a different investment objective and asset allocation structure.

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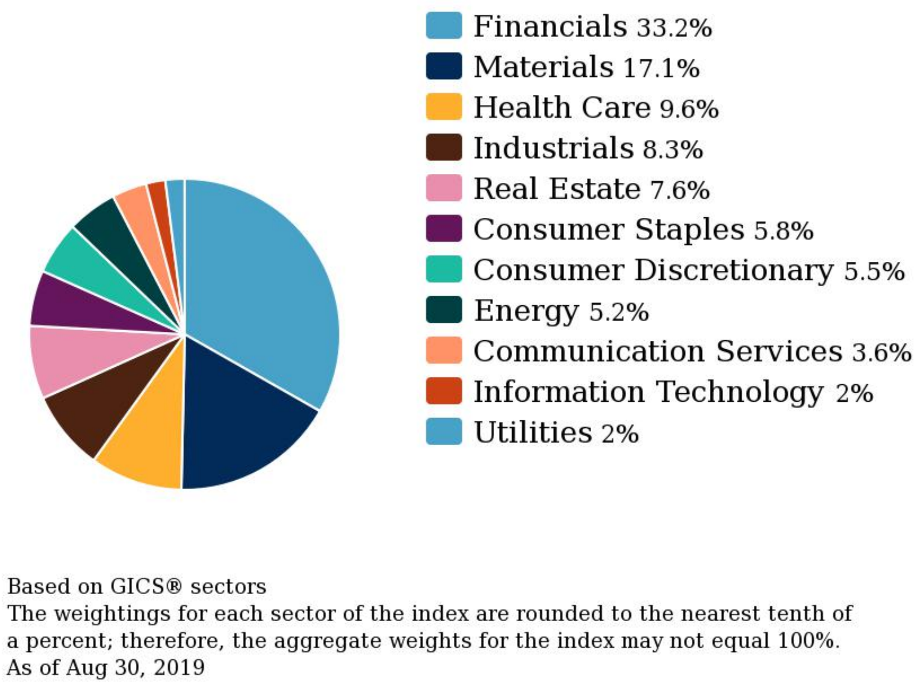
Appendix A

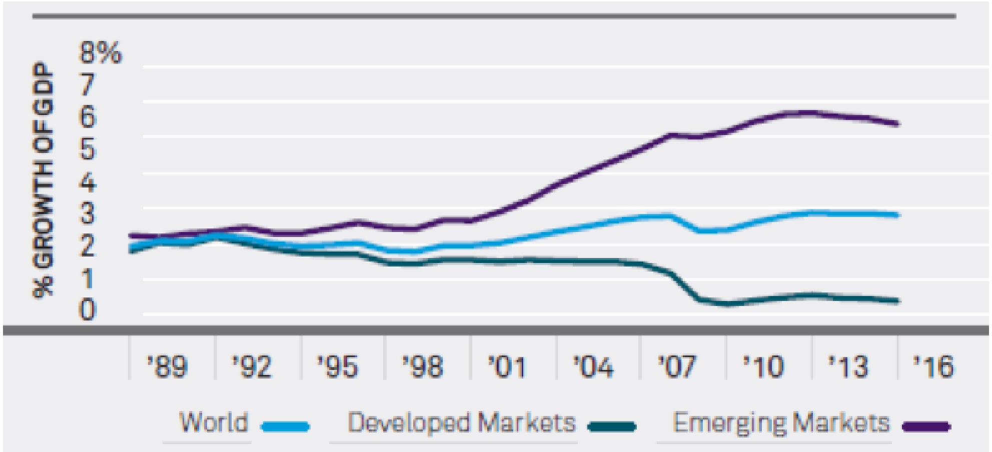
List of Figures

Figure A.1: S&P ASX 100 Sectoral Breakdown



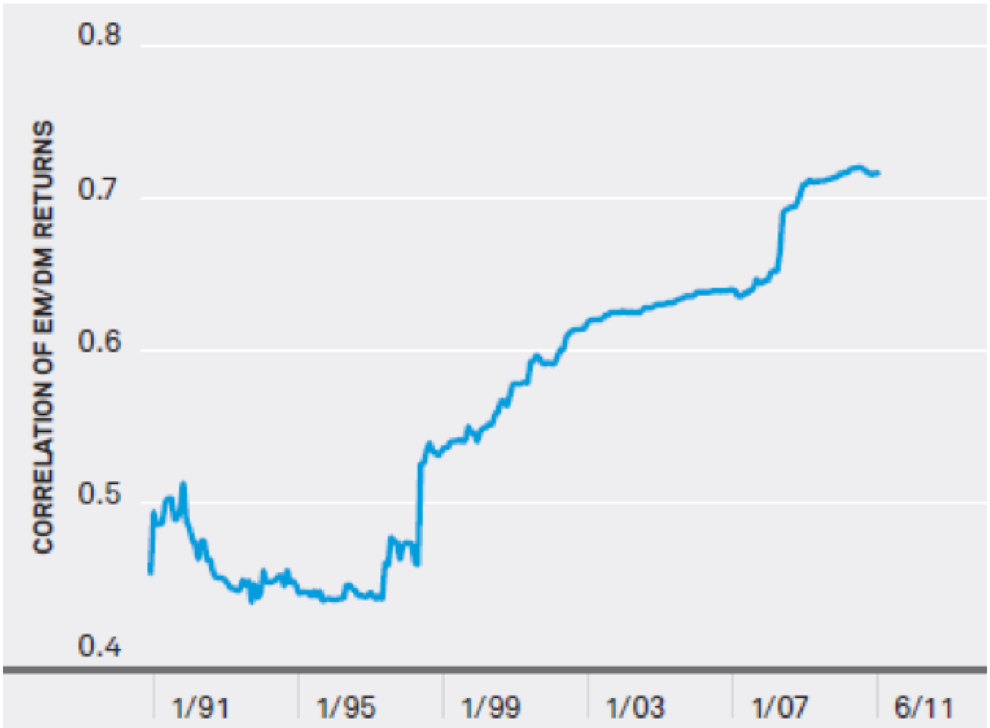
Source: ASX (2019)

Figure A.2: Emerging Markets Growth Rates



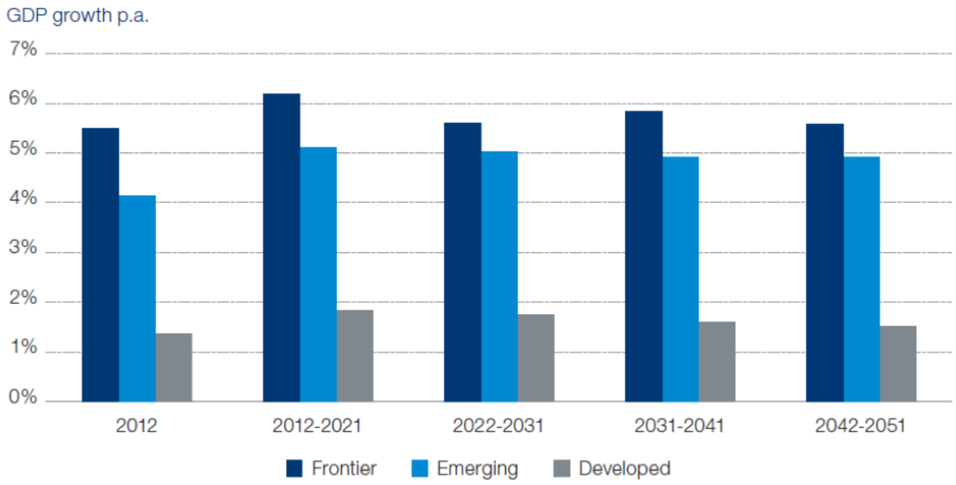
Source: BlackRock Investment Institute (2011)

Figure A.3: Increasing Correlations between Emerging and Developed Markets



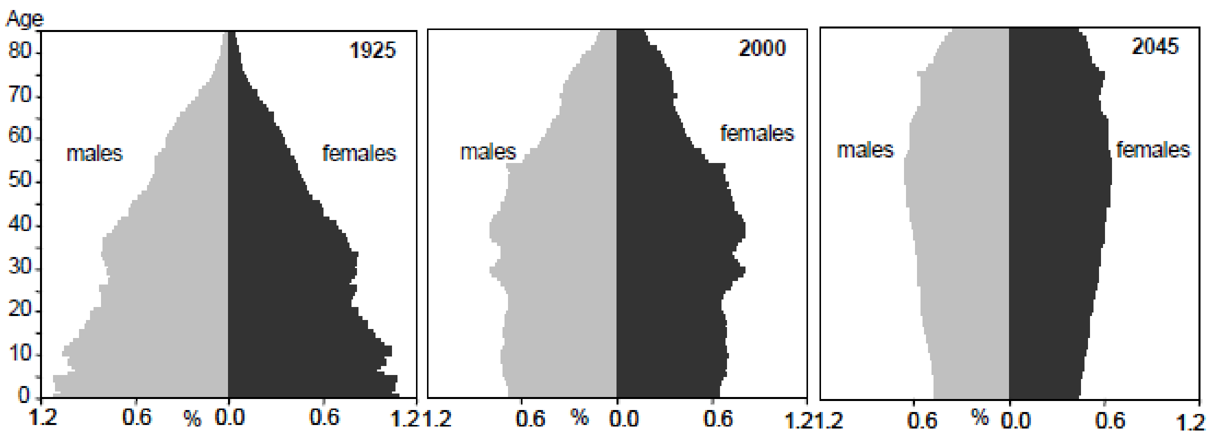
Source: BlackRock Investment Institute (2011)

Figure A.4: GDP Growth Forecasts for Frontier, Emerging and Developed Markets 2012-2051



Source: CITI Bank (2014)

Figure A.5: Australia's Changing Age Structure, 1925 - 2045

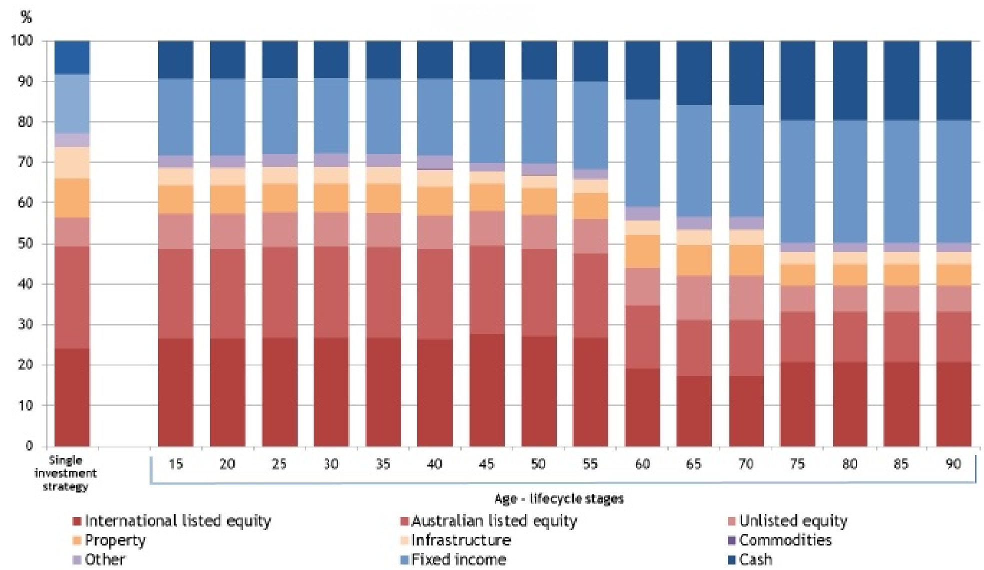


Source: Productivity Commission (2005)

Figure A.6: Performance of Emerging vs Developed Markets

Source: Morgan Stanley Capital International (2019)

Figure A.7: MySuper: Lifecycle Investment Strategy Asset Allocation



Source: Australian Prudential Regulation Authority (2014)

Appendix B

List of Tables

Table B.1: Joint Country Classification Matrix

Joint Country Classification Matrix

Developed Markets					Emerging Markets					Frontier Markets				
No.	**Countries**	**MSCI**	**FTSE**	**S&P Dow Jones**	**No.**	**Countries**	**MSCI**	**FTSE**	**S&P Dow Jones**	**No.**	**Countries**	**MSCI**	**FTSE**	**S&P Dow Jones**
1	Austria	•	•	•	1	Brazil	•	•	•	1	Bahrain	•	•	•
2	Belgium	•	•	•	2	Chile	•	•	•	2	Bangladesh	•	•	•
3	Canada	•	•	•	3	China	•	•	•	3	Botswana	•	•	•
4	Denmark	•	•	•	4	Colombia	•	•	•	4	Bulgaria	•	•	•
5	Finland	•	•	•	5	Czech Republic	•	•	•	5	Croatia	•	•	•
6	France	•	•	•	6	Egypt	•	•	•	6	Estonia	•	•	•
7	Germany	•	•	•	7	Greece	•	•	•	7	Jordan	•	•	•
8	Hong Kong	•	•	•	8	Hungary	•	•	•	8	Kenya	•	•	•
9	Ireland	•	•	•	9	India	•	•	•	9	Lithuania	•	•	•
10	Israel	•	•	•	10	Indonesia	•	•	•	10	Mauritius	•	•	•
11	Italy	•	•	•	11	Malaysia	•	•	•	11	Nigeria	•	•	•
12	Japan	•	•	•	12	Mexico	•	•	•	12	Oman	•	•	•
13	Netherlands	•	•	•	13	Peru	•	•	•	13	Romania	•	•	•
14	New Zealand	•	•	•	14	Philippines	•	•	•	14	Sri Lanka	•	•	•
15	Norway	•	•	•	15	Poland	•	•	•	15	Tunisia	•	•	•
16	Portugal	•	•	•	16	Russia	•	•	•	16	Vietnam	•	•	•
17	Singapore	•	•	•	17	South Africa	•	•	•					
18	Spain	•	•	•	18	Taiwan	•	•	•					
19	Sweden	•	•	•	19	Thailand	•	•	•					
20	Switzerland	•	•	•	20	Turkey	•	•	•					
21	United Kingdom	•	•	•	21	United Arab Emirates	•	•	•					
22	United States	•	•	•										

Table B.2: Country Classification Matrix of MSCI

Criteria	DM	EM	FM
A. Economic Development			
A.1 Sustainability of economic development	Country GNI per capita 25% above the World Bank high income threshold* [52] for 3 consecutive years	No requirement	No requirement
B. Size and Liquidity Requirements			
B.1 Number of companies meeting the following Standard Index criteria	5	3	2
Company size (full market cap)** [53]	USD 2538 million	USD 1269 million	USD 635 million
Security size (float market cap)**	USD 1269 million	USD 635 million	USD 47 million
Security liquidity	20% ATVR	15% ATVR	2.5% ATVR
C. Market Accessibility Criteria			
C.1 Openness to foreign ownership	Very high	Significant	At least some
Investor qualification requirement Foreign ownership limit (FOL) level Foreign room level Equal rights to foreign investors			
C.2 Ease of capital inflows / outflows	Very high	Significant	At least partial
Capital flow restriction level Foreign exchange market liberalization level			
C.3 Efficiency of operational framework	Very high	Good and tested	Modest
Market entry Investor registration & account set up Market organization Market regulations Information flow Market infrastructure Clearing and Settlement Custody Registry / Depository Trading Transferability Stock lending Short selling			
C.4 Competitive landscape	Unrestricted	High	High
C.5 Stability of the institutional framework	Very high	Modest	Modest

[52] * High income threshold for 2015: GNI per capita of USD 12,736 (World Bank, Atlas method)
[53] ** Minimum in use for the May 2016 Semi-Annual Index Review, updated on a semi-annual basis

Table B.3: Country Classification Matrix of FTSE

Criteria	DM	Advanced EM	Secondary EM	FM
World Bank GNI Per Capita Rating*[54]				
Credit Worthiness [55]**				
Market and Regulatory Environment				
Formal stock market regulatory authorities actively monitor market (e.g., SEC, FSA, SFC)	•	•	•	•
Fair and non-prejudicial treatment of minority shareholders	•	•		
Non or selective incidence of foreign ownership restrictions	•	•		
No objection to or significant restrictions or penalties applied to the investment of capital or the repatriation of capital and income	•	•	•	•
Free and well-developed equity market	•	•		
Free and well-developed foreign exchange market	•	•		
Non or simple registration process for foreign investors	•	•		
Custody and Settlement				
Settlement - Rare incidence of failed trades	•	•	•	•
Custody-Sufficient competition to ensure high quality custodian services	•	•	•	
Clearing & settlement - T + 3 , T + 5 for Frontier	•	•	•	•
Stock Lending is permitted	•			
Settlement - Free delivery available	•			
Custody - Omnibus account facilities available to international investors	•	•		
Dealing Landscape				
Brokerage - Sufficient competition to ensure high quality broker services	•	•	•	
Liquidity - Sufficient broad market liquidity to support sizeable global investment	•	•	•	
Transaction costs - implicit and explicit costs to be reasonable and competitive	•	•	•	
Short sales permitted	•			
Off-exchange transactions permitted	•			
Efficient trading mechanism	•			
Transparency - market depth information / visibility and timely trade reporting process	•	•	•	•
Derivatives				
Developed Derivatives Market	•			
Size of Market				
Market Capitalisation USD in millions				
Total Number of Listed Companies				

54* High, Upper Middle, Lower Middle or Low income
55** Investment or Speculative

Table B.4: Country Classification Matrix of S&P Dow Jones

Criteria	DM	EM	FM
Initial Eligibility Criteria			
Full domestic market capitalization over USD 2.5 billion	•	•	* [56]
Domestic annual turnover value over USD 1 billion	•	•	
Exchange development ratio over 5%	•	•	
Additional Criteria			
Full domestic market capitalization over $15B	•	•	
Settlement period of T+3 or better	•	** [57]	
Sovereign Debt rating of BB+ or above	•		
Non-occurrence of hyperinflation	•		
No significant foreign ownership restrictions	•		
Freely traded foreign currency	•		
GDP Criteria			
GDP (PPP) per capita greater than USD 15,000	•		

[56]* Minimum of two criteria should be met
[57]** Minimum of three criteria should be met

Table B.5: Combined Country Classification Matrix [58]

Developed Markets

No.	Countries	MSCI	FTSE	S&P Dow Jones
1	Austria	•	•	•
2	Belgium	•	•	•
3	Canada	•	•	•
4	Denmark	•	•	•
5	Finland	•	•	•
6	France	•	•	•
7	Germany	•	•	•
8	Hong Kong	•	•	•
9	Ireland	•	•	•
10	Israel	•	•	•
11	Italy	•	•	•
12	Japan	•	•	•
13	Luxumbourg		•	•
14	Netherlands	•	•	•
15	New Zealand	•	•	•
16	Norway	•	•	•
17	Portugal	•	•	•
18	Singapore	•	•	•
19	South Korea		•	•
20	Spain	•	•	•
21	Sweden	•	•	•
22	Switzerland	•	•	•
23	United Kingdom	•	•	•
24	United States	•	•	•

Emerging Markets

No.	Countries	MSCI	FTSE	S&P Dow Jones
1	Brazil	•	•	•
2	Chile	•	•	•
3	China	•	•	•
4	Colombia	•	•	•
5	Czech Republic	•	•	•
6	Egypt	•	•	•
7	Greece	•	•	•
8	Hungary	•	•	•
9	India	•	•	•
10	Indonesia	•	•	•
11	Korea	•		
12	Malaysia	•	•	•
13	Mexico	•	•	•
14	Morocco			•
15	Pakistan		•	
16	Peru	•	•	•
17	Phillipines	•	•	•
18	Poland	•	•	•
19	Qatar	•		•
20	Russia	•	•	•
21	Saudi Arabia	•		
22	South Africa	•	•	•
23	Taiwan	•	•	•
24	Thailand	•	•	•
25	Turkey	•	•	•
26	United Arab Emirates	•	•	•

Frontier Markets

No.	Countries	MSCI	FTSE	S&P Dow Jones
1	Agrentina	•		•
2	Bahrain	•	•	•
3	Bangladesh	•	•	•
4	Bosnia	•		
5	Botswana	•	•	•
6	Bulgaria	•	•	•
7	Cote d'Ivoire		•	•
8	Croatia	•	•	•
9	Cyprus		•	•
10	Ecuador			•
11	Estonia	•	•	•
12	Ghana	•	•	•
13	Herzegovina	•		
14	Jamaica	•		•
15	Jordan	•	•	•
16	Kazakhstan	•		•
17	Kenya	•	•	•
18	Kuwait	•		•
19	Latvia			•
20	Lebanon	•		•
21	Lithuania	•	•	•
22	Macedonia		•	
23	Malta		•	
24	Mauritius	•	•	•
25	Morocco	•	•	
26	Namibia			•
27	Nigeria	•	•	•
28	Oman	•	•	•
29	Pakistan	•		•
30	Palestine	•		
31	Panama			•
32	Qatar		•	
33	Romania	•	•	•
34	Serbia	•	•	
35	Slovakia		•	•
36	Slovenia	•	•	•
37	Sri Lanka	•	•	•
38	Trinidad & Tobago	•		•
39	Tunisia	•	•	•
40	Ukraine	•		•
41	Vietnam	•	•	•
42	Zambia			•
43	Zimbabwe	•		

[58] highlighted in yellow: Countries not common among the three indices. Australia is not included in this classification

Table B.6: Joint Country Classification Matrix (JCC) by Regions

No.	Country Name	ISO Country Code
1	Canada	CAN
2	United States	USA
3	Austria	AUT
4	Belgium	BEL
5	Denmark	DNK
6	Finland	FIN
7	France	FRA
8	Germany	DEU
9	Ireland	IRL
10	Israel	ISR
11	Italy	ITA
12	Netherlands	NLD
13	Norway	NOR
14	Portugal	PRT
15	Spain	ESP
16	Sweden	SWE
17	Switzerland	CHE
18	United Kingdom	GBR
19	Hong Kong	HKG
20	Japan	JPN
21	New Zealand	NZL
22	Singapore	SGP

No.	Country Name	ISO Country Code
1	Brazil	BRA
2	Chile	CHL
3	Colombia	COL
4	Mexico	MEX
5	Peru	PER
6	Czech Republic	CZE
7	Egypt	EGY
8	Greece	GRC
9	Hungary	HUN
10	Poland	POL
11	Russia	RUS
12	South Africa	ZAF
13	Turkey	TUR
14	United Arab Emirates	ARE
15	China	CHN
16	India	IND
17	Indonesia	IDN
18	Malaysia	MYS
19	Philippines	PHL
20	Taiwan	TWN
21	Thailand	THA

No.	Country Name	ISO Country Code
1	Bulgaria	BGR
2	Croatia	HRV
3	Estonia	EST
4	Lithuania	LTU
5	Romania	ROM
6	Kenya	KEN
7	Mauritius	MUS
8	Nigeria	NGA
9	Tunisia	TUN
10	Botswana	BWA
11	Bahrain	BHR
12	Jordan	JOR
13	Oman	OMN
14	Bangladesh	BGD
15	Sri Lanka	LKA
16	Vietnam	VNM

Legend
Americas
Europe, Middle East & Africa
Asia-Pacific

Table B.7: Unit Root Tests

Augmented Dickey-Fuller (ADF) Test		
Super	**Level**	
	Without trend	**With trend**
AUS	-3.2735**	-4.4721**
Developed Markets	**Level**	
	Without trend	**With trend**
CAN	-6.0712**	-6.048**
USA	-7.9543**	-8.0147**
AUT	-6.6071**	-6.6302**
BEL	-7.7371**	-7.8404**
DNK	-6.9782**	-6.9748**
FIN	-7.673**	-7.7052**
FRA	-8.6866**	-8.7673**
DEU	-9.0645**	-9.0496**
IRL	-6.594**	-6.8311**
ISR	-6.3327**	-6.3435**
ITA	-8.7874**	-8.8687**
NLD	-7.8113**	-7.8832**
NOR	-6.8873**	-6.8621**
PRT	-7.6536**	-7.6245**
ESP	-8.4267**	-8.4065**
SWE	-7.6286**	-7.6059**
CHE	-7.273**	-7.3135**
GBR	-8.502**	-8.5169**
HKG	-7.0865**	-7.0614**
JPN	-7.2009**	-7.3939**
NZL	-7.8224**	-8.0811**
SGP	-6.5697**	-6.5562**
Emerging Markets	**Level**	
	Without trend	**With trend**
BRA	-7.7142**	-7.7141**
CHL	-6.7754**	-6.828**
COL	-7.7662**	-7.7858**
MEX	-7.5237**	-7.5535**

Philips-Perron (PP) Test		
Super	**Level**	
	Without trend	**With trend**
AUS	-4.9567**	-6.8701**
Developed Markets	**Level**	
	Without trend	**With trend**
CAN	-9.2092**	-9.1765**
USA	-9.7504**	-9.7732**
AUT	-8.7856**	-8.7947**
BEL	-8.7589**	-8.7916**
DNK	-9.5947**	-9.5811**
FIN	-9.3092**	-9.3119**
FRA	-9.9669**	-9.9926**
DEU	-9.9638**	-9.9351**
IRL	-9.1592**	-9.3354**
ISR	-10.1507**	-10.153**
ITA	-10.1577**	-10.187**
NLD	-10.114**	-10.1316**
NOR	-9.6332**	-9.5975**
PRT	-9.6602**	-9.6241**
ESP	-10.5101**	-10.4749**
SWE	-10.5063**	-10.4767**
CHE	-9.4799**	-9.4754**
GBR	-11.6875**	-11.6777**
HKG	-10.1621**	-10.1325**
JPN	-9.2714**	-9.4083**
NZL	-9.9232**	-10.1022**
SGP	-9.427**	-9.4037**
Emerging Markets	**Level**	
	Without trend	**With trend**
BRA	-9.4762**	-9.4629**
CHL	-9.7178**	-9.7481**
COL	-11.7365**	-11.832**
MEX	-10.128**	-10.1593**

PER	-5.4889**	-5.4957**	PER	-10.0299**	-10.0853**
CZE	-8.0898**	-8.0601**	CZE	-9.8852**	-9.8485**
EGY	-8.2876**	-8.2672**	EGY	-10.2736**	-10.2509**
GRC	-7.7703**	-7.7846**	GRC	-10.6867**	-10.6857**
HUN	-7.3227**	-7.3949**	HUN	-9.1307**	-9.1539**
POL	-7.511**	-7.501**	POL	-10.013**	-9.9791**
RUS	-6.6518**	-6.6334**	RUS	-8.6052**	-8.5826**
ZAF	-7.4793**	-7.4788**	ZAF	-12.5258**	-12.5043**
TUR	-8.2859**	-8.2551**	TUR	-11.7387**	-11.6945**
ARE	-6.1115**	-6.0911**	ARE	-9.7233**	-9.7039**
CHN	-6.4708**	-6.5244**	CHN	-9.9388**	-9.9543**
IND	-7.7642**	-7.748**	IND	-10.2769**	-10.2506**
IDN	-6.9976**	-7.0529**	IDN	-8.8227**	-8.8638**
MYS	-6.1357**	-6.1934**	MYS	-9.9923**	-10.0521**
PHL	-7.1171**	-7.0998**	PHL	-10.7944**	-10.7864**
TWN	-6.4846**	-6.4595**	TWN	-9.7483**	-9.714**
THA	-7.8724**	-7.843**	THA	-9.4261**	-9.3924**

Frontier Markets	**Level**		**Frontier Markets**	**Level**	
	Without trend	**With trend**		**Without trend**	**With trend**
BGR	-6.1561**	-6.2003**	BGR	-7.7727**	-7.7877**
HRV	-7.1168**	-7.0864**	HRV	-9.6956**	-9.6596**
EST	-7.5695**	-7.5544**	EST	-10.8095**	-10.7795**
LTU	-6.7859**	-6.7741**	LTU	-8.7977**	-8.7738**
ROM	-7.2551**	-7.2558**	ROM	-8.9566**	-8.9274**
SVN	-5.4937**	-5.4772**	SVN	-8.6185**	-8.5899**
KEN	-7.1328**	-7.1138**	KEN	-10.7526**	-10.7257**
MUS	-5.7444**	-5.8401**	MUS	-8.6257**	-8.7564**
NGA	-6.5824**	-6.5354**	NGA	-9.958**	-9.9225**
TUN	-7.6647**	-7.8796**	TUN	-10.6528**	-10.7755**
BWA	-5.5116**	-5.6089**	BWA	-7.1964**	-7.3455**
BHR	-4.9874**	-4.9856**	BHR	-7.0985**	-7.0843**
JOR	-9.0002**	-8.9635**	JOR	-13.2098**	-13.1558**
OMN	-5.1882**	-5.2963**	OMN	-8.9923**	-9.0846**
BGD	-8.076**	-8.4513**	BGD	-11.1028**	-11.4641**
LKA	-6.6986**	-6.7299**	LKA	-9.9244**	-9.9487**
VNM	-7.2709**	-7.2442**	VNM	-8.6403**	-8.6072**

** denotes rejection of null hypothesis of unit root (non-stationarity) at 5% significance level.

Table B.8: ADCC GARCH Correlation between Australia's Superannuation Funds and Developed Markets: 2006-2017

Date	AUSCAN	AUSUSA	AUSAUT	AUSBEL	AUSDNK	AUSFIN	AUSFRA	AUSDEU	AUSIRL	AUSISR	AUSITA	AUSNLD	AUSNOR	AUSPRT	AUSESP	AUSSWE	AUSCHE	AUSGBR	AUSHKG	AUSJPN	AUSNZL	AUSSGP
Jun-06	0.012	0.085	0.047	0.084	0.085	0.084	0.082	0.059	0.185	-0.019	0.088	0.074	0.020	0.037	0.008	-0.013	0.058	0.052	-0.117	0.122	0.073	-0.098
Jul-06	0.015	0.088	0.050	0.086	0.087	0.087	0.084	0.061	0.187	-0.024	0.091	0.077	0.023	0.038	0.009	-0.011	0.061	0.051	-0.116	0.125	0.075	-0.099
Aug-06	0.007	0.088	0.049	0.077	0.086	0.087	0.083	0.061	0.188	-0.025	0.089	0.065	0.019	0.033	0.004	-0.012	0.041	0.048	-0.112	0.125	0.075	-0.095
Sep-06	0.008	0.081	0.049	0.078	0.072	0.076	0.075	0.054	0.167	-0.015	0.080	0.067	0.024	0.031	0.004	-0.027	0.050	0.055	-0.110	0.113	0.071	-0.101
Oct-06	0.008	0.077	0.036	0.066	0.078	0.085	0.078	0.054	0.182	-0.035	0.085	0.063	0.016	0.024	-0.016	-0.032	0.041	0.051	-0.110	0.124	0.064	-0.108
Nov-06	-0.011	0.075	0.031	0.081	0.077	0.066	0.078	0.047	0.173	-0.044	0.081	0.076	-0.006	0.033	-0.010	-0.027	0.054	0.042	-0.105	0.125	0.045	-0.113
Dec-06	-0.004	0.082	0.051	0.088	0.088	0.088	0.085	0.063	0.188	-0.031	0.084	0.073	0.017	0.034	0.010	-0.014	0.059	0.053	-0.101	0.125	0.066	-0.116
Jan-07	0.011	0.085	0.020	0.061	0.076	0.070	0.068	0.046	0.158	-0.016	0.081	0.062	0.000	0.020	0.004	-0.042	0.042	0.041	-0.095	0.106	0.047	-0.115
Feb-07	0.012	0.084	0.048	0.085	0.073	0.079	0.082	0.054	0.186	-0.026	0.084	0.075	0.012	0.028	0.001	-0.022	0.040	0.056	-0.095	0.117	0.066	-0.111
Mar-07	0.016	0.081	0.043	0.080	0.084	0.087	0.082	0.059	0.181	-0.025	0.088	0.073	0.015	0.035	0.009	-0.016	0.051	0.054	-0.100	0.118	0.065	-0.095
Apr-07	0.011	0.086	0.020	0.067	0.081	0.075	0.075	0.050	0.188	-0.028	0.084	0.056	0.006	0.041	-0.001	-0.036	0.048	0.042	-0.100	0.122	0.068	-0.116
May-07	0.004	0.063	0.044	0.071	0.073	0.075	0.054	0.029	0.187	-0.051	0.069	0.058	0.012	0.014	0.009	-0.035	0.026	0.042	-0.097	0.125	0.064	-0.114
Jun-07	-0.008	0.076	0.041	0.082	0.081	0.073	0.078	0.042	0.176	-0.037	0.091	0.072	0.013	0.011	-0.011	-0.009	0.063	0.044	-0.096	0.114	0.065	-0.111
Jul-07	0.015	0.085	0.051	0.086	0.083	0.085	0.085	0.060	0.182	-0.017	0.089	0.073	0.018	0.039	0.010	-0.013	0.057	0.056	-0.092	0.123	0.072	-0.096
Aug-07	0.015	0.078	0.043	0.073	0.076	0.083	0.073	0.049	0.173	-0.017	0.084	0.071	0.019	0.038	0.011	-0.013	0.050	0.043	-0.082	0.118	0.073	-0.096
Sep-07	0.008	0.083	0.045	0.086	0.085	0.086	0.082	0.063	0.186	-0.039	0.092	0.071	0.009	0.026	0.006	-0.021	0.063	0.053	-0.076	0.109	0.063	-0.112
Oct-07	-0.011	0.064	0.049	0.086	0.089	0.063	0.081	0.048	0.175	-0.070	0.091	0.056	-0.006	0.029	0.008	-0.012	0.058	0.036	-0.050	0.125	0.046	-0.152
Nov-07	0.003	0.086	0.033	0.080	0.087	0.087	0.079	0.059	0.189	-0.035	0.087	0.075	0.018	0.019	-0.010	-0.014	0.059	0.042	-0.037	0.125	0.074	-0.100
Dec-07	0.004	0.080	0.042	0.078	0.078	0.078	0.082	0.059	0.179	-0.021	0.088	0.067	0.019	0.038	0.012	-0.020	0.058	0.048	-0.046	0.119	0.068	-0.105
Jan-08	0.019	0.085	0.052	0.085	0.084	0.080	0.083	0.065	0.181	-0.010	0.090	0.080	0.023	0.040	0.006	-0.015	0.051	0.056	-0.043	0.119	0.073	-0.095
Feb-08	0.001	0.072	0.026	0.066	0.063	0.068	0.058	0.031	0.182	-0.048	0.073	0.047	-0.015	0.014	-0.012	-0.040	0.035	0.031	-0.069	0.110	0.046	-0.128
Mar-08	0.003	0.082	0.049	0.086	0.074	0.082	0.085	0.061	0.184	-0.029	0.090	0.075	0.000	0.040	0.013	-0.013	0.060	0.057	-0.065	0.124	0.071	-0.097
Apr-08	0.008	0.085	0.044	0.085	0.085	0.078	0.081	0.051	0.180	-0.056	0.077	0.075	0.015	0.030	0.006	-0.016	0.042	0.042	-0.083	0.100	0.058	-0.098
May-08	-0.021	0.055	-0.016	0.051	0.086	0.080	0.045	0.028	0.178	-0.068	0.051	0.030	-0.046	0.016	-0.011	-0.032	0.026	0.001	-0.057	0.051	0.038	-0.124
Jun-08	0.010	0.089	0.051	0.087	0.081	0.085	0.087	0.062	0.187	-0.016	0.092	0.077	0.021	0.041	0.013	-0.010	0.063	0.058	-0.059	0.125	0.078	-0.094
Jul-08	0.013	0.073	0.039	0.066	0.077	0.071	0.070	0.049	0.174	-0.020	0.079	0.061	0.016	0.021	-0.002	-0.035	0.048	0.043	-0.070	0.118	0.051	-0.106
Aug-08	-0.014	0.084	0.032	0.069	0.082	0.070	0.084	0.061	0.147	-0.034	0.085	0.058	-0.003	0.029	0.009	-0.015	0.036	0.039	-0.064	0.124	0.032	-0.098
Sep-08	0.017	0.088	0.051	0.088	0.088	0.088	0.086	0.062	0.189	-0.015	0.091	0.078	0.025	0.042	0.012	-0.009	0.063	0.056	-0.064	0.126	0.078	-0.095
Oct-08	-0.005	0.078	0.033	0.074	0.074	0.074	0.076	0.053	0.178	-0.029	0.083	0.061	0.002	0.035	0.007	-0.024	0.051	0.040	-0.059	0.115	0.064	-0.111
Nov-08	-0.011	0.068	0.028	0.067	0.071	0.076	0.072	0.047	0.178	-0.040	0.078	0.059	0.001	0.021	-0.005	-0.033	0.051	0.041	-0.083	0.110	0.062	-0.131
Dec-08	0.001	0.068	0.034	0.064	0.071	0.072	0.072	0.048	0.162	-0.035	0.081	0.065	0.004	0.041	0.009	-0.009	0.045	0.050	-0.085	0.119	0.062	-0.101
Jan-09	0.011	0.088	0.048	0.084	0.081	0.081	0.084	0.056	0.181	-0.018	0.089	0.074	0.018	0.038	0.003	-0.020	0.053	0.043	-0.081	0.117	0.076	-0.099
Feb-09	0.010	0.074	0.050	0.087	0.074	0.082	0.075	0.049	0.187	-0.017	0.083	0.075	0.023	0.036	0.003	-0.020	0.054	0.045	-0.091	0.117	0.068	-0.095
Mar-09	-0.016	0.042	0.011	0.049	0.062	0.048	0.054	0.024	0.161	-0.019	0.053	0.038	0.009	0.022	-0.017	-0.038	0.008	0.021	-0.105	0.113	0.026	-0.127
Apr-09	-0.048	0.023	-0.025	0.069	0.072	0.090	0.061	0.028	0.159	-0.079	0.071	0.076	-0.009	0.022	-0.002	-0.021	0.018	0.037	-0.092	0.113	0.057	-0.136
May-09	-0.025	0.038	0.017	0.029	0.000	-0.020	0.023	-0.009	0.104	-0.067	0.009	0.025	-0.018	-0.001	-0.050	-0.088	0.024	0.007	-0.067	0.087	0.038	-0.146
Jun-09	-0.062	0.058	-0.005	0.056	0.067	0.079	0.068	0.050	0.177	-0.060	0.078	0.037	-0.050	0.006	-0.006	-0.013	0.047	0.030	-0.030	0.089	0.076	-0.184
Jul-09	0.020	0.089	0.053	0.083	0.088	0.079	0.073	0.053	0.189	-0.022	0.083	0.074	0.015	0.040	-0.012	-0.027	0.055	0.041	-0.028	0.105	0.071	-0.092
Aug-09	-0.017	0.035	0.015	0.043	0.051	0.037	0.026	0.001	0.175	-0.079	0.049	0.008	-0.004	0.024	-0.046	-0.079	-0.024	-0.011	0.004	0.115	0.005	-0.172
Sep-09	0.013	0.071	0.001	0.034	0.052	0.047	0.048	0.055	0.134	-0.015	0.049	0.055	0.024	0.001	-0.009	-0.021	0.031	0.011	-0.006	0.118	0.061	-0.098
Oct-09	0.013	0.086	0.050	0.087	0.090	0.089	0.085	0.061	0.185	-0.018	0.091	0.075	0.021	0.038	0.012	-0.009	0.062	0.055	-0.004	0.125	0.076	-0.095
Nov-09	0.010	0.085	0.046	0.084	0.085	0.084	0.081	0.058	0.181	-0.020	0.087	0.074	0.021	0.040	0.010	-0.021	0.061	0.054	0.000	0.124	0.072	-0.095
Dec-09	0.000	0.071	0.050	0.085	0.088	0.081	0.081	0.054	0.186	-0.030	0.091	0.075	0.012	0.040	0.008	-0.011	0.061	0.047	0.001	0.120	0.071	-0.101
Jan-10	0.030	0.094	0.054	0.101	0.095	0.110	0.113	0.082	0.204	0.010	0.111	0.112	0.046	0.051	0.022	-0.003	0.086	0.077	0.002	0.153	0.093	-0.067
Feb-10	0.015	0.088	0.050	0.086	0.087	0.086	0.084	0.061	0.187	-0.017	0.090	0.075	0.023	0.040	0.011	-0.010	0.061	0.055	0.003	0.124	0.075	-0.096
Mar-10	0.005	0.083	0.049	0.087	0.088	0.087	0.085	0.061	0.186	-0.021	0.089	0.075	0.021	0.038	0.008	-0.010	0.052	0.049	0.006	0.125	0.075	-0.094
Apr-10	0.029	0.105	0.067	0.101	0.105	0.106	0.104	0.085	0.207	0.002	0.109	0.098	0.041	0.060	0.025	0.013	0.071	0.076	0.003	0.147	0.088	-0.079
May-10	0.026	0.092	0.051	0.059	0.124	0.081	0.054	0.053	0.215	-0.055	0.059	0.075	0.028	-0.010	-0.008	0.010	0.024	0.032	0.008	0.125	0.073	-0.072
Jun-10	-0.005	0.046	0.024	0.070	0.061	0.062	0.053	0.049	0.142	-0.044	0.063	0.048	-0.012	0.028	-0.024	-0.042	0.038	0.022	0.022	0.085	0.031	-0.123
Jul-10	0.016	0.090	0.051	0.088	0.090	0.089	0.087	0.062	0.190	-0.014	0.092	0.078	0.025	0.042	0.014	-0.008	0.063	0.057	0.023	0.127	0.078	-0.092
Aug-10	0.031	0.110	0.072	0.104	0.098	0.104	0.103	0.069	0.188	0.002	0.113	0.089	0.048	0.054	0.048	0.004	0.066	0.082	0.018	0.127	0.083	-0.076
Sep-10	0.016	0.086	0.049	0.086	0.087	0.086	0.084	0.061	0.187	-0.016	0.089	0.076	0.022	0.040	0.010	-0.011	0.061	0.054	0.020	0.125	0.076	-0.095
Oct-10	0.024	0.101	0.057	0.095	0.094	0.098	0.095	0.068	0.185	-0.002	0.096	0.085	0.035	0.044	0.017	0.003	0.066	0.067	0.014	0.130	0.085	-0.085
Nov-10	0.024	0.097	0.060	0.096	0.090	0.089	0.093	0.075	0.186	-0.005	0.101	0.078	0.037	0.061	0.019	-0.011	0.072	0.063	0.012	0.118	0.090	-0.090
Dec-10	0.016	0.087	0.050	0.087	0.088	0.087	0.085	0.061	0.188	-0.016	0.091	0.077	0.023	0.040	0.011	-0.009	0.061	0.055	0.013	0.125	0.075	-0.094
Jan-11	0.024	0.098	0.064	0.092	0.098	0.098	0.094	0.066	0.196	-0.004	0.098	0.089	0.038	0.047	0.021	-0.002	0.066	0.068	0.014	0.132	0.078	-0.091
Feb-11	0.016	0.088	0.049	0.087	0.088	0.087	0.085	0.062	0.187	-0.016	0.090	0.077	0.023	0.041	0.013	-0.010	0.062	0.055	0.015	0.125	0.076	-0.094
Mar-11	0.020	0.090	0.050	0.089	0.089	0.085	0.087	0.063	0.190	-0.016	0.092	0.079	0.026	0.043	0.012	-0.011	0.064	0.058	0.017	0.128	0.077	-0.098
Apr-11	0.015	0.087	0.050	0.085	0.086	0.088	0.082	0.058	0.184	-0.013	0.089	0.076	0.024	0.038	0.010	-0.009	0.056	0.053	0.018	0.118	0.078	-0.090
May-11	0.013	0.092	0.049	0.093	0.085	0.086	0.090	0.071	0.192	-0.017	0.095	0.074	0.025	0.040	0.016	-0.006	0.068	0.061	0.019	0.122	0.080	-0.090
Jun-11	0.014	0.085	0.048	0.083	0.085	0.082	0.082	0.057	0.186	-0.021	0.085	0.073	0.021	0.040	0.008	-0.012	0.062	0.053	0.021	0.124	0.076	-0.095
Jul-11	0.007	0.083	0.049	0.080	0.078	0.079	0.084	0.063	0.186	-0.022	0.086	0.072	0.017	0.037	0.011	-0.016	0.049	0.054	0.027	0.127	0.068	-0.096
Aug-11	0.014	0.086	0.047	0.084	0.087	0.083	0.081	0.060	0.185	-0.015	0.087	0.075	0.024	0.038	0.008	-0.013	0.057	0.054	0.028	0.125	0.074	-0.092
Sep-11	0.011	0.070	0.027	0.070	0.054	0.071	0.058	0.017	0.170	-0.036	0.062	0.051	0.005	0.024	-0.008	-0.039	0.047	0.033	0.040	0.106	0.066	-0.118
Oct-11	-0.006	0.074	0.033	0.078	0.085	0.075	0.073	0.056	0.185	-0.024	0.087	0.071	0.013	0.032	0.010	-0.018	0.063	0.046	0.017	0.125	0.077	-0.106
Nov-11	0.021	0.092	0.052	0.088	0.090	0.091	0.090	0.067	0.189	-0.011	0.094	0.081	0.029	0.041	0.015	-0.003	0.064	0.061	0.015	0.126	0.075	-0.088
Dec-11	0.016	0.087	0.049	0.087	0.085	0.087	0.085	0.061	0.187	-0.017	0.090	0.076	0.024	0.040	0.011	-0.010	0.061	0.055	0.014	0.125	0.075	-0.096
Jan-12	0.011	0.087	0.044	0.087	0.088	0.083	0.086	0.057	0.172	-0.015	0.090	0.062	0.023	0.041	0.008	-0.012	0.037	0.051	0.019	0.126	0.075	-0.098
Feb-12	0.003	0.076	0.032	0.072	0.079	0.071	0.074	0.041	0.182	-0.022	0.081	0.074	0.020	0.038	0.012	-0.021	0.062	0.050	0.032	0.117	0.076	-0.113
Mar-12	0.013	0.079	0.041	0.081	0.066	0.074	0.076	0.052	0.176	-0.019	0.085	0.074	0.010	0.031	0.012	-0.022	0.055	0.047	0.040	0.101	0.075	-0.099
Apr-12	0.013	0.081	0.050	0.083	0.087	0.086	0.085	0.061	0.187	-0.023	0.090	0.077	0.024	0.041	0.008	-0.012	0.056	0.054	0.036	0.122	0.058	-0.095
May-12	0.014	0.085	0.048	0.078	0.092	0.078	0.074	0.056	0.185	-0.009	0.079	0.069	0.021	0.032	-0.007	-0.013	0.056	0.054	0.036	0.116	0.079	-0.096
Jun-12	0.010	0.083	0.045	0.084	0.084	0.081	0.082	0.057	0.186	-0.023	0.086	0.074	0.019	0.034	0.005	-0.016	0.058	0.050	0.029	0.121	0.074	-0.099
Jul-12	0.014	0.074	0.040	0.065	0.081	0.083	0.065	0.057	0.183	-0.017	0.060	0.058	0.008	0.028	-0.033	-0.024	0.045	0.036	0.038	0.103	0.070	-0.106
Aug-12	0.015	0.087	0.048	0.085	0.074	0.081	0.081	0.053	0.188	-0.023	0.091	0.066	0.019	0.041	0.011	-0.018	0.048	0.054	0.041	0.124	0.065	-0.102
Sep-12	0.011	0.085	0.050	0.082	0.088	0.085	0.080	0.059	0.187	-0.016	0.079	0.077	0.021	0.031	-0.001	-0.011	0.062	0.053	0.041	0.125	0.069	-0.094

Oct-12	0.010	0.084	0.046	0.086	0.088	0.085	0.085	0.058	0.183	-0.024	0.091	0.076	0.021	0.035	0.008	-0.013	0.058	0.055	0.048	0.124	0.066	-0.096
Nov-12	0.016	0.088	0.051	0.087	0.088	0.087	0.086	0.062	0.188	-0.015	0.091	0.077	0.024	0.042	0.012	-0.010	0.062	0.056	0.049	0.126	0.077	-0.094
Dec-12	0.015	0.088	0.047	0.085	0.088	0.084	0.082	0.061	0.187	-0.016	0.090	0.076	0.024	0.040	0.011	-0.012	0.058	0.054	0.051	0.121	0.074	-0.095
Jan-13	0.014	0.088	0.047	0.086	0.088	0.085	0.083	0.060	0.185	-0.017	0.088	0.075	0.024	0.033	0.009	-0.011	0.062	0.055	0.054	0.112	0.076	-0.097
Feb-13	0.014	0.082	0.049	0.086	0.081	0.085	0.083	0.061	0.184	-0.016	0.085	0.074	0.021	0.033	0.010	-0.015	0.050	0.048	0.058	0.115	0.070	-0.097
Mar-13	0.020	0.090	0.052	0.093	0.091	0.093	0.083	0.058	0.202	-0.002	0.066	0.062	0.026	0.031	0.007	0.000	0.075	0.061	0.067	0.137	0.081	-0.094
Apr-13	0.015	0.089	0.049	0.087	0.087	0.086	0.086	0.062	0.188	-0.016	0.091	0.078	0.024	0.041	0.011	-0.010	0.062	0.056	0.070	0.126	0.077	-0.093
May-13	-0.003	0.094	0.060	0.095	0.086	0.081	0.102	0.065	0.170	-0.032	0.129	0.079	0.032	0.076	0.041	-0.012	0.068	0.055	0.068	0.179	0.105	-0.083
Jun-13	0.025	0.094	0.049	0.086	0.080	0.090	0.094	0.080	0.199	-0.006	0.098	0.089	0.029	0.021	0.006	-0.005	0.063	0.067	0.076	0.110	0.055	-0.101
Jul-13	0.014	0.087	0.049	0.086	0.088	0.086	0.084	0.060	0.187	-0.017	0.090	0.075	0.023	0.041	0.011	-0.011	0.061	0.054	0.080	0.126	0.076	-0.095
Aug-13	0.023	0.097	0.058	0.097	0.098	0.094	0.098	0.068	0.192	-0.014	0.103	0.089	0.033	0.047	0.026	0.005	0.066	0.070	0.077	0.125	0.081	-0.089
Sep-13	0.019	0.078	0.056	0.087	0.087	0.091	0.081	0.056	0.190	-0.021	0.093	0.072	0.023	0.044	0.008	-0.015	0.058	0.046	0.081	0.121	0.074	-0.107
Oct-13	0.017	0.091	0.053	0.092	0.090	0.095	0.091	0.067	0.188	-0.007	0.095	0.080	0.024	0.044	0.022	-0.005	0.067	0.057	0.080	0.132	0.082	-0.088
Nov-13	0.037	0.104	0.058	0.099	0.092	0.099	0.098	0.077	0.196	-0.010	0.121	0.092	0.042	0.058	0.037	-0.003	0.074	0.074	0.080	0.124	0.092	-0.088
Dec-13	0.015	0.093	0.053	0.083	0.095	0.091	0.084	0.069	0.190	-0.002	0.086	0.078	0.026	0.051	0.009	-0.006	0.062	0.050	0.080	0.136	0.064	-0.097
Jan-14	0.024	0.096	0.037	0.093	0.092	0.087	0.084	0.064	0.186	-0.027	0.090	0.081	0.026	0.043	0.015	-0.002	0.056	0.062	0.089	0.136	0.064	-0.094
Feb-14	0.016	0.088	0.051	0.087	0.087	0.088	0.086	0.062	0.188	-0.015	0.091	0.077	0.024	0.041	0.012	-0.010	0.062	0.055	0.092	0.125	0.076	-0.094
Mar-14	0.026	0.097	0.052	0.101	0.105	0.099	0.097	0.069	0.202	-0.007	0.100	0.083	0.029	0.059	0.016	0.001	0.071	0.067	0.091	0.124	0.082	-0.088
Apr-14	0.017	0.088	0.048	0.087	0.084	0.083	0.084	0.059	0.183	-0.011	0.096	0.078	0.024	0.044	0.014	-0.011	0.061	0.050	0.096	0.125	0.080	-0.091
May-14	0.020	0.088	0.050	0.085	0.087	0.087	0.089	0.062	0.185	-0.019	0.092	0.076	0.027	0.038	0.014	-0.010	0.062	0.061	0.099	0.120	0.079	-0.090
Jun-14	0.014	0.092	0.050	0.092	0.091	0.095	0.087	0.068	0.186	-0.013	0.090	0.080	0.033	0.031	0.019	-0.003	0.069	0.058	0.096	0.133	0.069	-0.092
Jul-14	0.012	0.086	0.050	0.086	0.086	0.086	0.085	0.061	0.187	-0.016	0.091	0.076	0.022	0.040	0.011	-0.011	0.061	0.055	0.099	0.120	0.076	-0.095
Aug-14	0.018	0.085	0.043	0.086	0.086	0.087	0.080	0.056	0.186	-0.015	0.088	0.074	0.022	0.028	0.010	-0.010	0.059	0.055	0.097	0.128	0.076	-0.089
Sep-14	0.026	0.103	0.049	0.099	0.083	0.086	0.098	0.062	0.194	-0.014	0.089	0.085	0.021	0.040	0.013	-0.008	0.078	0.061	0.101	0.120	0.078	-0.099
Oct-14	0.014	0.086	0.049	0.086	0.087	0.087	0.084	0.062	0.187	-0.018	0.090	0.075	0.024	0.040	0.011	-0.010	0.059	0.054	0.103	0.123	0.076	-0.094
Nov-14	0.006	0.094	0.051	0.080	0.082	0.084	0.072	0.055	0.180	-0.024	0.078	0.069	0.011	0.017	0.004	-0.008	0.061	0.050	0.098	0.126	0.085	-0.094
Dec-14	0.017	0.088	0.051	0.089	0.088	0.089	0.087	0.064	0.189	-0.013	0.092	0.078	0.023	0.042	0.013	-0.008	0.063	0.057	0.101	0.126	0.076	-0.093
Jan-15	0.016	0.088	0.050	0.087	0.088	0.087	0.085	0.062	0.187	-0.015	0.091	0.077	0.024	0.041	0.012	-0.010	0.062	0.055	0.104	0.125	0.075	-0.094
Feb-15	0.016	0.084	0.048	0.070	0.071	0.070	0.068	0.045	0.180	-0.017	0.077	0.064	0.019	0.027	0.010	-0.025	0.054	0.049	0.110	0.125	0.068	-0.096
Mar-15	0.023	0.095	0.063	0.094	0.098	0.094	0.095	0.070	0.195	-0.009	0.100	0.086	0.027	0.054	0.021	0.002	0.074	0.061	0.112	0.133	0.080	-0.093
Apr-15	0.009	0.081	0.050	0.087	0.100	0.089	0.088	0.070	0.187	-0.001	0.097	0.078	0.024	0.050	0.017	-0.014	0.064	0.048	0.116	0.127	0.071	-0.091
May-15	0.019	0.088	0.052	0.086	0.088	0.083	0.085	0.058	0.188	-0.015	0.091	0.076	0.026	0.042	0.011	-0.012	0.061	0.059	0.114	0.128	0.075	-0.093
Jun-15	0.008	0.089	0.048	0.089	0.091	0.088	0.082	0.058	0.196	-0.007	0.097	0.080	0.024	0.028	0.008	-0.007	0.069	0.056	0.124	0.140	0.077	-0.103
Jul-15	0.013	0.086	0.047	0.084	0.085	0.085	0.083	0.059	0.186	-0.018	0.089	0.074	0.022	0.039	0.010	-0.015	0.057	0.050	0.123	0.123	0.073	-0.095
Aug-15	0.011	0.094	0.062	0.108	0.110	0.101	0.110	0.072	0.203	0.001	0.107	0.095	0.026	0.053	0.026	0.011	0.100	0.069	0.145	0.131	0.093	-0.107
Sep-15	0.007	0.076	0.042	0.074	0.077	0.075	0.072	0.048	0.184	-0.029	0.083	0.062	0.014	0.030	0.001	-0.023	0.047	0.042	0.163	0.115	0.064	-0.107
Oct-15	0.011	0.085	0.048	0.085	0.086	0.084	0.083	0.058	0.185	-0.020	0.090	0.073	0.022	0.039	0.008	-0.015	0.058	0.053	0.163	0.120	0.075	-0.098
Nov-15	0.016	0.085	0.049	0.085	0.088	0.084	0.082	0.059	0.187	-0.015	0.090	0.074	0.024	0.040	0.011	-0.010	0.061	0.055	0.168	0.121	0.073	-0.093
Dec-15	0.015	0.088	0.046	0.078	0.074	0.078	0.083	0.054	0.177	-0.016	0.089	0.074	0.021	0.040	0.011	-0.014	0.061	0.056	0.169	0.123	0.072	-0.098
Jan-16	0.009	0.084	0.046	0.085	0.087	0.083	0.076	0.054	0.187	-0.019	0.085	0.069	0.019	0.041	0.002	-0.019	0.058	0.052	0.173	0.123	0.082	-0.092
Feb-16	0.016	0.087	0.049	0.086	0.087	0.087	0.085	0.061	0.187	-0.016	0.090	0.077	0.023	0.040	0.011	-0.011	0.061	0.055	0.177	0.125	0.075	-0.097
Mar-16	0.016	0.086	0.050	0.082	0.084	0.083	0.083	0.057	0.188	-0.020	0.085	0.076	0.019	0.034	0.007	-0.013	0.050	0.056	0.176	0.114	0.074	-0.099
Apr-16	-0.003	0.065	0.038	0.087	0.088	0.085	0.084	0.050	0.187	-0.017	0.084	0.069	0.023	0.026	0.004	-0.011	0.062	0.052	0.198	0.115	0.039	-0.111
May-16	0.004	0.089	0.045	0.085	0.088	0.086	0.083	0.062	0.185	-0.017	0.085	0.077	0.012	0.039	0.004	-0.011	0.055	0.053	0.205	0.126	0.076	-0.094
Jun-16	0.016	0.088	0.050	0.087	0.087	0.087	0.085	0.062	0.186	-0.015	0.091	0.077	0.025	0.041	0.012	-0.010	0.061	0.056	0.209	0.125	0.075	-0.094
Jul-16	0.016	0.087	0.040	0.078	0.080	0.084	0.074	0.051	0.170	-0.023	0.077	0.072	0.020	0.025	-0.004	-0.017	0.056	0.032	0.215	0.110	0.069	-0.102
Aug-16	0.016	0.088	0.051	0.088	0.089	0.087	0.086	0.062	0.188	-0.015	0.092	0.077	0.024	0.042	0.013	-0.009	0.062	0.057	0.220	0.125	0.075	-0.094
Sep-16	0.016	0.088	0.049	0.086	0.087	0.087	0.085	0.061	0.185	-0.016	0.091	0.077	0.024	0.041	0.011	-0.011	0.061	0.055	0.226	0.125	0.076	-0.094
Oct-16	0.017	0.087	0.054	0.087	0.081	0.091	0.086	0.060	0.185	-0.016	0.088	0.076	0.024	0.038	0.013	-0.008	0.060	0.058	0.231	0.125	0.074	-0.092
Nov-16	0.016	0.087	0.049	0.087	0.088	0.087	0.085	0.062	0.188	-0.016	0.089	0.077	0.023	0.040	0.011	-0.010	0.061	0.055	0.235	0.123	0.076	-0.095
Dec-16	0.015	0.086	0.050	0.087	0.088	0.087	0.085	0.062	0.185	-0.016	0.091	0.077	0.023	0.040	0.011	-0.011	0.062	0.055	0.240	0.122	0.076	-0.095
Jan-17	0.020	0.092	0.058	0.097	0.100	0.099	0.102	0.080	0.196	-0.011	0.118	0.091	0.034	0.054	0.030	-0.003	0.077	0.073	0.255	0.133	0.072	-0.096
Feb-17	0.017	0.090	0.053	0.082	0.089	0.083	0.079	0.061	0.183	-0.026	0.084	0.073	0.024	0.033	0.011	-0.008	0.063	0.053	0.254	0.125	0.082	-0.081
Mar-17	0.016	0.095	0.054	0.089	0.088	0.091	0.090	0.066	0.191	-0.013	0.095	0.084	0.022	0.049	0.017	-0.005	0.070	0.061	0.258	0.127	0.079	-0.091
Apr-17	0.020	0.084	0.058	0.109	0.086	0.091	0.104	0.073	0.190	-0.024	0.114	0.090	0.022	0.066	0.041	-0.007	0.067	0.058	0.264	0.119	0.074	-0.084
May-17	0.016	0.088	0.077	0.092	0.112	0.102	0.099	0.062	0.195	-0.016	0.092	0.078	0.025	0.043	0.023	0.004	0.073	0.041	0.271	0.129	0.091	-0.092
Jun-17	0.005	0.090	0.062	0.086	0.094	0.090	0.085	0.064	0.188	-0.010	0.093	0.077	0.030	0.063	0.018	-0.008	0.074	0.080	0.270	0.134	0.074	-0.088

Table B.9: ADCC GARCH Correlation between Australia's Superannuation Funds and Emerging Markets: 2006-2017

Date	AUSBRA	AUSCHL	AUSCOL	AUSMEX	AUSPER	AUSCZE	AUSEGY	AUSGRC	AUSHUN	AUSPOL	AUSRUS	AUSZAF	AUSTUR	AUSARE	AUSCHN	AUSIND	AUSIDN	AUSMYS	AUSPHL	AUSTWN	AUSTHA
Jun-06	-0.158	-0.049	-0.054	-0.098	-0.189	0.003	-0.010	0.067	-0.011	0.001	-0.078	-0.001	-0.079	0.065	-0.150	-0.068	-0.050	-0.054	-0.029	-0.064	-0.021
Jul-06	-0.154	-0.049	-0.081	-0.095	-0.188	0.004	-0.026	0.063	-0.007	0.003	-0.074	-0.001	-0.084	0.066	-0.146	-0.064	-0.050	-0.055	-0.036	-0.064	-0.025
Aug-06	-0.153	-0.047	-0.096	-0.100	-0.193	0.003	-0.046	0.066	-0.010	-0.011	-0.074	-0.010	-0.080	0.055	-0.162	-0.062	-0.049	-0.055	-0.044	-0.076	-0.022
Sep-06	-0.158	-0.048	-0.089	-0.102	-0.195	0.006	-0.046	0.069	-0.013	-0.022	-0.074	-0.011	-0.078	0.055	-0.157	-0.067	-0.050	-0.055	-0.050	-0.072	-0.020
Oct-06	-0.156	-0.051	-0.093	-0.106	-0.195	0.009	-0.044	0.069	-0.017	-0.015	-0.085	-0.007	-0.082	0.054	-0.158	-0.073	-0.057	-0.053	-0.061	-0.074	-0.024
Nov-06	-0.162	-0.054	-0.097	-0.109	-0.193	0.003	-0.034	0.071	-0.015	-0.018	-0.083	-0.008	-0.088	0.044	-0.156	-0.073	-0.055	-0.053	-0.058	-0.071	-0.026
Dec-06	-0.169	-0.066	-0.087	-0.120	-0.197	0.003	-0.026	0.069	-0.013	-0.020	-0.090	-0.006	-0.110	-0.005	-0.170	-0.076	-0.063	-0.076	-0.051	-0.080	-0.023
Jan-07	-0.171	-0.067	-0.090	-0.122	-0.202	0.006	-0.023	0.071	-0.020	-0.012	-0.091	-0.007	-0.101	0.015	-0.178	-0.072	-0.062	-0.070	-0.052	-0.078	-0.054
Feb-07	-0.166	-0.073	-0.092	-0.120	-0.201	0.002	-0.021	0.070	-0.026	-0.017	-0.094	-0.003	-0.098	0.027	-0.183	-0.069	-0.071	-0.082	-0.056	-0.079	-0.061
Mar-07	-0.173	-0.088	-0.116	-0.140	-0.210	-0.003	-0.031	0.065	-0.034	-0.035	-0.088	0.001	-0.091	0.034	-0.181	-0.107	-0.074	-0.073	-0.080	-0.078	-0.054
Apr-07	-0.175	-0.086	-0.111	-0.146	-0.219	-0.008	-0.029	0.059	-0.026	-0.044	-0.088	-0.009	-0.091	0.010	-0.183	-0.096	-0.073	-0.078	-0.073	-0.075	-0.050
May-07	-0.181	-0.093	-0.097	-0.133	-0.233	-0.012	-0.024	0.061	-0.034	-0.037	-0.084	-0.008	-0.090	0.016	-0.203	-0.096	-0.080	-0.088	-0.062	-0.072	-0.046
Jun-07	-0.180	-0.085	-0.107	-0.135	-0.228	-0.007	-0.018	0.065	-0.030	-0.033	-0.097	-0.004	-0.086	0.005	-0.196	-0.091	-0.074	-0.080	-0.059	-0.071	-0.043
Jul-07	-0.175	-0.080	-0.096	-0.128	-0.222	-0.002	-0.014	0.066	-0.030	-0.025	-0.092	-0.004	-0.082	0.019	-0.190	-0.082	-0.065	-0.070	-0.053	-0.075	-0.039
Aug-07	-0.175	-0.101	-0.093	-0.136	-0.219	-0.015	-0.012	0.065	-0.023	-0.037	-0.093	0.000	-0.098	0.023	-0.201	-0.086	-0.076	-0.067	-0.075	-0.079	-0.052
Sep-07	-0.175	-0.106	-0.113	-0.148	-0.278	-0.007	-0.016	0.069	-0.063	-0.065	-0.107	0.001	-0.126	0.025	-0.227	-0.098	-0.130	-0.165	-0.104	-0.106	-0.092
Oct-07	-0.195	-0.113	-0.118	-0.144	-0.267	-0.004	-0.039	0.074	-0.056	-0.053	-0.111	-0.009	-0.128	0.032	-0.218	-0.117	-0.126	-0.157	-0.099	-0.109	-0.081
Nov-07	-0.188	-0.100	-0.100	-0.133	-0.246	-0.004	-0.034	0.074	-0.050	-0.040	-0.103	-0.008	-0.116	0.022	-0.198	-0.112	-0.113	-0.136	-0.082	-0.096	-0.069
Dec-07	-0.188	-0.117	-0.090	-0.146	-0.267	-0.017	-0.029	0.073	-0.053	-0.058	-0.093	-0.016	-0.119	0.027	-0.219	-0.107	-0.094	-0.120	-0.085	-0.126	-0.076
Jan-08	-0.175	-0.104	-0.081	-0.131	-0.245	-0.006	-0.019	0.073	-0.038	-0.042	-0.083	-0.016	-0.104	0.048	-0.189	-0.089	-0.078	-0.095	-0.067	-0.107	-0.058
Feb-08	-0.200	-0.150	-0.152	-0.141	-0.281	-0.077	-0.021	0.073	-0.072	-0.099	-0.126	-0.038	-0.193	0.056	-0.220	-0.141	-0.093	-0.112	-0.109	-0.158	-0.090
Mar-08	-0.193	-0.123	-0.125	-0.129	-0.265	-0.059	-0.020	0.050	-0.055	-0.073	-0.116	-0.044	-0.163	0.056	-0.200	-0.123	-0.082	-0.110	-0.104	-0.145	-0.078
Apr-08	-0.222	-0.112	-0.131	-0.147	-0.270	-0.048	-0.030	0.038	-0.099	-0.055	-0.112	-0.072	-0.231	0.022	-0.296	-0.200	-0.163	-0.215	-0.135	-0.132	-0.097
May-08	-0.232	-0.104	-0.139	-0.159	-0.256	-0.042	-0.026	0.039	-0.084	-0.060	-0.107	-0.065	-0.215	0.013	-0.270	-0.190	-0.183	-0.186	-0.175	-0.125	-0.079
Jun-08	-0.210	-0.086	-0.114	-0.141	-0.235	-0.028	-0.018	0.049	-0.062	-0.041	-0.097	-0.047	-0.186	0.029	-0.241	-0.160	-0.146	-0.149	-0.134	-0.109	-0.061
Jul-08	-0.228	-0.082	-0.125	-0.165	-0.231	-0.051	-0.025	0.057	-0.073	-0.064	-0.100	-0.050	-0.192	0.035	-0.273	-0.200	-0.135	-0.165	-0.159	-0.142	-0.074
Aug-08	-0.284	-0.075	-0.121	-0.229	-0.315	-0.041	-0.074	-0.013	-0.080	-0.054	-0.164	-0.150	-0.218	0.048	-0.250	-0.186	-0.140	-0.172	-0.141	-0.186	-0.167
Sep-08	-0.252	-0.066	-0.099	-0.195	-0.279	-0.025	-0.055	0.010	-0.060	-0.037	-0.144	-0.109	-0.181	0.056	-0.227	-0.151	-0.116	-0.143	-0.107	-0.150	-0.125
Oct-08	-0.237	-0.062	-0.084	-0.174	-0.265	-0.027	-0.043	0.027	-0.051	-0.029	-0.142	-0.102	-0.157	0.058	-0.206	-0.137	-0.113	-0.130	-0.087	-0.156	-0.109
Nov-08	-0.319	-0.089	-0.148	-0.251	-0.363	-0.098	-0.056	0.024	-0.118	-0.088	-0.206	-0.125	-0.185	0.029	-0.244	-0.199	-0.274	-0.215	-0.169	-0.185	-0.245
Dec-08	-0.286	-0.104	-0.122	-0.210	-0.319	-0.073	-0.161	-0.046	-0.118	-0.088	-0.226	-0.089	-0.191	-0.050	-0.230	-0.204	-0.205	-0.165	-0.125	-0.208	-0.194
Jan-09	-0.250	-0.094	-0.104	-0.186	-0.293	-0.049	-0.142	-0.026	-0.097	-0.061	-0.189	-0.063	-0.163	-0.066	-0.209	-0.169	-0.161	-0.131	-0.117	-0.168	-0.149
Feb-09	-0.227	-0.089	-0.091	-0.234	-0.268	-0.061	-0.109	-0.010	-0.089	-0.072	-0.190	-0.066	-0.151	-0.046	-0.197	-0.148	-0.135	-0.107	-0.102	-0.166	-0.121
Mar-09	-0.240	-0.118	-0.081	-0.333	-0.277	-0.196	-0.170	0.013	-0.159	-0.162	-0.166	-0.180	-0.191	-0.031	-0.199	-0.179	-0.154	-0.095	-0.088	-0.166	-0.114
Apr-09	-0.239	-0.103	-0.080	-0.306	-0.308	-0.187	-0.166	-0.024	-0.142	-0.148	-0.186	-0.172	-0.177	-0.015	-0.215	-0.172	-0.155	-0.112	-0.087	-0.180	-0.095
May-09	-0.239	-0.104	-0.077	-0.273	-0.287	-0.164	-0.141	-0.010	-0.131	-0.141	-0.178	-0.129	-0.177	0.008	-0.202	-0.169	-0.157	-0.130	-0.079	-0.175	-0.097
Jun-09	-0.241	-0.128	-0.094	-0.255	-0.297	-0.130	-0.135	-0.018	-0.128	-0.106	-0.187	-0.123	-0.166	0.013	-0.195	-0.187	-0.150	-0.127	-0.093	-0.178	-0.104
Jul-09	-0.252	-0.119	-0.103	-0.228	-0.294	-0.108	-0.127	-0.019	-0.105	-0.089	-0.205	-0.138	-0.156	0.015	-0.211	-0.173	-0.139	-0.122	-0.079	-0.208	-0.100
Aug-09	-0.244	-0.113	-0.101	-0.228	-0.283	-0.122	-0.116	-0.011	-0.108	-0.102	-0.179	-0.133	-0.164	0.016	-0.222	-0.164	-0.148	-0.139	-0.101	-0.199	-0.088
Sep-09	-0.229	-0.113	-0.093	-0.206	-0.269	-0.110	-0.098	0.001	-0.106	-0.092	-0.160	-0.104	-0.155	0.026	-0.310	-0.145	-0.126	-0.122	-0.086	-0.191	-0.078
Oct-09	-0.205	-0.093	-0.079	-0.175	-0.243	-0.078	-0.072	0.021	-0.078	-0.065	-0.134	-0.075	-0.132	0.039	-0.264	-0.121	-0.103	-0.101	-0.069	-0.154	-0.060
Nov-09	-0.190	-0.084	-0.079	-0.159	-0.234	-0.057	-0.053	0.032	-0.059	-0.047	-0.119	-0.058	-0.118	0.043	-0.234	-0.119	-0.096	-0.089	-0.057	-0.134	-0.056
Dec-09	-0.184	-0.079	-0.073	-0.147	-0.221	-0.044	-0.040	0.043	-0.044	-0.034	-0.106	-0.043	-0.112	0.027	-0.213	-0.107	-0.081	-0.078	-0.050	-0.116	-0.044
Jan-10	-0.168	-0.043	-0.058	-0.123	-0.207	-0.028	-0.049	0.036	-0.030	-0.021	-0.089	-0.025	-0.077	0.044	-0.190	-0.089	-0.062	-0.065	-0.042	-0.083	-0.023
Feb-10	-0.162	-0.039	-0.052	-0.115	-0.198	-0.017	-0.035	0.047	-0.021	-0.012	-0.082	-0.016	-0.073	0.053	-0.178	-0.081	-0.055	-0.059	-0.035	-0.076	-0.019
Mar-10	-0.157	-0.038	-0.049	-0.109	-0.194	-0.012	-0.027	0.050	-0.018	-0.010	-0.080	-0.010	-0.081	0.058	-0.168	-0.074	-0.054	-0.054	-0.031	-0.073	-0.017
Apr-10	-0.145	-0.040	-0.041	-0.094	-0.181	0.001	-0.022	0.053	0.003	0.008	-0.066	0.007	-0.062	0.072	-0.157	-0.061	-0.039	-0.042	-0.022	-0.058	-0.002
May-10	-0.153	-0.030	-0.030	-0.098	-0.168	0.023	-0.012	0.073	0.007	0.014	-0.063	0.003	-0.055	0.059	-0.165	-0.059	-0.021	-0.033	-0.010	-0.052	-0.014
Jun-10	-0.161	-0.030	-0.035	-0.100	-0.178	0.010	0.000	0.066	-0.009	0.008	-0.075	-0.008	-0.066	0.053	-0.168	-0.063	-0.035	-0.048	-0.013	-0.066	-0.015
Jul-10	-0.157	-0.029	-0.035	-0.096	-0.176	0.012	0.001	0.070	-0.006	0.009	-0.071	-0.003	-0.064	0.059	-0.161	-0.059	-0.033	-0.044	-0.012	-0.061	-0.011
Aug-10	-0.137	-0.017	-0.025	-0.086	-0.171	0.022	-0.005	0.067	0.003	0.021	-0.059	0.014	-0.053	0.065	-0.142	-0.057	-0.027	-0.035	-0.011	-0.049	0.000
Sep-10	-0.138	-0.018	-0.025	-0.086	-0.169	0.021	-0.002	0.072	0.004	0.020	-0.059	0.014	-0.054	0.068	-0.139	-0.055	-0.028	-0.033	-0.010	-0.048	0.001
Oct-10	-0.133	-0.016	-0.024	-0.079	-0.158	0.021	0.000	0.072	0.007	0.025	-0.056	0.021	-0.050	0.076	-0.136	-0.046	-0.019	-0.031	0.001	-0.041	0.004
Nov-10	-0.132	-0.016	-0.016	-0.069	-0.154	0.023	0.004	0.070	0.006	0.025	-0.052	0.024	-0.049	0.083	-0.122	-0.047	-0.018	-0.026	0.003	-0.041	0.003
Dec-10	-0.134	-0.019	-0.021	-0.070	-0.155	0.022	0.005	0.074	0.005	0.024	-0.054	0.022	-0.052	0.082	-0.125	-0.048	-0.022	-0.029	-0.002	-0.042	0.002
Jan-11	-0.133	-0.022	-0.021	-0.068	-0.151	0.029	0.005	0.072	0.007	0.026	-0.049	0.027	-0.055	0.081	-0.126	-0.045	-0.021	-0.028	0.001	-0.036	0.003
Feb-11	-0.135	-0.026	-0.024	-0.072	-0.154	0.028	0.006	0.075	0.008	0.024	-0.050	0.024	-0.057	0.081	-0.127	-0.049	-0.025	-0.029	-0.003	-0.038	0.000
Mar-11	-0.135	-0.030	-0.027	-0.073	-0.157	0.026	0.001	0.080	0.009	0.023	-0.050	0.024	-0.059	0.081	-0.125	-0.051	-0.026	-0.032	-0.007	-0.042	0.000
Apr-11	-0.134	-0.028	-0.031	-0.074	-0.161	0.026	0.001	0.080	0.008	0.023	-0.051	0.021	-0.057	0.081	-0.126	-0.046	-0.025	-0.030	-0.004	-0.043	0.003
May-11	-0.138	-0.024	-0.032	-0.077	-0.169	0.025	-0.002	0.080	0.011	0.024	-0.053	0.021	-0.053	0.083	-0.127	-0.048	-0.024	-0.033	-0.001	-0.040	0.004
Jun-11	-0.139	-0.026	-0.032	-0.081	-0.164	0.023	0.004	0.078	0.008	0.022	-0.057	0.019	-0.060	0.081	-0.131	-0.051	-0.026	-0.032	-0.005	-0.041	0.001
Jul-11	-0.142	-0.028	-0.035	-0.079	-0.174	0.021	0.003	0.076	0.005	0.019	-0.056	0.015	-0.060	0.083	-0.129	-0.049	-0.027	-0.031	-0.006	-0.046	-0.003
Aug-11	-0.144	-0.034	-0.035	-0.080	-0.166	0.020	0.003	0.077	0.004	0.017	-0.056	0.014	-0.061	0.081	-0.130	-0.051	-0.026	-0.034	-0.005	-0.045	0.001
Sep-11	-0.147	-0.039	-0.040	-0.082	-0.171	0.009	-0.002	0.075	-0.010	0.006	-0.066	0.012	-0.073	0.080	-0.133	-0.060	-0.036	-0.048	-0.012	-0.060	-0.007
Oct-11	-0.172	-0.085	-0.053	-0.114	-0.200	-0.023	-0.024	0.033	-0.054	-0.024	-0.112	-0.010	-0.081	0.070	-0.154	-0.065	-0.065	-0.072	-0.044	-0.083	-0.060
Nov-11	-0.158	-0.065	-0.048	-0.101	-0.190	-0.013	-0.015	0.042	-0.035	-0.011	-0.094	0.001	-0.080	0.072	-0.147	-0.059	-0.055	-0.058	-0.033	-0.072	-0.044
Dec-11	-0.154	-0.058	-0.045	-0.096	-0.185	-0.006	-0.011	0.052	-0.025	-0.005	-0.086	0.004	-0.075	0.074	-0.145	-0.059	-0.050	-0.053	-0.029	-0.069	-0.034
Jan-12	-0.153	-0.053	-0.050	-0.093	-0.188	-0.005	-0.027	0.031	-0.030	-0.016	-0.101	-0.009	-0.090	0.069	-0.157	-0.071	-0.048	-0.057	-0.028	-0.067	-0.030
Feb-12	-0.156	-0.049	-0.054	-0.090	-0.188	-0.004	-0.032	0.044	-0.029	-0.015	-0.097	-0.008	-0.089	0.071	-0.153	-0.073	-0.045	-0.055	-0.030	-0.067	-0.028
Mar-12	-0.154	-0.050	-0.055	-0.088	-0.185	-0.001	-0.028	0.045	-0.022	-0.008	-0.092	-0.003	-0.085	0.069	-0.150	-0.069	-0.043	-0.054	-0.028	-0.067	-0.026
Apr-12	-0.155	-0.048	-0.051	-0.089	-0.182	-0.002	-0.028	0.047	-0.021	-0.004	-0.091	-0.007	-0.080	0.067	-0.154	-0.069	-0.041	-0.051	-0.026	-0.067	-0.022
May-12	-0.154	-0.046	-0.046	-0.087	-0.181	0.000	-0.021	0.055	-0.017	-0.001	-0.085	0.000	-0.079	0.069	-0.145	-0.065	-0.039	-0.050	-0.022	-0.068	-0.016
Jun-12	-0.169	-0.054	-0.049	-0.093	-0.185	-0.004	-0.019	0.059	-0.024	-0.004	-0.099	-0.003	-0.083	0.068	-0.141	-0.070	-0.049	-0.047	-0.023	-0.066	-0.023
Jul-12	-0.165	-0.050	-0.071	-0.098	-0.190	-0.003	-0.014	0.025	-0.025	-0.008	-0.095	0.000	-0.089	0.071	-0.152	-0.072	-0.047	-0.046	-0.023	-0.063	-0.020
Aug-12	-0.160	-0.055	-0.064	-0.094	-0.189	0.001	-0.010	0.032	-0.018	-0.005	-0.087	0.003	-0.083	0.072	-0.153	-0.069	-0.045	-0.045	-0.020	-0.060	-0.017
Sep-12	-0.155	-0.053	-0.059	-0.097	-0.184	0.002	-0.008	0.043	-0.012	-0.001	-0.081	0.005	-0.079	0.074	-0.152	-0.065	-0.046	-0.043	-0.022	-0.057	-0.014

Oct-12	-0.152	-0.048	-0.054	-0.094	-0.181	0.006	-0.007	0.050	-0.010	0.001	-0.077	0.007	-0.077	0.075	-0.148	-0.064	-0.044	-0.043	-0.020	-0.056	-0.014
Nov-12	-0.150	-0.044	-0.048	-0.090	-0.179	0.010	-0.004	0.058	-0.006	0.005	-0.073	0.010	-0.071	0.077	-0.144	-0.061	-0.041	-0.041	-0.018	-0.056	-0.011
Dec-12	-0.147	-0.043	-0.047	-0.088	-0.177	0.012	-0.005	0.063	-0.005	0.007	-0.070	0.011	-0.068	0.077	-0.142	-0.058	-0.040	-0.043	-0.017	-0.054	-0.009
Jan-13	-0.145	-0.041	-0.045	-0.087	-0.175	0.013	-0.004	0.067	-0.003	0.008	-0.068	0.012	-0.067	0.077	-0.140	-0.056	-0.038	-0.043	-0.016	-0.052	-0.009
Feb-13	-0.144	-0.040	-0.043	-0.085	-0.173	0.014	-0.002	0.069	-0.002	0.010	-0.066	0.012	-0.066	0.075	-0.138	-0.055	-0.037	-0.045	-0.016	-0.051	-0.009
Mar-13	-0.149	-0.038	-0.043	-0.090	-0.176	0.014	-0.003	0.080	-0.004	0.009	-0.069	0.007	-0.064	0.084	-0.136	-0.062	-0.025	-0.042	-0.004	-0.049	-0.001
Apr-13	-0.147	-0.038	-0.043	-0.088	-0.174	0.014	-0.002	0.081	-0.003	0.010	-0.068	0.009	-0.061	0.083	-0.136	-0.059	-0.026	-0.040	-0.005	-0.048	-0.001
May-13	-0.146	-0.048	-0.054	-0.100	-0.194	0.017	0.001	0.064	0.003	0.006	-0.070	-0.002	-0.061	0.099	-0.137	-0.051	-0.025	-0.030	-0.001	-0.042	0.002
Jun-13	-0.151	-0.051	-0.050	-0.100	-0.197	0.016	0.006	0.081	0.011	0.022	-0.073	0.024	-0.062	0.108	-0.127	-0.049	-0.027	-0.023	-0.006	-0.039	-0.005
Jul-13	-0.155	-0.048	-0.048	-0.097	-0.191	0.015	0.005	0.082	0.010	0.020	-0.070	0.021	-0.065	0.102	-0.133	-0.050	-0.030	-0.026	-0.009	-0.041	-0.006
Aug-13	-0.150	-0.055	-0.040	-0.093	-0.187	0.020	0.012	0.075	0.007	0.024	-0.066	0.024	-0.067	0.104	-0.132	-0.050	-0.035	-0.028	-0.008	-0.041	-0.008
Sep-13	-0.143	-0.054	-0.037	-0.095	-0.176	0.023	0.009	0.080	0.005	0.026	-0.065	0.025	-0.073	0.096	-0.128	-0.054	-0.045	-0.035	-0.019	-0.044	-0.016
Oct-13	-0.139	-0.045	-0.035	-0.090	-0.176	0.023	0.011	0.081	0.007	0.026	-0.060	0.025	-0.064	0.094	-0.127	-0.051	-0.041	-0.033	-0.016	-0.043	-0.010
Nov-13	-0.133	-0.038	-0.035	-0.085	-0.171	0.031	0.018	0.094	0.007	0.033	-0.055	0.028	-0.060	0.090	-0.129	-0.038	-0.033	-0.029	-0.006	-0.038	-0.002
Dec-13	-0.138	-0.041	-0.042	-0.079	-0.175	0.031	0.015	0.101	0.007	0.032	-0.059	0.023	-0.062	0.088	-0.127	-0.043	-0.040	-0.030	-0.015	-0.040	-0.009
Jan-14	-0.140	-0.046	-0.043	-0.079	-0.169	0.022	0.022	0.098	0.004	0.017	-0.056	0.026	-0.077	0.103	-0.132	-0.042	-0.039	-0.024	-0.026	-0.037	-0.018
Feb-14	-0.142	-0.045	-0.043	-0.080	-0.168	0.021	0.020	0.095	0.005	0.017	-0.057	0.024	-0.075	0.099	-0.132	-0.044	-0.037	-0.027	-0.022	-0.039	-0.015
Mar-14	-0.142	-0.031	-0.037	-0.088	-0.168	0.023	0.022	0.093	0.000	0.023	-0.059	0.028	-0.071	0.100	-0.132	-0.043	-0.032	-0.027	-0.014	-0.038	-0.009
Apr-14	-0.137	-0.030	-0.029	-0.083	-0.171	0.022	0.017	0.094	0.000	0.020	-0.060	0.025	-0.062	0.095	-0.132	-0.042	-0.031	-0.028	-0.014	-0.038	-0.006
May-14	-0.135	-0.027	-0.031	-0.082	-0.166	0.022	0.017	0.093	0.001	0.019	-0.062	0.024	-0.059	0.094	-0.131	-0.043	-0.031	-0.029	-0.010	-0.040	-0.003
Jun-14	-0.136	-0.029	-0.032	-0.080	-0.165	0.024	0.014	0.086	0.012	0.018	-0.053	0.024	-0.053	0.095	-0.130	-0.037	-0.031	-0.031	-0.013	-0.038	-0.004
Jul-14	-0.137	-0.030	-0.033	-0.080	-0.165	0.022	0.012	0.086	0.009	0.018	-0.054	0.022	-0.055	0.090	-0.130	-0.040	-0.031	-0.032	-0.012	-0.040	-0.004
Aug-14	-0.134	-0.030	-0.034	-0.078	-0.165	0.019	0.014	0.085	0.006	0.016	-0.060	0.020	-0.054	0.093	-0.126	-0.041	-0.029	-0.033	-0.012	-0.041	-0.004
Sep-14	-0.117	-0.024	-0.024	-0.070	-0.164	0.023	0.019	0.080	0.007	0.022	-0.062	0.015	-0.060	0.093	-0.127	-0.040	-0.030	-0.036	-0.009	-0.040	0.002
Oct-14	-0.128	-0.026	-0.029	-0.072	-0.166	0.023	0.016	0.081	0.007	0.020	-0.062	0.014	-0.061	0.090	-0.127	-0.042	-0.030	-0.036	-0.009	-0.043	0.001
Nov-14	-0.129	-0.032	-0.034	-0.074	-0.169	0.021	0.008	0.075	0.003	0.017	-0.063	0.014	-0.054	0.081	-0.126	-0.039	-0.033	-0.036	-0.012	-0.043	-0.001
Dec-14	-0.131	-0.030	-0.038	-0.076	-0.169	0.022	0.008	0.076	0.004	0.017	-0.064	0.014	-0.053	0.080	-0.124	-0.040	-0.033	-0.037	-0.012	-0.043	-0.001
Jan-15	-0.135	-0.031	-0.037	-0.077	-0.169	0.021	0.008	0.078	0.004	0.017	-0.066	0.014	-0.054	0.081	-0.120	-0.042	-0.032	-0.037	-0.012	-0.043	-0.002
Feb-15	-0.147	-0.033	-0.054	-0.091	-0.178	0.020	0.005	0.067	0.003	0.017	-0.071	0.013	-0.057	0.078	-0.126	-0.047	-0.032	-0.037	-0.015	-0.043	-0.005
Mar-15	-0.137	-0.029	-0.050	-0.081	-0.176	0.025	0.003	0.067	0.010	0.019	-0.058	0.017	-0.061	0.081	-0.125	-0.047	-0.030	-0.035	-0.014	-0.042	-0.005
Apr-15	-0.138	-0.032	-0.052	-0.083	-0.179	0.025	0.002	0.082	0.015	0.019	-0.059	0.013	-0.064	0.077	-0.117	-0.052	-0.030	-0.035	-0.012	-0.043	-0.010
May-15	-0.132	-0.030	-0.044	-0.081	-0.174	0.024	0.002	0.080	0.019	0.021	-0.053	0.016	-0.062	0.079	-0.114	-0.054	-0.035	-0.036	-0.013	-0.042	-0.008
Jun-15	-0.143	-0.031	-0.050	-0.081	-0.173	0.022	0.003	0.086	0.014	0.017	-0.060	0.007	-0.064	0.075	-0.115	-0.049	-0.032	-0.047	-0.017	-0.045	-0.011
Jul-15	-0.142	-0.038	-0.046	-0.080	-0.173	0.018	0.000	0.086	0.010	0.012	-0.062	0.007	-0.064	0.074	-0.125	-0.050	-0.041	-0.050	-0.017	-0.051	-0.009
Aug-15	-0.148	-0.039	-0.049	-0.083	-0.182	0.027	-0.002	0.081	0.013	0.011	-0.070	0.009	-0.067	0.079	-0.144	-0.049	-0.044	-0.045	-0.018	-0.064	-0.017
Sep-15	-0.153	-0.038	-0.049	-0.085	-0.189	0.025	-0.005	0.076	0.009	0.010	-0.069	0.006	-0.069	0.075	-0.148	-0.054	-0.047	-0.052	-0.022	-0.065	-0.017
Oct-15	-0.156	-0.046	-0.052	-0.090	-0.188	0.017	-0.002	0.076	0.005	0.007	-0.072	0.008	-0.069	0.076	-0.150	-0.055	-0.056	-0.048	-0.026	-0.061	-0.019
Nov-15	-0.151	-0.042	-0.048	-0.087	-0.183	0.018	0.000	0.078	0.005	0.010	-0.068	0.011	-0.066	0.077	-0.144	-0.053	-0.049	-0.045	-0.022	-0.057	-0.015
Dec-15	-0.151	-0.050	-0.060	-0.092	-0.183	0.017	-0.012	0.072	0.001	0.004	-0.066	0.003	-0.073	0.075	-0.140	-0.056	-0.047	-0.043	-0.026	-0.059	-0.017
Jan-16	-0.151	-0.045	-0.053	-0.090	-0.181	0.017	-0.004	0.074	0.002	0.005	-0.069	0.004	-0.073	0.077	-0.136	-0.055	-0.042	-0.040	-0.023	-0.056	-0.018
Feb-16	-0.151	-0.042	-0.048	-0.087	-0.179	0.017	-0.003	0.076	0.003	0.007	-0.067	0.006	-0.070	0.077	-0.144	-0.055	-0.040	-0.040	-0.021	-0.054	-0.015
Mar-16	-0.154	-0.041	-0.054	-0.088	-0.186	-0.001	-0.002	0.067	-0.004	0.007	-0.067	0.003	-0.070	0.070	-0.147	-0.077	-0.040	-0.045	-0.023	-0.056	-0.014
Apr-16	-0.162	-0.046	-0.057	-0.092	-0.189	-0.001	-0.012	0.063	-0.013	0.002	-0.073	0.000	-0.074	0.072	-0.150	-0.079	-0.039	-0.048	-0.029	-0.057	-0.016
May-16	-0.163	-0.043	-0.053	-0.092	-0.191	0.002	-0.009	0.067	-0.010	-0.002	-0.075	0.003	-0.072	0.072	-0.150	-0.072	-0.040	-0.058	-0.031	-0.067	-0.016
Jun-16	-0.161	-0.041	-0.049	-0.089	-0.185	0.006	-0.005	0.071	-0.006	0.003	-0.071	0.007	-0.070	0.074	-0.145	-0.067	-0.038	-0.053	-0.026	-0.061	-0.013
Jul-16	-0.165	-0.040	-0.049	-0.088	-0.184	-0.020	-0.021	0.041	-0.007	-0.004	-0.071	-0.014	-0.074	0.068	-0.145	-0.064	-0.042	-0.053	-0.030	-0.060	-0.011
Aug-16	-0.155	-0.037	-0.046	-0.086	-0.179	-0.009	-0.013	0.051	-0.003	0.001	-0.068	-0.008	-0.071	0.071	-0.141	-0.060	-0.039	-0.049	-0.025	-0.056	-0.008
Sep-16	-0.151	-0.036	-0.043	-0.084	-0.176	-0.003	-0.008	0.058	-0.001	0.005	-0.066	-0.002	-0.068	0.073	-0.138	-0.057	-0.037	-0.046	-0.022	-0.053	-0.007
Oct-16	-0.147	-0.037	-0.044	-0.084	-0.173	0.003	-0.006	0.063	0.000	0.007	-0.062	0.000	-0.066	0.075	-0.137	-0.057	-0.037	-0.046	-0.022	-0.051	-0.009
Nov-16	-0.143	-0.035	-0.042	-0.082	-0.171	0.007	-0.003	0.068	0.001	0.009	-0.061	0.003	-0.065	0.076	-0.135	-0.055	-0.035	-0.043	-0.019	-0.049	-0.008
Dec-16	-0.143	-0.034	-0.041	-0.083	-0.170	0.009	-0.001	0.071	0.003	0.011	-0.060	0.006	-0.064	0.077	-0.133	-0.054	-0.035	-0.042	-0.019	-0.048	-0.006
Jan-17	-0.145	-0.037	-0.032	-0.082	-0.168	0.017	0.005	0.076	0.010	0.020	-0.051	0.008	-0.058	0.084	-0.138	-0.054	-0.032	-0.038	-0.017	-0.047	-0.004
Feb-17	-0.136	-0.034	-0.032	-0.078	-0.166	0.019	0.007	0.075	0.010	0.025	-0.052	0.014	-0.051	0.083	-0.134	-0.050	-0.033	-0.035	-0.011	-0.045	-0.002
Mar-17	-0.134	-0.029	-0.035	-0.080	-0.167	0.021	0.003	0.080	0.008	0.028	-0.056	0.009	-0.052	0.082	-0.132	-0.047	-0.032	-0.034	-0.012	-0.042	-0.004
Apr-17	-0.138	-0.011	-0.031	-0.073	-0.167	0.025	0.011	0.084	0.005	0.024	-0.055	0.014	-0.053	0.077	-0.131	-0.044	-0.028	-0.028	-0.011	-0.042	-0.003
May-17	-0.136	-0.016	-0.031	-0.071	-0.168	0.030	0.003	0.093	0.013	0.036	-0.055	0.024	-0.043	0.080	-0.130	-0.044	-0.026	-0.025	-0.001	-0.041	-0.007
Jun-17	-0.144	-0.017	-0.022	-0.077	-0.163	0.027	0.010	0.101	0.019	0.027	-0.062	0.021	-0.044	0.075	-0.128	-0.039	-0.028	-0.029	-0.001	-0.039	-0.008

Table B.10: ADCC GARCH Correlation between Australia's Superannuation Funds and Frontier Markets: 2006-2017

Date	AUSBGR	AUSHRV	AUSEST	AUSLTU	AUSROM	AUSSVN	AUSKEN	AUSMUS	AUSNGA	AUSTUN	AUSBWA	AUSBHR	AUSJOR	AUSOMN	AUSBGD	AUSLKA	AUSVNM
Jun-06	0.031	-0.021	0.058	0.037	-0.016	-0.023	0.049	-0.038	0.066	-0.082	-0.068	0.156	0.052	-0.137	-0.071	0.070	-0.055
Jul-06	0.032	-0.014	0.057	0.033	-0.016	-0.020	0.047	-0.034	0.069	-0.089	-0.063	0.158	0.040	-0.139	-0.072	0.066	-0.058
Aug-06	0.038	-0.005	0.061	0.034	-0.003	-0.011	0.047	-0.027	0.078	-0.096	-0.051	0.162	0.042	-0.146	-0.063	0.072	-0.080
Sep-06	0.042	0.006	0.067	0.034	-0.003	-0.006	0.057	-0.018	0.102	-0.086	-0.031	0.186	0.152	-0.134	-0.038	0.072	-0.065
Oct-06	0.043	0.011	0.070	0.049	0.003	0.003	0.080	-0.003	0.098	-0.069	-0.013	0.196	0.088	-0.117	-0.045	0.090	-0.056
Nov-06	0.062	0.016	0.078	0.048	0.012	0.020	0.100	0.025	0.097	-0.049	0.036	0.197	0.091	-0.106	-0.051	0.095	-0.060
Dec-06	0.072	0.016	0.094	0.068	0.005	0.022	0.115	0.080	0.090	-0.051	0.035	0.191	0.066	-0.120	-0.058	0.125	-0.026
Jan-07	0.080	0.014	0.109	0.080	0.005	0.031	0.117	0.070	0.096	-0.053	0.037	0.200	0.063	-0.116	-0.055	0.122	-0.002
Feb-07	0.095	0.045	0.137	0.089	0.019	0.066	0.123	0.081	0.113	-0.023	0.047	0.192	0.095	-0.109	-0.042	0.136	0.056
Mar-07	0.091	0.047	0.114	0.080	0.019	0.055	0.108	0.093	0.133	-0.023	0.104	0.194	0.118	-0.111	-0.044	0.141	0.073
Apr-07	0.087	0.075	0.125	0.081	0.015	0.072	0.098	0.106	0.146	-0.027	0.145	0.200	0.104	-0.123	-0.041	0.128	0.063
May-07	0.087	0.096	0.124	0.080	0.020	0.109	0.103	0.115	0.163	-0.031	0.154	0.193	0.092	-0.112	-0.045	0.129	0.039
Jun-07	0.094	0.111	0.126	0.080	0.019	0.126	0.096	0.107	0.171	-0.039	0.206	0.238	0.090	-0.098	-0.027	0.112	0.064
Jul-07	0.100	0.108	0.134	0.091	0.033	0.152	0.101	0.123	0.173	-0.046	0.235	0.254	0.094	-0.094	-0.020	0.116	0.058
Aug-07	0.124	0.120	0.135	0.104	0.045	0.187	0.114	0.135	0.179	-0.061	0.250	0.298	0.086	-0.092	0.001	0.104	0.037
Sep-07	0.132	0.107	0.121	0.098	0.048	0.227	0.119	0.129	0.167	-0.057	0.251	0.297	0.075	-0.079	0.028	0.117	0.037
Oct-07	0.173	0.126	0.120	0.110	0.036	0.225	0.108	0.158	0.167	-0.068	0.246	0.307	0.093	-0.062	0.032	0.121	0.075
Nov-07	0.178	0.128	0.112	0.110	0.039	0.222	0.104	0.187	0.166	-0.063	0.234	0.323	0.128	-0.038	0.046	0.123	0.076
Dec-07	0.169	0.118	0.098	0.098	0.028	0.216	0.114	0.204	0.176	-0.060	0.225	0.321	0.128	-0.029	0.049	0.120	0.066
Jan-08	0.169	0.110	0.097	0.098	0.021	0.213	0.110	0.203	0.172	-0.059	0.241	0.317	0.120	-0.036	0.049	0.121	0.069
Feb-08	0.141	0.086	0.073	0.079	-0.017	0.193	0.083	0.226	0.173	-0.058	0.233	0.329	0.142	-0.033	0.042	0.114	0.054
Mar-08	0.144	0.078	0.080	0.093	-0.018	0.190	0.098	0.233	0.190	-0.058	0.229	0.342	0.156	-0.006	0.041	0.119	0.029
Apr-08	0.115	0.052	0.068	0.075	-0.038	0.141	0.083	0.205	0.181	-0.049	0.221	0.333	0.151	-0.018	0.072	0.122	-0.035
May-08	0.096	0.050	0.054	0.062	-0.035	0.136	0.123	0.201	0.169	-0.010	0.167	0.353	0.193	0.028	0.080	0.133	-0.035
Jun-08	0.101	0.052	0.053	0.060	-0.030	0.136	0.122	0.202	0.168	-0.012	0.163	0.355	0.201	0.030	0.081	0.131	-0.046
Jul-08	0.091	0.039	0.051	0.058	-0.051	0.126	0.122	0.197	0.161	-0.006	0.175	0.356	0.241	0.026	0.078	0.126	-0.052
Aug-08	0.060	0.046	0.018	0.042	-0.076	0.133	0.102	0.171	0.149	-0.016	0.203	0.353	0.229	0.003	0.060	0.128	-0.012
Sep-08	0.060	0.045	0.019	0.042	-0.077	0.132	0.102	0.171	0.149	-0.015	0.205	0.354	0.230	0.001	0.060	0.128	-0.011
Oct-08	0.069	0.050	0.023	0.052	-0.073	0.146	0.107	0.175	0.150	-0.015	0.207	0.369	0.239	0.006	0.059	0.133	-0.006
Nov-08	0.034	0.021	-0.008	0.021	-0.115	0.125	0.085	0.154	0.132	-0.038	0.201	0.359	0.234	-0.044	0.050	0.118	-0.036
Dec-08	-0.025	-0.045	-0.047	-0.020	-0.108	0.084	0.082	0.114	0.115	-0.056	0.168	0.325	0.178	-0.042	0.028	0.095	-0.060
Jan-09	-0.027	-0.032	-0.047	-0.027	-0.112	0.060	0.093	0.116	0.108	-0.065	0.139	0.310	0.177	-0.076	0.047	0.083	-0.061
Feb-09	-0.059	-0.037	-0.035	-0.017	-0.148	0.073	0.078	0.106	0.074	-0.059	0.125	0.294	0.170	-0.107	0.036	0.123	-0.068
Mar-09	-0.090	-0.109	-0.070	-0.075	-0.209	0.052	-0.017	-0.006	0.097	-0.051	0.081	0.268	0.145	-0.106	0.021	0.099	-0.142
Apr-09	-0.077	-0.093	-0.075	-0.083	-0.137	0.049	0.046	0.107	0.053	-0.048	0.071	0.287	0.189	-0.135	0.006	0.088	-0.099
May-09	-0.003	-0.066	-0.069	-0.082	-0.069	0.063	0.046	0.134	0.071	-0.011	0.039	0.292	0.200	-0.094	0.022	0.123	-0.065
Jun-09	0.014	0.062	-0.038	-0.054	-0.039	0.123	0.054	0.252	0.199	-0.014	0.028	0.311	0.251	-0.059	0.035	0.201	0.021
Jul-09	-0.011	0.009	-0.056	-0.052	-0.027	0.163	0.143	0.356	0.167	0.035	0.047	0.302	0.216	-0.048	0.103	0.252	0.060
Aug-09	-0.014	0.005	-0.061	-0.028	0.030	0.162	0.144	0.405	0.148	0.022	0.067	0.277	0.184	-0.024	0.092	0.272	0.075
Sep-09	0.096	0.038	0.045	0.158	0.064	0.165	0.126	0.416	0.120	0.042	0.114	0.293	0.171	0.026	0.093	0.289	0.146
Oct-09	0.099	0.044	0.050	0.167	0.065	0.167	0.124	0.454	0.118	0.047	0.116	0.296	0.181	0.028	0.094	0.300	0.149
Nov-09	0.092	0.040	0.041	0.156	0.068	0.167	0.129	0.458	0.115	0.045	0.119	0.293	0.172	0.021	0.102	0.301	0.149
Dec-09	0.089	0.033	0.040	0.143	0.083	0.158	0.137	0.451	0.108	0.045	0.151	0.280	0.168	0.021	0.115	0.298	0.129
Jan-10	0.106	0.042	0.048	0.148	0.092	0.168	0.133	0.448	0.114	0.031	0.181	0.275	0.182	0.020	0.113	0.270	0.137
Feb-10	0.106	0.046	0.073	0.166	0.094	0.168	0.138	0.455	0.116	0.034	0.181	0.276	0.181	0.020	0.119	0.273	0.136
Mar-10	0.103	0.042	0.060	0.160	0.101	0.163	0.141	0.449	0.117	0.032	0.196	0.286	0.175	0.024	0.120	0.280	0.139
Apr-10	0.105	0.041	0.043	0.153	0.082	0.162	0.120	0.454	0.101	0.033	0.212	0.280	0.166	0.024	0.122	0.286	0.139
May-10	0.115	0.037	0.014	0.155	0.102	0.173	0.104	0.447	0.102	0.014	0.216	0.263	0.144	0.011	0.127	0.248	0.109
Jun-10	0.139	0.061	0.046	0.165	0.140	0.200	0.104	0.486	0.108	0.011	0.247	0.324	0.195	0.041	0.116	0.249	0.128
Jul-10	0.139	0.061	0.046	0.165	0.139	0.200	0.104	0.487	0.108	0.010	0.246	0.325	0.194	0.040	0.116	0.252	0.127
Aug-10	0.142	0.060	0.037	0.160	0.126	0.222	0.099	0.478	0.108	-0.001	0.242	0.328	0.197	0.028	0.112	0.234	0.134
Sep-10	0.142	0.060	0.037	0.160	0.126	0.222	0.099	0.477	0.108	-0.001	0.242	0.328	0.198	0.027	0.112	0.237	0.134
Oct-10	0.143	0.056	0.032	0.152	0.121	0.220	0.095	0.474	0.113	-0.009	0.244	0.325	0.192	0.022	0.110	0.234	0.135
Nov-10	0.160	0.060	0.018	0.139	0.123	0.212	0.094	0.463	0.103	0.021	0.250	0.322	0.186	0.019	0.100	0.247	0.137
Dec-10	0.160	0.060	0.019	0.140	0.122	0.211	0.093	0.464	0.102	0.021	0.251	0.322	0.185	0.018	0.100	0.247	0.136
Jan-11	0.158	0.041	0.017	0.141	0.119	0.210	0.092	0.460	0.103	0.027	0.302	0.322	0.182	0.014	0.104	0.244	0.130
Feb-11	0.160	0.042	0.017	0.141	0.120	0.210	0.092	0.461	0.104	0.028	0.312	0.322	0.182	0.014	0.104	0.247	0.130
Mar-11	0.159	0.042	0.016	0.140	0.118	0.210	0.094	0.460	0.105	0.034	0.310	0.323	0.189	0.019	0.123	0.246	0.134
Apr-11	0.160	0.041	0.018	0.142	0.117	0.209	0.100	0.462	0.108	0.028	0.310	0.323	0.194	0.018	0.119	0.253	0.134
May-11	0.161	0.043	0.024	0.147	0.117	0.216	0.096	0.458	0.108	0.035	0.310	0.326	0.191	0.014	0.124	0.252	0.131
Jun-11	0.162	0.041	0.027	0.144	0.122	0.217	0.095	0.457	0.107	0.039	0.310	0.334	0.193	0.019	0.129	0.251	0.142
Jul-11	0.167	0.043	0.032	0.145	0.121	0.222	0.098	0.456	0.111	0.034	0.312	0.339	0.201	0.020	0.125	0.264	0.139
Aug-11	0.166	0.043	0.030	0.144	0.122	0.222	0.100	0.461	0.112	0.032	0.311	0.340	0.201	0.021	0.123	0.264	0.142
Sep-11	0.182	0.055	0.050	0.157	0.137	0.239	0.113	0.480	0.128	0.030	0.308	0.349	0.209	0.022	0.131	0.264	0.136
Oct-11	0.165	0.029	0.019	0.129	0.117	0.222	0.100	0.471	0.116	0.043	0.295	0.326	0.198	0.011	0.117	0.262	0.137
Nov-11	0.165	0.029	0.017	0.127	0.115	0.221	0.099	0.471	0.115	0.043	0.299	0.327	0.197	0.011	0.123	0.266	0.137
Dec-11	0.162	0.026	0.016	0.124	0.112	0.219	0.095	0.470	0.113	0.042	0.297	0.329	0.194	0.008	0.123	0.264	0.134
Jan-12	0.173	0.026	0.000	0.123	0.119	0.211	0.100	0.478	0.119	0.042	0.297	0.325	0.207	0.027	0.119	0.264	0.117
Feb-12	0.173	0.024	0.005	0.133	0.144	0.215	0.102	0.470	0.118	0.038	0.295	0.326	0.199	0.021	0.096	0.255	0.136
Mar-12	0.169	0.031	0.019	0.134	0.158	0.207	0.106	0.464	0.113	0.039	0.292	0.330	0.202	0.032	0.109	0.248	0.151
Apr-12	0.167	0.036	0.020	0.134	0.162	0.222	0.110	0.470	0.114	0.039	0.294	0.332	0.209	0.026	0.117	0.247	0.156
May-12	0.169	0.038	0.015	0.128	0.162	0.223	0.104	0.472	0.110	0.031	0.292	0.332	0.209	0.021	0.114	0.248	0.150
Jun-12	0.166	0.028	0.009	0.129	0.151	0.214	0.108	0.472	0.109	0.027	0.291	0.330	0.199	0.018	0.106	0.239	0.141
Jul-12	0.166	0.032	0.015	0.133	0.150	0.209	0.113	0.467	0.103	0.020	0.293	0.329	0.203	0.014	0.099	0.247	0.137
Aug-12	0.176	0.033	0.020	0.136	0.156	0.208	0.118	0.463	0.110	0.030	0.295	0.325	0.199	0.003	0.089	0.245	0.134
Sep-12	0.178	0.031	0.025	0.136	0.159	0.206	0.120	0.458	0.112	0.027	0.293	0.323	0.213	0.007	0.093	0.252	0.128

Oct-12	0.178	0.034	0.023	0.134	0.157	0.246	0.123	0.460	0.120	0.016	0.294	0.324	0.210	0.008	0.095	0.282	0.127
Nov-12	0.178	0.034	0.023	0.133	0.157	0.245	0.124	0.460	0.120	0.016	0.293	0.324	0.210	0.007	0.094	0.284	0.126
Dec-12	0.177	0.034	0.023	0.134	0.155	0.244	0.122	0.460	0.119	0.010	0.293	0.324	0.210	0.005	0.090	0.282	0.124
Jan-13	0.181	0.032	0.029	0.135	0.163	0.257	0.124	0.466	0.123	0.005	0.290	0.327	0.213	0.010	0.089	0.288	0.132
Feb-13	0.199	0.040	0.033	0.139	0.168	0.257	0.130	0.474	0.132	0.009	0.297	0.331	0.226	0.010	0.088	0.290	0.148
Mar-13	0.211	0.031	0.036	0.145	0.162	0.266	0.125	0.465	0.128	0.023	0.292	0.331	0.227	0.000	0.100	0.303	0.152
Apr-13	0.211	0.031	0.036	0.145	0.162	0.267	0.125	0.466	0.128	0.022	0.297	0.330	0.227	-0.001	0.102	0.303	0.152
May-13	0.203	0.043	0.042	0.147	0.183	0.242	0.136	0.482	0.135	0.042	0.276	0.328	0.277	-0.012	0.124	0.296	0.168
Jun-13	0.187	0.059	0.053	0.146	0.182	0.259	0.122	0.482	0.112	0.052	0.288	0.299	0.272	-0.031	0.099	0.278	0.148
Jul-13	0.187	0.059	0.053	0.146	0.182	0.259	0.123	0.482	0.112	0.051	0.288	0.298	0.272	-0.032	0.099	0.279	0.148
Aug-13	0.183	0.055	0.049	0.144	0.178	0.255	0.118	0.492	0.108	0.057	0.290	0.297	0.274	-0.040	0.105	0.282	0.146
Sep-13	0.189	0.055	0.050	0.144	0.171	0.255	0.121	0.487	0.115	0.055	0.300	0.299	0.290	-0.042	0.102	0.289	0.152
Oct-13	0.187	0.056	0.050	0.142	0.168	0.257	0.120	0.485	0.115	0.059	0.298	0.298	0.291	-0.042	0.105	0.290	0.149
Nov-13	0.190	0.063	0.051	0.148	0.168	0.252	0.110	0.476	0.113	0.060	0.296	0.297	0.264	-0.044	0.108	0.287	0.149
Dec-13	0.187	0.062	0.052	0.150	0.162	0.248	0.107	0.479	0.111	0.064	0.293	0.296	0.256	-0.046	0.101	0.295	0.147
Jan-14	0.178	0.058	0.062	0.146	0.157	0.244	0.118	0.471	0.102	0.077	0.287	0.283	0.243	-0.053	0.104	0.293	0.151
Feb-14	0.182	0.058	0.062	0.149	0.157	0.248	0.118	0.470	0.101	0.078	0.292	0.286	0.258	-0.052	0.107	0.295	0.155
Mar-14	0.174	0.058	0.064	0.148	0.155	0.243	0.115	0.472	0.105	0.070	0.307	0.277	0.262	-0.053	0.110	0.305	0.149
Apr-14	0.173	0.059	0.066	0.149	0.156	0.244	0.115	0.471	0.107	0.073	0.313	0.278	0.263	-0.051	0.114	0.305	0.148
May-14	0.173	0.061	0.067	0.150	0.154	0.240	0.115	0.474	0.108	0.078	0.316	0.274	0.265	-0.049	0.114	0.302	0.150
Jun-14	0.173	0.063	0.067	0.146	0.148	0.227	0.118	0.475	0.101	0.077	0.312	0.268	0.263	-0.054	0.120	0.303	0.156
Jul-14	0.169	0.067	0.066	0.148	0.151	0.228	0.117	0.475	0.101	0.078	0.312	0.266	0.261	-0.052	0.119	0.303	0.157
Aug-14	0.170	0.066	0.067	0.148	0.152	0.229	0.117	0.473	0.102	0.076	0.310	0.263	0.258	-0.055	0.120	0.301	0.155
Sep-14	0.169	0.060	0.075	0.161	0.145	0.227	0.105	0.479	0.109	0.080	0.305	0.265	0.261	-0.065	0.118	0.296	0.140
Oct-14	0.168	0.062	0.073	0.161	0.145	0.229	0.106	0.481	0.108	0.078	0.304	0.266	0.259	-0.064	0.123	0.298	0.137
Nov-14	0.176	0.071	0.076	0.165	0.151	0.237	0.109	0.489	0.125	0.060	0.302	0.275	0.261	-0.048	0.123	0.299	0.138
Dec-14	0.176	0.071	0.076	0.165	0.151	0.237	0.108	0.490	0.126	0.059	0.301	0.275	0.260	-0.048	0.125	0.299	0.139
Jan-15	0.176	0.069	0.075	0.164	0.151	0.236	0.108	0.489	0.126	0.060	0.300	0.275	0.261	-0.050	0.124	0.299	0.137
Feb-15	0.170	0.071	0.087	0.168	0.150	0.238	0.111	0.484	0.111	0.063	0.297	0.275	0.262	-0.044	0.119	0.296	0.145
Mar-15	0.172	0.072	0.083	0.165	0.149	0.237	0.107	0.484	0.111	0.059	0.296	0.272	0.259	-0.044	0.119	0.295	0.143
Apr-15	0.167	0.074	0.083	0.163	0.150	0.237	0.113	0.492	0.107	0.066	0.294	0.276	0.268	-0.037	0.127	0.308	0.152
May-15	0.168	0.073	0.082	0.162	0.148	0.235	0.115	0.493	0.105	0.064	0.293	0.281	0.267	-0.038	0.132	0.307	0.151
Jun-15	0.178	0.076	0.090	0.161	0.149	0.244	0.130	0.498	0.110	0.061	0.277	0.292	0.253	-0.042	0.110	0.309	0.151
Jul-15	0.178	0.076	0.087	0.159	0.147	0.237	0.133	0.501	0.107	0.061	0.280	0.293	0.246	-0.041	0.107	0.306	0.155
Aug-15	0.187	0.066	0.082	0.160	0.138	0.233	0.166	0.511	0.132	0.072	0.273	0.310	0.244	-0.050	0.102	0.299	0.146
Sep-15	0.189	0.069	0.082	0.162	0.144	0.243	0.171	0.516	0.134	0.077	0.275	0.314	0.246	-0.040	0.103	0.299	0.154
Oct-15	0.185	0.065	0.079	0.158	0.144	0.238	0.171	0.514	0.139	0.067	0.267	0.311	0.239	-0.043	0.103	0.295	0.153
Nov-15	0.185	0.065	0.079	0.158	0.144	0.239	0.170	0.513	0.138	0.066	0.266	0.311	0.238	-0.043	0.102	0.294	0.155
Dec-15	0.182	0.062	0.081	0.159	0.142	0.240	0.176	0.508	0.132	0.057	0.265	0.309	0.232	-0.055	0.100	0.292	0.148
Jan-16	0.179	0.061	0.081	0.158	0.141	0.239	0.176	0.509	0.130	0.056	0.266	0.311	0.229	-0.053	0.101	0.292	0.147
Feb-16	0.177	0.058	0.080	0.158	0.138	0.238	0.173	0.510	0.126	0.062	0.264	0.309	0.229	-0.056	0.100	0.291	0.145
Mar-16	0.177	0.059	0.091	0.158	0.143	0.239	0.180	0.506	0.129	0.051	0.253	0.309	0.224	-0.044	0.099	0.286	0.150
Apr-16	0.176	0.067	0.100	0.167	0.155	0.257	0.188	0.504	0.133	0.057	0.250	0.299	0.235	-0.041	0.089	0.283	0.150
May-16	0.175	0.069	0.103	0.165	0.149	0.254	0.191	0.502	0.130	0.050	0.253	0.295	0.225	-0.019	0.081	0.301	0.162
Jun-16	0.175	0.069	0.102	0.166	0.148	0.254	0.190	0.502	0.133	0.051	0.251	0.295	0.225	-0.020	0.081	0.300	0.163
Jul-16	0.184	0.066	0.099	0.164	0.155	0.248	0.179	0.506	0.147	0.031	0.244	0.303	0.220	-0.023	0.081	0.291	0.169
Aug-16	0.184	0.066	0.099	0.165	0.155	0.249	0.179	0.506	0.147	0.031	0.244	0.305	0.219	-0.023	0.081	0.291	0.168
Sep-16	0.184	0.067	0.098	0.164	0.157	0.249	0.177	0.507	0.146	0.031	0.242	0.305	0.217	-0.025	0.080	0.292	0.169
Oct-16	0.180	0.062	0.098	0.163	0.157	0.247	0.175	0.506	0.145	0.034	0.239	0.303	0.213	-0.025	0.078	0.292	0.168
Nov-16	0.182	0.062	0.099	0.163	0.157	0.247	0.175	0.504	0.144	0.034	0.238	0.303	0.212	-0.028	0.077	0.291	0.167
Dec-16	0.184	0.063	0.099	0.163	0.156	0.245	0.174	0.503	0.142	0.034	0.236	0.306	0.216	-0.028	0.078	0.290	0.166
Jan-17	0.180	0.063	0.095	0.164	0.151	0.239	0.178	0.505	0.136	0.038	0.249	0.297	0.216	-0.040	0.073	0.292	0.167
Feb-17	0.178	0.054	0.093	0.163	0.146	0.235	0.198	0.501	0.140	0.039	0.256	0.289	0.216	-0.041	0.066	0.295	0.162
Mar-17	0.177	0.050	0.093	0.164	0.140	0.227	0.190	0.498	0.144	0.037	0.265	0.283	0.210	-0.041	0.065	0.296	0.161
Apr-17	0.172	0.074	0.092	0.164	0.138	0.235	0.183	0.501	0.146	0.044	0.260	0.283	0.201	-0.030	0.065	0.303	0.159
May-17	0.165	0.093	0.096	0.159	0.134	0.234	0.181	0.490	0.151	0.039	0.261	0.299	0.231	-0.028	0.084	0.281	0.167
Jun-17	0.167	0.099	0.100	0.156	0.120	0.229	0.158	0.485	0.124	0.040	0.268	0.309	0.236	-0.023	0.094	0.284	0.163

Table B.11: Descriptive Statistics of Developed Markets: Full Period and Sub-Periods

Developed Markets											
	Full Period (2006-2017)							GFC (2006-2009)		Post-GFC (2010-2017)	
Variables	Mean	Minimum	Maximum	Variance	Standard Deviation	Skewness	Excess Kurtosis	Mean	Standard Deviation	Mean	Standard Deviation
VA	1.2106	-0.3900	1.7400	0.1772	0.4209	-1.8431	3.5920	1.1989	0.4320	1.2165	0.4164
PV	0.8170	-1.6300	1.5900	0.3350	0.5788	-1.9573	4.4029	0.8164	0.6237	0.8173	0.5568
GE	1.6162	0.2000	2.4400	0.1691	0.4112	-1.0734	1.6266	1.6301	0.4545	1.6092	0.3889
RegQ	1.5221	0.6300	2.2600	0.1280	0.3578	-0.5064	-0.5009	1.5098	0.2886	1.5282	0.3884
RL	1.5883	0.2700	2.1000	0.1616	0.4020	-1.3756	1.5110	1.5676	0.3970	1.5986	0.4052
CC	1.6744	-0.0300	2.4700	0.3116	0.5583	-0.9633	0.5802	1.7147	0.5392	1.6543	0.5680
TF	86.6053	79.2000	95.0000	6.9939	2.6446	-0.4680	0.7048	85.1546	3.1984	87.3307	1.9590
IF	79.1856	50.0000	95.0000	103.0415	10.1509	-0.7585	0.0171	75.6818	11.7244	80.9375	8.7897
FF	72.5000	50.0000	90.0000	136.6920	11.6915	-0.3808	-0.6633	71.8182	14.7427	72.8409	9.8502
GDP	1.7871	-8.2700	25.5600	8.8897	2.9816	1.8460	16.4003	1.0868	3.4228	2.1373	2.6769
index_returns	0.0572	-0.6600	0.7500	0.0494	0.2222	-0.6614	1.2884	0.0368	0.3295	0.0673	0.1412

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.12: Descriptive Statistics of Emerging Markets: Full Period and Sub-Periods

Emerging Markets											
	Full Period (2006-2017)							GFC (2006-2009)		Post-GFC (2010-2017)	
Variables	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
VA	0.0493	-1.7500	1.1100	0.6095	0.7807	-0.5308	-0.7157	0.0630	0.7870	0.0424	0.7797
PV	-0.3044	-2.0000	1.1100	0.7012	0.8374	0.1062	-1.1565	-0.3168	0.8746	-0.2982	0.8207
GE	0.3326	-0.8800	1.5100	0.2947	0.5428	0.2379	-0.7956	0.3146	0.5429	0.3415	0.5442
RegQ	0.3618	-0.9200	1.5400	0.3180	0.5639	0.1722	-0.7829	0.3645	0.5448	0.3605	0.5749
RL	0.0919	-0.9700	1.4300	0.3775	0.6144	0.4159	-0.9659	0.0707	0.6264	0.1025	0.6100
CC	-0.0328	-1.1300	1.5800	0.3706	0.6088	0.6899	-0.0739	-0.0217	0.5990	-0.0384	0.6153
TF	77.6397	24.0000	88.0000	73.4143	8.5682	-1.7071	6.3277	74.4345	10.9504	79.2423	6.5569
IF	53.1548	20.0000	90.0000	294.4899	17.1607	0.0060	-1.1026	48.3333	15.2753	55.5655	17.5815
FF	54.2460	20.0000	90.0000	183.8914	13.5607	-0.1573	-0.5463	51.0714	14.3130	55.8333	12.9215
GDP	3.8401	-9.1300	14.2300	12.3930	3.5204	-0.6795	1.4802	4.0011	4.2649	3.7596	3.0931
index_returns	0.1190	-0.7200	1.6800	0.1272	0.3567	0.7890	2.5471	0.2104	0.5228	0.0733	0.2216

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.13: Descriptive Statistics of Frontier Markets: Full Period and Sub-Periods

Frontier Markets											
	Full Period (2006-2017)							GFC (2006-2009)		Post-GFC (2010-2017)	
Variables	Mean	Minimum	Maximum	Variance	Standard Deviation	Skewness	Excess Kurtosis	Mean	Standard Deviation	Mean	Standard Deviation
VA	-0.1155	-1.5400	1.2100	0.6560	0.8100	-0.1146	-1.2644	-0.1548	0.8348	-0.0959	0.7999
PV	-0.1105	-2.2100	1.1000	0.8668	0.9310	-0.6038	-0.8909	-0.0873	0.9690	-0.1220	0.9150
GE	0.1345	-1.2100	1.1900	0.3423	0.5850	-0.2860	-0.5816	0.1263	0.5838	0.1386	0.5879
RegQ	0.2599	-1.0000	1.7000	0.4475	0.6690	-0.1467	-0.7690	0.2536	0.6508	0.2631	0.6804
RL	0.1233	-1.1800	1.3700	0.4023	0.6343	-0.2790	-0.6624	0.0955	0.6526	0.1372	0.6271
CC	-0.0519	-1.4300	1.3000	0.4009	0.6332	-0.0235	-0.5618	-0.0745	0.6410	-0.0406	0.6314
TF	75.5167	0.0000	88.7000	186.8357	13.6688	-2.1206	8.0634	70.7188	17.5785	77.9156	10.5025
IF	57.3438	15.0000	90.0000	419.6090	20.4844	-0.2417	-0.9231	51.4063	18.8450	60.3125	20.6942
FF	55.4688	20.0000	90.0000	339.0461	18.4132	-0.1050	-0.9494	55.6250	19.9901	55.3906	17.6538
GDP	4.0754	-14.8100	11.3400	13.3497	3.6537	-1.9245	6.9424	4.6227	5.1917	3.8018	2.5456
index_returns	0.0906	-0.8000	1.4400	0.1026	0.3203	0.6586	2.4859	0.1447	0.4697	0.0635	0.2064

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.14: Descriptive Statistics of Regional Classification of Developed Markets: 2006-2017

Developed Markets: Americas							
Variables	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**
VA	1.2613	1.0500	1.4800	0.0256	0.1599	0.0382	-1.8128
PV	0.8054	0.3000	1.2700	0.1029	0.3208	-0.0933	-1.5355
GE	1.6642	1.4600	1.9000	0.0192	0.1387	-0.0624	-1.4905
RegQ	1.5738	1.2600	1.8900	0.0329	0.1814	-0.3004	-0.8376
RL	1.7125	1.5600	1.8900	0.0103	0.1013	0.1156	-1.5219
CC	1.6563	1.2700	2.0700	0.1002	0.3166	0.0189	-1.8466
TF	86.9417	81.4000	88.4000	2.6199	1.6186	-2.1409	4.6923
IF	73.3333	50.0000	80.0000	51.4493	7.1728	-1.5612	2.9107
FF	76.2500	70.0000	90.0000	33.1522	5.7578	0.1963	-0.7885
GDP	1.6708	-2.9500	3.1400	2.6008	1.6127	-1.8940	2.9254
index_returns	0.0638	-0.3800	0.3100	0.0281	0.1675	-1.2358	1.5012

Developed Markets: Europe, Middle East and Africa							
Variables	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**
VA	1.3275	0.5700	1.7400	0.0625	0.2500	-0.9711	0.6413
PV	0.7307	-1.6300	1.5000	0.4000	0.6324	-1.7415	2.9976
GE	1.5502	0.2000	2.3500	0.1946	0.4411	-0.9480	0.8225
RegQ	1.4589	0.6300	2.0500	0.1226	0.3501	-0.5832	-0.7078
RL	1.5559	0.2700	2.1000	0.2067	0.4546	-1.1240	0.4226
CC	1.6125	-0.0300	2.4700	0.3685	0.6071	-0.8233	0.0134
TF	86.4740	80.8000	90.0000	4.8962	2.2127	-1.0406	0.3186
IF	80.2083	50.0000	95.0000	104.1449	10.2051	-0.9492	0.3700
FF	72.1354	50.0000	90.0000	116.3585	10.7870	-0.2310	-0.5706
GDP	1.5163	-8.2700	25.5600	8.9756	2.9959	2.1812	21.0397
index_returns	0.0523	-0.6600	0.7500	0.0509	0.2256	-0.7415	1.3289

Developed Markets: Asia-Pacific							
Variables	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**
VA	0.7179	-0.3900	1.6200	0.4199	0.6480	-0.2266	-1.2004
PV	1.1679	0.8400	1.5900	0.0425	0.2063	0.4110	-0.7732
GE	1.8560	1.4200	2.4400	0.0681	0.2610	0.3591	-0.5944
RegQ	1.7490	1.0200	2.2600	0.1320	0.3633	-0.7630	-0.6713
RL	1.6558	1.2900	2.0100	0.0426	0.2063	-0.1289	-1.1018
CC	1.9313	1.2400	2.3900	0.1140	0.3376	-0.3406	-1.2237
TF	86.9625	79.2000	95.0000	17.6981	4.2069	-0.1463	-0.8984
IF	78.0208	60.0000	90.0000	105.0421	10.2490	-0.4282	-0.9339
FF	72.0833	50.0000	90.0000	267.9078	16.3679	-0.3684	-1.5416
GDP	2.9285	-5.4200	15.2400	10.3591	3.2186	0.9855	3.7265
index_returns	0.0733	-0.4900	0.6400	0.0553	0.2351	-0.2450	0.5905

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.15: Descriptive Statistics of Regional Classification of Emerging Markets: 2006-2017

Emerging Markets: Americas							
Variables	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**
VA	0.3412	-0.1700	1.1100	0.1695	0.4117	0.7401	-0.7597
PV	-0.5132	-1.9000	0.6800	0.4496	0.6705	-0.0423	-0.5953
GE	0.1713	-0.6700	1.2800	0.2864	0.5351	1.0830	-0.1075
RegQ	0.5055	-0.2100	1.5400	0.2598	0.5098	1.0540	-0.1575
RL	-0.0647	-0.7300	1.4300	0.5030	0.7092	1.3102	0.0267
CC	0.0162	-0.9300	1.5800	0.5226	0.7229	1.2691	0.0965
TF	77.6367	57.4000	88.0000	51.8295	7.1993	-0.3439	-0.7443
IF	64.9167	45.0000	90.0000	160.5862	12.6723	0.1637	-1.1583
FF	61.6667	40.0000	70.0000	54.8023	7.4029	-0.7771	0.7225
GDP	3.4887	-5.2900	9.1300	8.2066	2.8647	-0.6286	0.9137
index_returns	0.1307	-0.6000	1.6800	0.1340	0.3660	1.4373	4.1097

Emerging Markets: Europe, Middle East and Africa							
Variables	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**
VA	0.0846	-1.2500	1.1100	0.7764	0.8811	-0.3448	-1.6268
PV	0.0124	-2.0000	1.1100	0.7722	0.8788	-0.4235	-1.1259
GE	0.3951	-0.8800	1.5100	0.3025	0.5500	-0.4597	-0.3727
RegQ	0.4538	-0.9200	1.3100	0.3319	0.5761	-0.5918	-0.6521
RL	0.2599	-0.9700	1.1500	0.3326	0.5767	-0.5044	-0.7016
CC	0.0877	-1.1300	1.2800	0.3647	0.6039	-0.2522	-0.4826
TF	79.9657	44.2000	88.0000	66.9135	8.1801	-1.5465	2.8811
IF	55.0000	25.0000	80.0000	271.4953	16.4771	-0.2865	-1.0316
FF	55.7407	30.0000	90.0000	213.4649	14.6104	0.0608	-0.7265
GDP	2.6458	-9.1300	11.1100	13.9767	3.7385	-0.8354	1.0884
index_returns	0.0823	-0.7200	1.2900	0.1160	0.3405	0.1984	0.9299

Emerging Markets: Asia-Pacific							
Variables	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**
VA	-0.2046	-1.7500	1.0400	0.5932	0.7702	-0.5661	-0.4562
PV	-0.5625	-1.7800	0.9500	0.5759	0.7589	0.5725	-0.7190
GE	0.3674	-0.3300	1.4000	0.2725	0.5220	0.6758	-0.9961
RegQ	0.1410	-0.4700	1.3700	0.2740	0.5234	0.9232	-0.3490
RL	-0.0123	-0.7200	1.1900	0.2899	0.5384	0.8123	-0.4733
CC	-0.2227	-0.8400	0.9600	0.2222	0.4713	1.0547	0.0289
TF	74.6512	24.0000	86.7000	82.8283	9.1010	-2.5525	10.7846
IF	42.3810	20.0000	75.0000	204.5037	14.3005	0.7662	-0.5224
FF	47.0238	20.0000	70.0000	146.4573	12.1020	-0.0291	-0.8246
GDP	5.6267	-1.5700	14.2300	8.4505	2.9070	-0.0471	0.6986
index_returns	0.1579	-0.6600	1.6200	0.1366	0.3697	0.9069	2.6000

Table B.16: **Descriptive Statistics of Regional Classification of Frontier Markets: 2006-2017**

Frontier Markets: Europe, Middle East and Africa							
Variables	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**
VA	0.0354	-1.4500	1.2100	0.6293	0.7933	-0.3465	-1.2598
PV	0.0153	-2.2100	1.1000	0.8480	0.9209	-0.8512	-0.4383
GE	0.2460	-1.2100	1.1900	0.3341	0.5781	-0.6450	-0.0517
RegQ	0.4465	-0.9200	1.7000	0.3435	0.5861	-0.3987	0.0105
RL	0.2460	-1.1800	1.3700	0.3882	0.6231	-0.6488	-0.0635
CC	0.0783	-1.2700	1.3000	0.3809	0.6172	-0.3221	-0.2178
TF	78.3269	38.6000	88.7000	110.4471	10.5094	-1.0660	0.4095
IF	63.3013	30.0000	90.0000	290.8054	17.0530	-0.2854	-0.8362
FF	60.9615	30.0000	90.0000	243.5856	15.6072	-0.2521	-0.5366
GDP	3.5992	-14.8100	11.3400	14.8504	3.8536	-1.7235	5.8973
index_returns	0.0658	-0.8000	0.7500	0.0774	0.2782	-0.1374	0.7951

Frontier Markets: Asia-Pacific							
Variables	**Mean**	**Minimum**	**Maximum**	**Variance**	**Standard Deviation**	**Skewness**	**Excess Kurtosis**
VA	-0.7697	-1.5400	-0.0600	0.2513	0.5013	-0.5188	-1.4049
PV	-0.6556	-1.8000	0.4000	0.5986	0.7737	0.0032	-1.6781
GE	-0.3486	-0.8200	0.0700	0.0926	0.3042	-0.4597	-1.3944
RegQ	-0.5486	-1.0000	-0.0500	0.0934	0.3057	0.1802	-1.3118
RL	-0.4086	-0.9300	0.1800	0.1181	0.3436	0.1770	-1.3324
CC	-0.6161	-1.4300	-0.1500	0.0979	0.3130	-0.5434	-0.4241
TF	63.3389	0.0000	83.1000	342.7304	18.5130	-2.2152	5.3084
IF	31.5278	15.0000	55.0000	158.3135	12.5823	0.4779	-0.6994
FF	31.6667	20.0000	40.0000	54.2857	7.3679	-0.2656	-1.0803
GDP	6.1389	3.1100	9.1400	1.6952	1.3020	-0.2891	0.3830
index_returns	0.1981	-0.6600	1.4400	0.2024	0.4499	1.0009	0.9664

Table B.17: Developed Markets (2006-2017): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Regressors

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.085970	−0.389035	0.005845		0.085970
	(0.506149)	(0.356633)	(0.024016)		(0.506149)
VA	0.011216	0.009461	0.414594	0.355525	0.011216
	(0.052283)	(0.043489)	(0.409479)	(0.250955)	(0.052283)
PV	−0.048130	−0.046470**	−0.652654***	−0.199266*	−0.048130
	(0.033314)	(0.020943)	(0.199425)	(0.107681)	(0.033314)
GE	0.062171	−0.018857	0.405555	0.197784	0.062171
	(0.097867)	(0.098788)	(0.267369)	(0.150750)	(0.097867)
RegQ	0.019931	0.095846	−0.218717	−0.107844	0.019931
	(0.105974)	(0.090639)	(0.276783)	(0.151845)	(0.105974)
RL	−0.001912	0.010713	−0.107098	−0.024510	−0.001912
	(0.113448)	(0.076863)	(0.355483)	(0.214434)	(0.113448)
CC	0.040617	0.040140	−0.071450	−0.022645	0.040617
	(0.083215)	(0.082688)	(0.312978)	(0.140344)	(0.083215)
TF	−0.001788	0.005341	−0.020820	−0.010911	−0.001788
	(0.006353)	(0.004601)	(0.014391)	(0.008799)	(0.006353)
IF	0.002173	−0.000775	−0.007876	0.004342	0.002173
	(0.001923)	(0.001271)	(0.006285)	(0.003107)	(0.001923)
FF	−0.002909	−0.001705	−0.005033	−0.005351*	−0.002909
	(0.001814)	(0.001145)	(0.006242)	(0.003039)	(0.001814)
GDP	−0.002904	−0.002530	−0.018722***	−0.004811	−0.002904
	(0.005071)	(0.008748)	(0.006612)	(0.005575)	(0.005071)
Observations	264	22	242	264	264
R^2	0.029925	0.658088	0.110199	0.045607	0.029925
Adjusted R^2	−0.008418	0.347258	0.071679	−0.081920	−0.008418
F Statistic	0.780466	2.117198	2.860858***	1.108647	7.804658

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.18: Developed Markets (2006-2017): Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.2640	0.0687	0.0547	0.3918	0.2999	-0.1877	0.0002	0.1974	-0.2393
PV	0.2640	1	0.5608	0.5054	0.6265	0.6457	0.1932	0.0274	0.1442	-0.0038
GE	0.0687	0.5608	1	0.7955	0.8643	0.8996	0.2690	0.1534	0.3704	0.1713
RegQ	0.0547	0.5054	0.7955	1	0.8065	0.8147	0.3881	0.4639	0.6303	0.2216
RL	0.3918	0.6265	0.8643	0.8065	1	0.9229	0.2102	0.1992	0.4614	0.0983
CC	0.2999	0.6457	0.8996	0.8147	0.9229	1	0.2038	0.1678	0.4307	0.1162
TF	-0.1877	0.1932	0.2690	0.3881	0.2102	0.2038	1	0.4692	0.3000	0.1525
IF	0.0002	0.0274	0.1534	0.4639	0.1992	0.1678	0.4692	1	0.5523	0.1230
FF	0.1974	0.1442	0.3704	0.6303	0.4614	0.4307	0.3000	0.5523	1	-0.0395
GDP	-0.2393	-0.0038	0.1713	0.2216	0.0983	0.1162	0.1525	0.1230	-0.0395	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.19: Developed Markets (2006-2017): Variance Inflation Factor

VA	2.5586
PV	1.9639
GE	8.5530
RegQ	7.5949
RL	10.9864
CC	11.3995
TF	1.4913
IF	2.0123
FF	2.3764
GDP	1.2074

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.20: Developed Markets (2006-2017): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
	index_returns				
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.053397	−0.410330	0.002877		0.053397
	(0.506551)	(0.430018)	(0.023511)		(0.506551)
VA	0.010316	0.034186	0.396638	0.247622	0.010316
	(0.037193)	(0.026703)	(0.405989)	(0.234376)	(0.037193)
PV	0.001655	−0.001352	−0.640304***	−0.149950	0.001655
	(0.025885)	(0.015841)	(0.193771)	(0.098543)	(0.025885)
TF	−0.000831	0.005155	−0.020368	−0.010164	−0.000831
	(0.006339)	(0.005393)	(0.014221)	(0.008725)	(0.006339)
IF	0.001789	−0.000850	−0.007769	0.003973	0.001789
	(0.001797)	(0.001334)	(0.006234)	(0.002899)	(0.001797)
FF	−0.001107	0.000297	−0.006343	−0.006228**	−0.001107
	(0.001479)	(0.001093)	(0.006152)	(0.002782)	(0.001479)
GDP	0.000270	0.014805*	−0.019411***	−0.005236	0.000270
	(0.004848)	(0.008047)	(0.006483)	(0.005502)	(0.004848)
Observations	264	22	242	264	264
R^2	0.004558	0.307154	0.100784	0.037502	0.004558
Adjusted R^2	−0.018682	0.030015	0.077825	−0.072614	−0.018682
F Statistic	0.196119	1.108304	4.389774***	1.532563	1.176715

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.21: Emerging Markets (2006-2017): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.492985	0.010591	−0.012663		0.492985
	(0.301350)	(0.246311)	(0.037906)		(0.301350)
VA	−0.008302	0.009067	0.392537	−0.284521	−0.008302
	(0.046385)	(0.024928)	(0.518525)	(0.238305)	(0.046385)
PV	−0.005852	0.019892	−0.010329	0.032296	−0.005852
	(0.051777)	(0.032151)	(0.234874)	(0.120181)	(0.051777)
GE	−0.120661	−0.121273	−0.508109	−0.468267*	−0.120661
	(0.128667)	(0.096422)	(0.418947)	(0.270345)	(0.128667)
RegQ	0.040472	0.096507	0.173999	0.029917	0.040472
	(0.149961)	(0.137405)	(0.454824)	(0.250999)	(0.149961)
RL	−0.085094	−0.044279	0.272897	−0.114275	−0.085094
	(0.119708)	(0.074442)	(0.509187)	(0.292609)	(0.119708)
CC	0.126701	0.007622	−0.066854	0.286608	0.126701
	(0.092012)	(0.057606)	(0.426011)	(0.205433)	(0.092012)
TF	−0.003553	0.001802	−0.002682	−0.009600*	−0.003553
	(0.003981)	(0.003251)	(0.009817)	(0.005192)	(0.003981)
IF	−0.001016	−0.000491	−0.010820	−0.002895	−0.001016
	(0.002539)	(0.002147)	(0.008324)	(0.003758)	(0.002539)
FF	0.000019	−0.001748	0.005223	0.000597	0.000019
	(0.002905)	(0.001925)	(0.008206)	(0.004516)	(0.002905)
GDP	−0.002362	0.027273***	−0.047106***	−0.018284**	−0.002362
	(0.007074)	(0.006315)	(0.010619)	(0.009125)	(0.007074)
Observations	252	21	231	252	252
R^2	0.039003	0.802508	0.108262	0.068793	0.039003
Adjusted R^2	−0.000873	0.605016	0.067728	−0.057615	−0.000873
F Statistic	0.978109	4.063491**	2.670918***	1.632646*	9.781093

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.22: Emerging Markets (2006-2017): Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.4793	0.3726	0.6236	0.5993	0.4707	0.4002	0.6365	0.6084	-0.3038
PV	0.4793	1	0.7799	0.7742	0.8145	0.7730	0.5246	0.3694	0.3652	-0.2219
GE	0.3726	0.7799	1	0.8442	0.8759	0.8532	0.5561	0.3508	0.3875	-0.1473
RegQ	0.6236	0.7742	0.8442	1	0.8646	0.8518	0.6887	0.6809	0.6848	-0.2490
RL	0.5993	0.8145	0.8759	0.8646	1	0.8835	0.5226	0.5364	0.4840	-0.2329
CC	0.4707	0.7730	0.8532	0.8518	0.8835	1	0.5223	0.4674	0.4439	-0.1283
TF	0.4002	0.5246	0.5561	0.6887	0.5226	0.5223	1	0.5706	0.5653	-0.3065
IF	0.6365	0.3694	0.3508	0.6809	0.5364	0.4674	0.5706	1	0.7366	-0.2463
FF	0.6084	0.3652	0.3875	0.6848	0.4840	0.4439	0.5653	0.7366	1	-0.2978
GDP	-0.3038	-0.2219	-0.1473	-0.2490	-0.2329	-0.1283	-0.3065	-0.2463	-0.2978	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.23: Emerging Markets (2006-2017): Variance Inflation Factor

VA	2.5848
PV	3.7055
GE	9.6164
RegQ	14.0984
RL	10.6641
CC	6.1855
TF	2.2935
IF	3.7410
FF	3.0600
GDP	1.2223

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.24: Emerging Markets (2006-2017): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.446076*	−0.009469	−0.023684		0.446076*
	(0.259379)	(0.182633)	(0.036499)		(0.259379)
VA	−0.014431	−0.000188	0.339349	−0.130635	−0.014431
	(0.034029)	(0.019267)	(0.496142)	(0.204529)	(0.034029)
PV	−0.025635	−0.020829	−0.050414	−0.093019	−0.025635
	(0.033500)	(0.020259)	(0.222844)	(0.105803)	(0.033500)
TF	−0.004237	0.000377	−0.003309	−0.012141**	−0.004237
	(0.003195)	(0.002252)	(0.009517)	(0.005027)	(0.003195)
GDP	−0.001359	0.024194***	−0.048934***	−0.014929*	−0.001359
	(0.006838)	(0.006336)	(0.010387)	(0.008658)	(0.006838)
Observations	252	21	231	252	252
R^2	0.024526	0.620302	0.094238	0.040264	0.024526
Adjusted R^2	0.008729	0.525378	0.078207	−0.061206	0.008729
F Statistic	1.552584	6.534688***	5.878450***	2.380863*	6.210334

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.25: Frontier Markets (2006-2017): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.792620***	0.439761	−0.010075		0.792620***
	(0.216688)	(0.291498)	(0.036195)		(0.216688)
VA	0.045876	0.076504*	−0.161153	−0.157148	0.045876
	(0.039623)	(0.033168)	(0.342275)	(0.139516)	(0.039623)
PV	0.058557	0.019856	0.453878**	0.022570	0.058557
	(0.046605)	(0.048848)	(0.219953)	(0.107577)	(0.046605)
GE	0.013598	0.033277	0.236708	0.156910	0.013598
	(0.125117)	(0.139279)	(0.418810)	(0.277588)	(0.125117)
RegQ	−0.000991	0.039208	−0.790299	−0.383248	−0.000991
	(0.121053)	(0.125657)	(0.481276)	(0.279865)	(0.121053)
RL	0.106575	−0.004033	−0.138413	0.083222	0.106575
	(0.150216)	(0.200752)	(0.457644)	(0.237710)	(0.150216)
CC	−0.101145	0.010338	0.100806	−0.048076	−0.101145
	(0.109946)	(0.120877)	(0.428971)	(0.243163)	(0.109946)
TF	−0.007688***	−0.002073	−0.004180	−0.008987***	−0.007688***
	(0.002565)	(0.003857)	(0.005118)	(0.003354)	(0.002565)
IF	−0.002919	−0.003195	−0.009791	−0.003357	−0.002919
	(0.002293)	(0.002626)	(0.007148)	(0.003388)	(0.002293)
FF	0.000904	−0.001845	0.008769	0.002056	0.000904
	(0.002966)	(0.003566)	(0.010422)	(0.006973)	(0.002966)
GDP	−0.003039	0.022162	−0.018721**	−0.004958	−0.003039
	(0.006649)	(0.018348)	(0.008488)	(0.007333)	(0.006649)
Observations	192	16	176	192	192
R^2	0.092461	0.802443	0.090243	0.093621	0.092461
Adjusted R^2	0.042321	0.407328	0.035106	−0.042882	0.042321
F Statistic	1.844055*	2.030911	1.636706	1.714629*	18.440550**

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.26: Frontier Markets (2006-2017): Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.4709	0.4919	0.6099	0.5009	0.4828	0.4105	0.6508	0.4783	-0.2600
PV	0.4709	1	0.7957	0.7432	0.7729	0.7639	0.5854	0.5462	0.5403	-0.1845
GE	0.4919	0.7957	1	0.8801	0.9359	0.8822	0.6009	0.6755	0.7555	-0.2312
RegQ	0.6099	0.7432	0.8801	1	0.8917	0.8429	0.7183	0.8204	0.8704	-0.2562
RL	0.5009	0.7729	0.9359	0.8917	1	0.9398	0.6055	0.7304	0.7655	-0.2010
CC	0.4828	0.7639	0.8822	0.8429	0.9398	1	0.5611	0.7039	0.7459	-0.1862
TF	0.4105	0.5854	0.6009	0.7183	0.6055	0.5611	1	0.6289	0.6724	-0.2713
IF	0.6508	0.5462	0.6755	0.8204	0.7304	0.7039	0.6289	1	0.7945	-0.2645
FF	0.4783	0.5403	0.7555	0.8704	0.7655	0.7459	0.6724	0.7945	1	-0.1867
GDP	-0.2600	-0.1845	-0.2312	-0.2562	-0.2010	-0.1862	-0.2713	-0.2645	-0.1867	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.27: Frontier Markets (2006-2017): Variance Inflation Factor

VA	2.0026
PV	3.6605
GE	10.4177
RegQ	12.7513
RL	17.6513
CC	9.4224
TF	2.3908
IF	4.2895
FF	5.7984
GDP	1.1475

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.28: Frontier Markets (2006-2017): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
	index_returns				
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.774492***	0.429778**	−0.014867		0.774492***
	(0.171039)	(0.138140)	(0.035393)		(0.171039)
VA	0.044214	0.079871***	−0.134158	−0.136872	0.044214
	(0.037516)	(0.021917)	(0.321172)	(0.114883)	(0.037516)
PV	0.064809**	0.044873**	0.385746*	−0.018766	0.064809**
	(0.031628)	(0.018282)	(0.213531)	(0.095685)	(0.031628)
TF	−0.007072***	−0.002711	−0.004465	−0.009498***	−0.007072***
	(0.002304)	(0.001747)	(0.004792)	(0.003183)	(0.002304)
IF	−0.002193	−0.003364***	−0.008147	−0.003075	−0.002193
	(0.001711)	(0.001029)	(0.006950)	(0.003258)	(0.001711)
GDP	−0.002901	0.017818	−0.020411**	−0.005124	−0.002901
	(0.006486)	(0.009990)	(0.008253)	(0.006992)	(0.006486)
Observations	192	16	176	192	192
R^2	0.085735	0.770264	0.068311	0.080490	0.085735
Adjusted R^2	0.061158	0.655396	0.040908	−0.027056	0.061158
F Statistic	3.488407***	6.705636***	2.492862**	2.993703**	17.442040***

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.29: Developed Markets (GFC 2006-2009): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.255147	−2.011112***	−0.212428		0.255147
	(1.164139)	(0.346734)	(0.141336)		(1.164139)
VA	−0.153756	0.002473	−0.841729	−0.188982	−0.153756
	(0.160343)	(0.047003)	(1.684885)	(1.328587)	(0.160343)
PV	−0.081855	−0.088037***	−1.543883**	−0.907183*	−0.081855
	(0.086614)	(0.023027)	(0.660311)	(0.534315)	(0.086614)
GE	−0.021105	−0.079351	0.803722	0.623058	−0.021105
	(0.229430)	(0.056704)	(0.703706)	(0.597707)	(0.229430)
RegQ	−0.411901	−0.072087	−1.984047**	−0.634257	−0.411901
	(0.403768)	(0.127947)	(0.943888)	(0.753611)	(0.403768)
RL	0.013132	−0.026561	−2.229742	−2.196632	0.013132
	(0.336544)	(0.083348)	(1.737665)	(1.369644)	(0.336544)
CC	0.280890	0.182363**	1.070608	0.990548	0.280890
	(0.239872)	(0.065840)	(1.043182)	(0.819707)	(0.239872)
TF	−0.000387	0.026930***	0.034800	−0.051480**	−0.000387
	(0.014100)	(0.004398)	(0.039772)	(0.025410)	(0.014100)
IF	0.002334	−0.000251	−0.000654	0.007597	0.002334
	(0.004443)	(0.001091)	(0.014921)	(0.010310)	(0.004443)
FF	0.000758	−0.002646*	−0.001563	−0.004190	0.000758
	(0.004635)	(0.001290)	(0.013869)	(0.010584)	(0.004635)
GDP	−0.010307	−0.000209	−0.071945*	−0.014754	−0.010307
	(0.011574)	(0.011680)	(0.036662)	(0.015174)	(0.011574)
Observations	88	22	66	88	88
R^2	0.063005	0.906239	0.283614	0.189558	0.063005
Adjusted R^2	−0.058683	0.821002	0.153363	−0.259080	−0.058683
F Statistic	0.517759	10.631970***	2.177430**	1.309806	5.177588

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.30: Developed Markets (GFC 2006-2009): Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.2189	-0.0101	0.0085	0.3855	0.1964	-0.3460	-0.1532	0.3114	-0.2633
PV	0.2189	1	0.5412	0.5186	0.6344	0.6576	0.1160	-0.0026	0.1105	-0.0317
GE	-0.0101	0.5412	1	0.7343	0.8417	0.8978	0.3379	0.1358	0.2491	0.1434
RegQ	0.0085	0.5186	0.7343	1	0.7562	0.8047	0.4497	0.5147	0.6466	0.1087
RL	0.3855	0.6344	0.8417	0.7562	1	0.9216	0.2014	0.0988	0.4133	0.0166
CC	0.1964	0.6576	0.8978	0.8047	0.9216	1	0.2742	0.1547	0.3824	0.1050
TF	-0.3460	0.1160	0.3379	0.4497	0.2014	0.2742	1	0.3405	0.2329	0.0169
IF	-0.1532	-0.0026	0.1358	0.5147	0.0988	0.1547	0.3405	1	0.5314	0.0375
FF	0.3114	0.1105	0.2491	0.6466	0.4133	0.3824	0.2329	0.5314	1	-0.1209
GDP	-0.2633	-0.0317	0.1434	0.1087	0.0166	0.1050	0.0169	0.0375	-0.1209	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.31: Developed Markets (GFC 2006-2009): Variance Inflation Factor

VA	3.6333
PV	2.2094
GE	8.2308
RegQ	10.2788
RL	13.5175
CC	12.6642
TF	1.5396
IF	2.0540
FF	3.5357
GDP	1.1882

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.32: Developed Markets (GFC 2006-2009): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.079906	−1.773485***	−0.204102		0.079906
	(1.134885)	(0.394270)	(0.139037)		(1.134885)
VA	−0.084210	0.053951	−0.980976	−0.449535	−0.084210
	(0.110686)	(0.031969)	(1.714159)	(1.307322)	(0.110686)
PV	−0.032081	−0.038946**	−1.792464***	−0.836897*	−0.032081
	(0.060927)	(0.015636)	(0.614828)	(0.495343)	(0.060927)
TF	0.001418	0.022936***	0.016756	−0.055425**	0.001418
	(0.013458)	(0.004882)	(0.036429)	(0.023640)	(0.013458)
IF	0.000067	−0.000685	−0.003082	0.004842	0.000067
	(0.003992)	(0.001069)	(0.015184)	(0.010166)	(0.003992)
FF	−0.000468	−0.002075**	−0.008527	−0.010026	−0.000468
	(0.003396)	(0.000928)	(0.013879)	(0.009942)	(0.003396)
GDP	−0.007586	0.023179**	−0.074241**	−0.019224	−0.007586
	(0.011016)	(0.010094)	(0.035064)	(0.014515)	(0.011016)
Observations	88	22	66	88	88
R^2	0.022824	0.821859	0.193058	0.130016	0.022824
Adjusted R^2	−0.049560	0.750602	0.110996	−0.261476	−0.049560
F Statistic	0.315315	11.533810***	2.352589**	1.494471	1.891891

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.33: Emerging Markets (GFC 2006-2009): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.381980	0.185449	−0.224405		0.381980
	(0.767238)	(0.447566)	(0.171312)		(0.767238)
VA	−0.062728	0.063778	4.247054	−0.475558	−0.062728
	(0.124441)	(0.064275)	(2.646045)	(1.757160)	(0.124441)
PV	0.036047	−0.006966	−0.653513	−0.070100	0.036047
	(0.123760)	(0.065266)	(0.669264)	(0.541636)	(0.123760)
GE	−0.213707	0.069087	−0.457385	−1.287399	−0.213707
	(0.295974)	(0.159252)	(1.278516)	(0.987428)	(0.295974)
RegQ	−0.117538	0.570597	0.177203	−0.269249	−0.117538
	(0.490764)	(0.319649)	(1.699015)	(1.188415)	(0.490764)
RL	−0.018683	−0.490092**	0.321373	0.509884	−0.018683
	(0.299524)	(0.166213)	(1.692893)	(1.262683)	(0.299524)
CC	0.091624	−0.096786	−1.354477	0.601673	0.091624
	(0.237089)	(0.124330)	(1.385686)	(1.061822)	(0.237089)
TF	−0.001127	−0.001015	0.006040	−0.005980	−0.001127
	(0.008334)	(0.004909)	(0.021602)	(0.016899)	(0.008334)
IF	−0.000138	0.004672	−0.036306	−0.023735	−0.000138
	(0.007860)	(0.004404)	(0.031731)	(0.021124)	(0.007860)
FF	0.001989	−0.010847*	0.025296	0.009490	0.001989
	(0.007936)	(0.005493)	(0.018706)	(0.014911)	(0.007936)
GDP	−0.013474	0.056288***	−0.087708**	−0.040428	−0.013474
	(0.015741)	(0.014928)	(0.040319)	(0.026274)	(0.015741)
Observations	84	21	63	84	84
R^2	0.062841	0.782739	0.207035	0.141918	0.062841
Adjusted R^2	−0.065536	0.565477	0.054542	−0.343788	−0.065536
F Statistic	0.489504	3.602750**	1.357670	0.876567	4.895039

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.34: Emerging Markets (GFC 2006-2009): Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.4283	0.3948	0.6780	0.6178	0.5472	0.4107	0.7176	0.6272	-0.3216
PV	0.4283	1	0.7551	0.7650	0.7914	0.7679	0.4896	0.5050	0.2952	-0.1771
GE	0.3948	0.7551	1	0.8105	0.8650	0.8133	0.5665	0.4234	0.3163	-0.2622
RegQ	0.6780	0.7650	0.8105	1	0.8721	0.8805	0.6837	0.7598	0.6778	-0.3376
RL	0.6178	0.7914	0.8650	0.8721	1	0.8456	0.5007	0.6540	0.4084	-0.2770
CC	0.5472	0.7679	0.8133	0.8805	0.8456	1	0.5446	0.6063	0.4608	-0.2330
TF	0.4107	0.4896	0.5665	0.6837	0.5007	0.5446	1	0.4139	0.4973	-0.4025
IF	0.7176	0.5050	0.4234	0.7598	0.6540	0.6063	0.4139	1	0.6971	-0.2834
FF	0.6272	0.2952	0.3163	0.6778	0.4084	0.4608	0.4973	0.6971	1	-0.3471
GDP	-0.3216	-0.1771	-0.2622	-0.3376	-0.2770	-0.2330	-0.4025	-0.2834	-0.3471	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.35: Emerging Markets (GFC 2006-2009): Variance Inflation Factor

VA	2.7342
PV	3.3395
GE	7.3601
RegQ	20.3802
RL	10.0343
CC	5.7496
TF	2.3742
IF	4.1095
FF	3.6778
GDP	1.2847

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.36: Emerging Markets (GFC 2006-2009): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
	index_returns				
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.504124	−0.173119	−0.231255		0.504124
	(0.543168)	(0.381679)	(0.147510)		(0.543168)
VA	−0.075873	0.005989	3.247120	0.206919	−0.075873
	(0.100858)	(0.063815)	(2.274393)	(1.557795)	(0.100858)
PV	−0.053771	−0.042297	−0.636272	−0.154157	−0.053771
	(0.079987)	(0.050600)	(0.616013)	(0.455756)	(0.079987)
TF	−0.004309	0.002108	0.012061	−0.008644	−0.004309
	(0.006970)	(0.005014)	(0.019894)	(0.015587)	(0.006970)
FF	0.001199	−0.000045	0.021287	0.011007	0.001199
	(0.005580)	(0.003859)	(0.017912)	(0.014202)	(0.005580)
GDP	−0.011623	0.053759***	−0.090974**	−0.032396	−0.011623
	(0.015239)	(0.017211)	(0.035216)	(0.021383)	(0.015239)
Observations	84	21	63	84	84
R^2	0.040469	0.528407	0.162142	0.076938	0.040469
Adjusted R^2	−0.021040	0.371209	0.088646	−0.320934	−0.021040
F Statistic	0.657939	3.361415**	2.206126*	0.966867	3.289696

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.37: Frontier Markets (GFC 2006-2009): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	1.068443*	0.787621**	−0.029847		1.068443*
	(0.564874)	(0.300798)	(0.129210)		(0.564874)
VA	0.141846	0.073222	1.754682	2.700999*	0.141846
	(0.113787)	(0.059735)	(2.032573)	(1.471371)	(0.113787)
PV	0.225036*	0.108250*	2.541549***	2.281686***	0.225036*
	(0.121493)	(0.049510)	(0.796340)	(0.630397)	(0.121493)
GE	−0.019052	−0.016062	−1.014929	−0.672754	−0.019052
	(0.334137)	(0.189253)	(1.277734)	(0.974812)	(0.334137)
RegQ	−0.384796	−0.294234	−1.671249	−1.137446	−0.384796
	(0.334391)	(0.165806)	(1.497403)	(1.109036)	(0.334391)
RL	0.141803	0.213401	−2.337370	−2.045433	0.141803
	(0.389113)	(0.222386)	(1.884835)	(1.384704)	(0.389113)
CC	−0.005525	−0.023372	0.806904	−0.141949	−0.005525
	(0.301466)	(0.134089)	(1.263572)	(0.955114)	(0.301466)
TF	−0.007172	−0.002157	−0.013211	−0.018234**	−0.007172
	(0.004907)	(0.002801)	(0.010196)	(0.007753)	(0.004907)
IF	−0.009620	−0.002666	−0.006108	0.001523	−0.009620
	(0.009295)	(0.004226)	(0.028217)	(0.020944)	(0.009295)
FF	0.004547	−0.003867	0.025424	0.034650**	0.004547
	(0.006910)	(0.002982)	(0.019379)	(0.015561)	(0.006910)
GDP	−0.010239	−0.013618	−0.047874**	−0.032831**	−0.010239
	(0.012184)	(0.023270)	(0.021669)	(0.013215)	(0.012184)
Observations	64	16	48	64	64
R^2	0.191826	0.909721	0.381818	0.410901	0.191826
Adjusted R^2	0.039340	0.729163	0.214742	0.023335	0.039340
F Statistic	1.257991	5.038387**	2.285292**	2.650525**	12.579910

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.38: Frontier Markets (GFC 2006-2009): Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.3996	0.4287	0.6193	0.4768	0.4649	0.4227	0.7514	0.5625	-0.2872
PV	0.3996	1	0.7993	0.7654	0.7487	0.7549	0.4973	0.6771	0.5161	-0.1913
GE	0.4287	0.7993	1	0.8493	0.9382	0.8852	0.5242	0.7121	0.6679	-0.2346
RegQ	0.6193	0.7654	0.8493	1	0.8666	0.8379	0.7069	0.8828	0.8458	-0.2797
RL	0.4768	0.7487	0.9382	0.8666	1	0.9420	0.5348	0.7583	0.6992	-0.1946
CC	0.4649	0.7549	0.8852	0.8379	0.9420	1	0.5354	0.7792	0.7176	-0.1771
TF	0.4227	0.4973	0.5242	0.7069	0.5348	0.5354	1	0.6079	0.6596	-0.2473
IF	0.7514	0.6771	0.7121	0.8828	0.7583	0.7792	0.6079	1	0.8340	-0.2695
FF	0.5625	0.5161	0.6679	0.8458	0.6992	0.7176	0.6596	0.8340	1	-0.1760
GDP	-0.2872	-0.1913	-0.2346	-0.2797	-0.1946	-0.1771	-0.2473	-0.2695	-0.1760	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.39: Frontier Markets (GFC 2006-2009): Variance Inflation Factor

VA	2.6818
PV	4.1202
GE	11.3103
RegQ	14.0758
RL	19.1682
CC	11.1012
TF	2.2119
IF	9.1205
FF	5.6716
GDP	1.1894

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.40: Frontier Markets (GFC 2006-2009): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
	index_returns				
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.976761***	0.826584***	−0.148569		0.976761***
	(0.299904)	(0.248108)	(0.117418)		(0.299904)
VA	−0.001186	0.008202	−0.383243	0.643178	−0.001186
	(0.079315)	(0.057821)	(1.630409)	(1.222994)	(0.079315)
PV	0.096099	0.073414	2.118842***	1.778285***	0.096099
	(0.070040)	(0.044083)	(0.760599)	(0.650593)	(0.070040)
TF	−0.011140***	−0.009608***	−0.005832	−0.014622**	−0.011140***
	(0.003932)	(0.002885)	(0.008201)	(0.006844)	(0.003932)
GDP	−0.007796	0.001134	−0.055526**	−0.016430	−0.007796
	(0.011615)	(0.023422)	(0.020718)	(0.012897)	(0.011615)
Observations	64	16	48	64	64
R^2	0.127426	0.536338	0.262937	0.211836	0.127426
Adjusted R^2	0.068268	0.367734	0.194373	−0.128507	0.068268
F Statistic	2.154008*	3.181044*	3.834918***	2.956495**	8.616032*

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.41: Developed Markets (Post-GFC 2010-2017): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable: index_returns				
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	1.495571***	0.781519	0.009706		1.495571***
	(0.551080)	(0.546275)	(0.016350)		(0.551080)
VA	0.068423*	0.049157	0.533471**	0.343555*	0.068423*
	(0.038629)	(0.058387)	(0.254289)	(0.188591)	(0.038629)
PV	0.007694	−0.004318	−0.251904*	−0.091288	0.007694
	(0.027041)	(0.028898)	(0.141168)	(0.089277)	(0.027041)
GE	0.109694	0.007679	0.314718	0.199773	0.109694
	(0.083525)	(0.152297)	(0.196282)	(0.129214)	(0.083525)
RegQ	0.123911	0.076719	0.241003	0.089445	0.123911
	(0.081268)	(0.100094)	(0.189337)	(0.142443)	(0.081268)
RL	−0.034390	−0.008543	0.202456	0.089142	−0.034390
	(0.084558)	(0.104924)	(0.216938)	(0.160045)	(0.084558)
CC	−0.062102	0.014333	−0.016500	−0.139945	−0.062102
	(0.062841)	(0.106420)	(0.213653)	(0.124341)	(0.062841)
TF	−0.019884***	−0.010018	−0.104571***	−0.063372***	−0.019884***
	(0.006886)	(0.007077)	(0.021205)	(0.016484)	(0.006886)
IF	0.002100	0.000948	−0.012618**	0.001419	0.002100
	(0.001773)	(0.002001)	(0.005512)	(0.003237)	(0.001773)
FF	−0.002250	−0.001728	−0.007038	−0.003659	−0.002250
	(0.001671)	(0.001712)	(0.006334)	(0.004044)	(0.001671)
GDP	0.002074	0.006496	0.003429	0.002333	0.002074
	(0.004359)	(0.009677)	(0.005907)	(0.005251)	(0.004359)
Observations	176	22	154	176	176
R^2	0.127818	0.629529	0.234699	0.134193	0.127818
Adjusted R^2	0.074958	0.292737	0.181181	−0.052196	0.074958
F Statistic	2.418067**	1.869191	4.385449***	2.231883**	24.180670***

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.42: Developed Markets (Post-GFC 2010-2017): Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.2904	0.1171	0.0726	0.3946	0.3532	-0.1093	0.0972	0.1140	-0.2368
PV	0.2904	1	0.5740	0.5126	0.6248	0.6438	0.3013	0.0511	0.1752	0.0156
GE	0.1171	0.5740	1	0.8481	0.8847	0.9078	0.2766	0.1869	0.4839	0.2037
RegQ	0.0726	0.5126	0.8481	1	0.8328	0.8280	0.4364	0.4786	0.6765	0.2841
RL	0.3946	0.6248	0.8847	0.8328	1	0.9290	0.2344	0.2636	0.5125	0.1428
CC	0.3532	0.6438	0.9078	0.8280	0.9290	1	0.2346	0.2101	0.4888	0.1418
TF	-0.1093	0.3013	0.2766	0.4364	0.2344	0.2346	1	0.5081	0.4009	0.1809
IF	0.0972	0.0511	0.1869	0.4786	0.2636	0.2101	0.5081	1	0.5895	0.1273
FF	0.1140	0.1752	0.4839	0.6765	0.5125	0.4888	0.4009	0.5895	1	0.0229
GDP	-0.2368	0.0156	0.2037	0.2841	0.1428	0.1418	0.1809	0.1273	0.0229	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.43: Developed Markets (Post-GFC 2010-2017): Variance Inflation Factor

VA	2.4564
PV	2.1526
GE	10.0165
RegQ	9.4608
RL	11.1437
CC	12.0949
TF	1.7274
IF	2.3045
FF	2.5729
GDP	1.2928

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.44: Developed Markets (Post-GFC 2010-2017): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
	index_returns				
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	1.469934***	0.737553	0.011460		1.469934***
	(0.544095)	(0.503848)	(0.016192)		(0.544095)
VA	0.031876	0.057317**	0.448598*	0.243828	0.031876
	(0.028193)	(0.026790)	(0.253586)	(0.184529)	(0.028193)
PV	0.039384*	0.025037	−0.184616	−0.009064	0.039384*
	(0.021207)	(0.018809)	(0.140140)	(0.080883)	(0.021207)
TF	−0.019580***	−0.009950	−0.095595***	−0.059537***	−0.019580***
	(0.006816)	(0.006445)	(0.021028)	(0.016402)	(0.006816)
IF	0.002765*	0.000923	−0.011159**	0.003059	0.002765*
	(0.001425)	(0.001469)	(0.005530)	(0.003035)	(0.001425)
GDP	0.005860	0.015813**	0.006413	0.004983	0.005860
	(0.004055)	(0.006777)	(0.005870)	(0.004843)	(0.004055)
Observations	176	22	154	176	176
R^2	0.085313	0.511002	0.180053	0.093893	0.085313
Adjusted R^2	0.058410	0.358190	0.152352	−0.064220	0.058410
F Statistic	3.171169***	3.343988**	6.499885***	3.087952**	15.855850***

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.45: Emerging Markets (Post-GFC 2010-2017): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	−0.416011	−0.539221*	0.008027		−0.416011
	(0.374694)	(0.266869)	(0.030554)		(0.374694)
VA	0.015348	0.004447	−0.066696	−0.128390	0.015348
	(0.036676)	(0.023042)	(0.367041)	(0.178956)	(0.036676)
PV	−0.006104	−0.012109	0.241224	0.053514	−0.006104
	(0.047121)	(0.033607)	(0.197451)	(0.116710)	(0.047121)
GE	0.019022	−0.013183	−0.631245*	−0.086920	0.019022
	(0.113317)	(0.094700)	(0.348466)	(0.246147)	(0.113317)
RegQ	−0.212362*	−0.197114	0.290468	−0.172001	−0.212362*
	(0.126179)	(0.116838)	(0.349277)	(0.206368)	(0.126179)
RL	−0.065503	−0.006449	0.300643	−0.284785	−0.065503
	(0.102133)	(0.072839)	(0.423286)	(0.277854)	(0.102133)
CC	0.138264*	0.107593*	0.093884	0.205849	0.138264*
	(0.077126)	(0.052926)	(0.336762)	(0.186984)	(0.077126)
TF	0.005358	0.005873	−0.014625	−0.001795	0.005358
	(0.005182)	(0.003712)	(0.014135)	(0.009486)	(0.005182)
IF	0.000632	−0.000174	−0.005658	−0.001460	0.000632
	(0.002302)	(0.001962)	(0.007409)	(0.004199)	(0.002302)
FF	0.001558	0.003402*	−0.009335	−0.003714	0.001558
	(0.002353)	(0.001556)	(0.008406)	(0.004960)	(0.002353)
GDP	0.005935	0.011562**	−0.010666	−0.005236	0.005935
	(0.006296)	(0.005174)	(0.013567)	(0.009806)	(0.006296)
Observations	168	21	147	168	168
R^2	0.057063	0.710075	0.052922	0.069580	0.057063
Adjusted R^2	−0.002996	0.420150	−0.016716	−0.134161	−0.002996
F Statistic	0.950113	2.449169*	0.759962	1.024538	9.501125

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.46: Emerging Markets (Post-GFC 2010-2017): Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.5071	0.3622	0.5981	0.5907	0.4333	0.4493	0.6258	0.6156	-0.2985
PV	0.5071	1	0.7935	0.7807	0.8272	0.7770	0.6125	0.3174	0.4117	-0.2573
GE	0.3622	0.7935	1	0.8608	0.8814	0.8734	0.6082	0.3242	0.4298	-0.0707
RegQ	0.5981	0.7807	0.8608	1	0.8624	0.8388	0.7908	0.6700	0.7068	-0.1987
RL	0.5907	0.8272	0.8814	0.8624	1	0.9037	0.5944	0.4954	0.5316	-0.2050
CC	0.4333	0.7770	0.8734	0.8388	0.9037	1	0.5815	0.4273	0.4492	-0.0624
TF	0.4493	0.6125	0.6082	0.7908	0.5944	0.5815	1	0.6942	0.6175	-0.2053
IF	0.6258	0.3174	0.3242	0.6700	0.4954	0.4273	0.6942	1	0.7498	-0.2317
FF	0.6156	0.4117	0.4298	0.7068	0.5316	0.4492	0.6175	0.7498	1	-0.2615
GDP	-0.2985	-0.2573	-0.0707	-0.1987	-0.2050	-0.0624	-0.2053	-0.2317	-0.2615	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.47: Emerging Markets (Post-GFC 2010-2017): Variance Inflation Factor

VA	2.7735
PV	5.0722
GE	12.8960
RegQ	17.8419
RL	13.1609
CC	7.6377
TF	3.9154
IF	5.5534
FF	3.1345
GDP	1.2862

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.48: Emerging Markets (Post-GFC 2010-2017): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.039528	0.022410	−0.000683		0.039528
	(0.028359)	(0.022314)	(0.028953)		(0.028359)
VA	−0.001384	0.006670	0.013871	−0.168174	−0.001384
	(0.025996)	(0.017354)	(0.348700)	(0.158493)	(0.025996)
PV	−0.021986	−0.019294	0.167389	−0.032148	−0.021986
	(0.024394)	(0.016372)	(0.184036)	(0.102990)	(0.024394)
GDP	0.007264	0.011939**	−0.007516	0.002554	0.007264
	(0.005845)	(0.005159)	(0.013157)	(0.008921)	(0.005845)
Observations	168	21	147	168	168
R^2	0.021882	0.361258	0.007919	0.010746	0.021882
Adjusted R^2	0.003990	0.248539	−0.012894	−0.147260	0.003990
F Statistic	1.222997	3.204942**	0.380493	0.521396	3.668992

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.49: Frontier Markets (Post-GFC 2010-2017): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.193483	−0.247874	0.000615		0.193483
	(0.282992)	(0.297395)	(0.029224)		(0.282992)
VA	0.069539**	0.089817**	−0.409534*	−0.142135	0.069539**
	(0.034842)	(0.031451)	(0.242639)	(0.137726)	(0.034842)
PV	−0.040888	−0.093888*	−0.048791	−0.217896*	−0.040888
	(0.046039)	(0.044752)	(0.174496)	(0.124310)	(0.046039)
GE	−0.051364	−0.022260	0.104244	0.104617	−0.051364
	(0.103800)	(0.088528)	(0.347718)	(0.256982)	(0.103800)
RegQ	0.045564	0.016721	−0.358240	−0.123698	0.045564
	(0.104508)	(0.103012)	(0.390628)	(0.246727)	(0.104508)
RL	0.151186	0.048861	0.092603	0.172213	0.151186
	(0.126549)	(0.147699)	(0.353536)	(0.211583)	(0.126549)
CC	−0.070910	0.070159	0.167715	−0.183741	−0.070910
	(0.091654)	(0.089985)	(0.354637)	(0.222056)	(0.091654)
TF	0.000134	0.006669	−0.005664	−0.005473	0.000134
	(0.003897)	(0.004181)	(0.009535)	(0.007506)	(0.003897)
IF	−0.004241**	−0.003304*	−0.021149***	−0.008610*	−0.004241**
	(0.001904)	(0.001495)	(0.007162)	(0.004538)	(0.001904)
FF	0.001156	−0.001857	0.017868	0.015262	0.001156
	(0.002939)	(0.002481)	(0.019292)	(0.011845)	(0.002939)
GDP	0.006452	0.022584*	−0.012998	−0.001252	0.006452
	(0.007705)	(0.009387)	(0.011565)	(0.010433)	(0.007705)
Observations	128	16	112	128	128
R^2	0.072075	0.807357	0.121808	0.109754	0.072075
Adjusted R^2	−0.007235	0.422070	0.034858	−0.108444	−0.007235
F Statistic	0.908773	2.095472	1.400896	1.257502	9.087726

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.50: Frontier Markets (Post-GFC 2010-2017): Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.5115	0.5246	0.6062	0.5130	0.4916	0.4304	0.6162	0.4303	-0.2571
PV	0.5115	1	0.7948	0.7337	0.7877	0.7702	0.7374	0.5089	0.5552	-0.2043
GE	0.5246	0.7948	1	0.8948	0.9353	0.8809	0.7334	0.6783	0.8068	-0.2587
RegQ	0.6062	0.7337	0.8948	1	0.9054	0.8460	0.8178	0.8174	0.8881	-0.2715
RL	0.5130	0.7877	0.9353	0.9054	1	0.9387	0.7214	0.7337	0.8061	-0.2267
CC	0.4916	0.7702	0.8809	0.8460	0.9387	1	0.6376	0.6857	0.7643	-0.2153
TF	0.4304	0.7374	0.7334	0.8178	0.7214	0.6376	1	0.6598	0.7556	-0.2692
IF	0.6162	0.5089	0.6783	0.8174	0.7337	0.6857	0.6598	1	0.8090	-0.2702
FF	0.4303	0.5552	0.8068	0.8881	0.8061	0.7643	0.7556	0.8090	1	-0.2201
GDP	-0.2571	-0.2043	-0.2587	-0.2715	-0.2267	-0.2153	-0.2692	-0.2702	-0.2201	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.51: Frontier Markets (Post-GFC 2010-2017): Variance Inflation Factor

VA	2.2982
PV	5.2516
GE	11.0196
RegQ	14.9623
RL	18.6333
CC	9.9104
TF	4.9575
IF	4.5917
FF	7.9679
GDP	1.1382

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.52: Frontier Markets (Post-GFC 2010-2017): Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
	index_returns				
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.150429^{*}	0.095512	0.002507		0.150429^{*}
	(0.083627)	(0.067622)	(0.027557)		(0.083627)
VA	0.060562^{**}	0.066466^{***}	-0.381830^{*}	−0.160995	0.060562^{**}
	(0.030411)	(0.020995)	(0.221395)	(0.117712)	(0.030411)
PV	−0.008979	−0.008430	−0.030143	−0.178495	−0.008979
	(0.024225)	(0.016344)	(0.161019)	(0.114144)	(0.024225)
IF	−0.001783	−0.001354	-0.019598^{***}	-0.008065^{*}	−0.001783
	(0.001177)	(0.000830)	(0.006542)	(0.004327)	(0.001177)
GDP	0.006661	0.014463	−0.015691	−0.001857	0.006661
	(0.007500)	(0.008151)	(0.010746)	(0.009905)	(0.007500)
Observations	128	16	112	128	128
R^2	0.040696	0.535511	0.098099	0.067025	0.040696
Adjusted R^2	0.009499	0.366605	0.064383	−0.097110	0.009499
F Statistic	1.304492	3.170481^{*}	2.909566^{**}	1.939681	5.217966

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.53: Developed Markets - Americas: Estimated Coefficients for Pooled OLS, First Differences and Fixed Effects Using All Explanatory Variables

	Dependent variable:		
	index_returns		
	Pooled OLS	First Differences	Fixed Effects
	(1)	(2)	(3)
Constant	3.225539	0.046020	
	(7.655742)	(0.060785)	
VA	−0.709595	−3.280432*	−1.770253
	(1.916077)	(1.725425)	(1.956158)
PV	0.249391	−0.607940	−0.005322
	(0.654794)	(0.601814)	(0.646506)
GE	−0.151163	0.776743	−0.297203
	(1.529107)	(1.965058)	(1.461104)
RegQ	0.599095	−0.139215	0.240331
	(0.740995)	(0.651526)	(0.745048)
RL	−0.475545	−0.265916	−0.843509
	(1.460239)	(1.378981)	(1.413245)
CC	0.076748	−0.380773	−0.747409
	(0.793858)	(0.987634)	(0.931759)
TF	−0.014608	0.025632	−0.034255
	(0.087359)	(0.088506)	(0.084294)
IF	−0.003958	−0.032044	0.001509
	(0.019807)	(0.024001)	(0.019226)
FF	−0.011496	−0.002770	−0.011867
	(0.018804)	(0.031346)	(0.017930)
GDP	−0.020828	−0.064308**	−0.026102
	(0.030296)	(0.028894)	(0.029094)
Observations	24	22	24
R^2	0.138592	0.587849	0.268426
Adjusted R^2	−0.524029	0.213167	−0.402184
F Statistic	0.209158	1.568927	0.440299
Notes:	***Significant at the 1 percent level.		
	**Significant at the 5 percent level.		
	*Significant at the 10 percent level.		

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.54: Developed Markets - Americas: Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.9501	0.9291	0.7781	0.9187	0.9405	0.4031	-0.0872	0.3783	0.0671
PV	0.9501	1	0.8437	0.6729	0.8773	0.9124	0.3980	-0.0762	0.3481	0.0490
GE	0.9291	0.8437	1	0.8114	0.8858	0.9209	0.2122	-0.1238	0.4451	0.1175
RegQ	0.7781	0.6729	0.8114	1	0.8166	0.7442	0.3022	0.2690	0.6178	0.0830
RL	0.9187	0.8773	0.8858	0.8166	1	0.9181	0.3960	-0.0568	0.3373	0.0698
CC	0.9405	0.9124	0.9209	0.7442	0.9181	1	0.3908	-0.1580	0.3688	0.0454
TF	0.4031	0.3980	0.2122	0.3022	0.3960	0.3908	1	0.4519	-0.0711	-0.1132
IF	-0.0872	-0.0762	-0.1238	0.2690	-0.0568	-0.1580	0.4519	1	0.4211	-0.1532
FF	0.3783	0.3481	0.4451	0.6178	0.3373	0.3688	-0.0711	0.4211	1	-0.1963
GDP	0.0671	0.0490	0.1175	0.0830	0.0698	0.0454	-0.1132	-0.1532	-0.1963	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.55: Developed Markets - Americas: Variance Inflation Factor

VA	50.5042
PV	23.7302
GE	24.1883
RegQ	9.7142
RL	11.7702
CC	33.9688
TF	10.7538
IF	10.8565
FF	6.3045
GDP	1.2839

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.56: Developed Markets - Americas: Estimated Coefficients for Pooled OLS, First Differences and Fixed Effects After Adjusting for Multi-collinearity

	Dependent variable:		
	index_returns		
	Pooled OLS	First Differences	Fixed Effects
	(1)	(2)	(3)
Constant	2.156960	0.017506	
	(2.352658)	(0.063025)	
TF	−0.017447	−0.026191	−0.039415
	(0.027039)	(0.058834)	(0.048954)
IF	−0.000149	−0.008694	0.004583
	(0.006674)	(0.017871)	(0.011056)
FF	−0.007084	−0.020974	−0.012969
	(0.007549)	(0.023731)	(0.013292)
GDP	−0.015092	−0.054737*	−0.020459
	(0.023439)	(0.029664)	(0.025851)
Observations	24	22	24
R^2	0.085591	0.220542	0.089453
Adjusted R^2	−0.106917	0.037140	−0.163477
F Statistic	0.444610	1.202505	0.442083

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.57: Developed Markets - Europe, Middle East and Africa: Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.767085	−0.041930	0.007692		0.767085
	(0.676667)	(0.624482)	(0.028552)		(0.676667)
VA	0.324806	0.024219	0.160366	0.361142	0.324806
	(0.222516)	(0.201491)	(0.558422)	(0.367171)	(0.222516)
PV	−0.117303**	−0.047536	−0.683445***	−0.287148**	−0.117303**
	(0.057265)	(0.040093)	(0.239116)	(0.124277)	(0.057265)
GE	0.153722	−0.006249	0.580602*	0.219445	0.153722
	(0.109440)	(0.147280)	(0.301213)	(0.172237)	(0.109440)
RegQ	−0.052954	0.035743	−0.076195	−0.074075	−0.052954
	(0.125168)	(0.110285)	(0.338113)	(0.186116)	(0.125168)
RL	0.010117	−0.028513	−0.357128	−0.082926	0.010117
	(0.130867)	(0.090553)	(0.423730)	(0.255256)	(0.130867)
CC	−0.040026	0.096197	−0.145541	−0.128425	−0.040026
	(0.121937)	(0.152453)	(0.357538)	(0.181533)	(0.121937)
TF	−0.012884	0.001259	−0.036338**	−0.017066	−0.012884
	(0.008352)	(0.008153)	(0.017916)	(0.010725)	(0.008352)
IF	0.004518*	0.000584	−0.010543	0.003551	0.004518*
	(0.002382)	(0.002123)	(0.007632)	(0.003803)	(0.002382)
FF	−0.005703**	−0.002957	−0.003854	−0.006987*	−0.005703**
	(0.002243)	(0.001531)	(0.007328)	(0.003803)	(0.002243)
GDP	−0.006182	0.000777	−0.015782*	−0.007987	−0.006182
	(0.005826)	(0.009993)	(0.008102)	(0.006495)	(0.005826)
Observations	192	16	176	192	192
R^2	0.073856	0.799013	0.146839	0.077861	0.073856
Adjusted R^2	0.022688	0.397038	0.095132	−0.061015	0.022688
F Statistic	1.443405	1.987719	2.839847***	1.401622	14.434050
Notes:	***Significant at the 1 percent level.				
	**Significant at the 5 percent level.				
	*Significant at the 10 percent level.				

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.58: Developed Markets - Europe, Middle East and Africa: Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.8561	0.7360	0.7226	0.8347	0.8531	0.2540	0.1720	0.3813	-0.0514
PV	0.8561	1	0.5235	0.4752	0.6311	0.6145	0.2171	0.0531	0.1649	-0.0888
GE	0.7360	0.5235	1	0.8134	0.9117	0.9270	0.2054	0.1624	0.4865	0.0766
RegQ	0.7226	0.4752	0.8134	1	0.8654	0.8616	0.2309	0.4682	0.6360	0.1387
RL	0.8347	0.6311	0.9117	0.8654	1	0.9512	0.2267	0.2245	0.4937	0.0769
CC	0.8531	0.6145	0.9270	0.8616	0.9512	1	0.1892	0.1945	0.5118	0.0465
TF	0.2540	0.2171	0.2054	0.2309	0.2267	0.1892	1	0.3750	0.1357	0.0546
IF	0.1720	0.0531	0.1624	0.4682	0.2245	0.1945	0.3750	1	0.5453	0.1050
FF	0.3813	0.1649	0.4865	0.6360	0.4937	0.5118	0.1357	0.5453	1	-0.0828
GDP	-0.0514	-0.0888	0.0766	0.1387	0.0769	0.0465	0.0546	0.1050	-0.0828	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.59: Developed Markets - Europe, Middle East and Africa: Variance Inflation Factor

VA	11.8827
PV	5.0350
GE	8.9461
RegQ	7.3707
RL	13.5866
CC	21.0350
TF	1.3110
IF	2.2684
FF	2.2462
GDP	1.1696

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.60: Developed Markets - Europe, Middle East and Africa: Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
	index_returns				
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.679048	−0.609760	0.007154		0.679048
	(0.678522)	(0.821997)	(0.027925)		(0.678522)
PV	0.004954	0.006085	−0.608110***	−0.198394*	0.004954
	(0.027175)	(0.021248)	(0.226194)	(0.109585)	(0.027175)
TF	−0.008041	0.007756	−0.035599**	−0.016154	−0.008041
	(0.008268)	(0.009884)	(0.017290)	(0.010431)	(0.008268)
IF	0.002844	−0.000904	−0.010529	0.004334	0.002844
	(0.002104)	(0.001919)	(0.007598)	(0.003372)	(0.002104)
FF	−0.002195	0.000560	−0.005373	−0.007616**	−0.002195
	(0.001879)	(0.001609)	(0.007257)	(0.003465)	(0.001879)
GDP	−0.003218	0.012535	−0.017708**	−0.008388	−0.003218
	(0.005609)	(0.010605)	(0.007945)	(0.006345)	(0.005609)
Observations	192	16	176	192	192
R^2	0.013523	0.207624	0.123269	0.061924	0.013523
Adjusted R^2	−0.012996	−0.188563	0.097482	−0.047793	−0.012996
F Statistic	0.509933	0.524056	4.780404***	2.257584*	2.549664
Notes:	***Significant at the 1 percent level.				
	**Significant at the 5 percent level.				
	*Significant at the 10 percent level.				

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.61: Developed Markets - Asia-Pacific: Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:			
	index_returns			
	Pooled OLS	Between Estimator	First Differences	Fixed Effects
	(1)	(2)	(3)	(4)
Constant	−1.685203	−0.897903	−0.025146	
	(1.590915)		(0.066609)	
VA	0.044311	0.256309	1.188733	0.409801
	(0.166159)		(0.791493)	(0.498988)
PV	0.034749	−0.710035	−0.722434	−0.029905
	(0.298381)		(0.583315)	(0.376589)
GE	0.079724	0.870933	−0.654292	−0.144258
	(0.580134)		(0.843782)	(0.633943)
RegQ	−0.457936		−0.234764	−0.103530
	(0.499858)		(0.833063)	(0.642536)
RL	0.250533		0.832413	0.255465
	(0.576889)		(0.900821)	(0.602332)
CC	0.051153		−0.008069	0.409410
	(0.218109)		(1.085888)	(0.526179)
TF	0.011960		0.047047	0.003552
	(0.019952)		(0.040005)	(0.026955)
IF	0.009819		0.015413	0.014136
	(0.009928)		(0.019396)	(0.013211)
FF	0.000033		0.002534	−0.003629
	(0.008461)		(0.020014)	(0.010206)
GDP	0.005742		−0.008444	0.005300
	(0.013572)		(0.015711)	(0.014460)
Observations	48	4	44	48
R^2	0.090801	1.000000	0.178799	0.112902
Adjusted R^2	−0.154928		−0.070050	−0.226282
F Statistic	0.369517		0.718505	0.432723
Notes:	***Significant at the 1 percent level.			
	**Significant at the 5 percent level.			
	*Significant at the 10 percent level.			

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.62: Developed Markets - Asia-Pacific: Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.0293	-0.7245	-0.3356	0.1822	0.0189	-0.5713	-0.3996	0.0899	-0.3959
PV	0.0293	1	0.4826	0.4762	0.6915	0.7092	0.1687	0.1600	0.1822	0.1944
GE	-0.7245	0.4826	1	0.6386	0.4083	0.5420	0.6082	0.5145	0.0692	0.4772
RegQ	-0.3356	0.4762	0.6386	1	0.7309	0.5753	0.7583	0.8453	0.7703	0.3323
RL	0.1822	0.6915	0.4083	0.7309	1	0.7603	0.2632	0.4372	0.5753	0.1818
CC	0.0189	0.7092	0.5420	0.5753	0.7603	1	0.3017	0.3205	0.3318	0.3300
TF	-0.5713	0.1687	0.6082	0.7583	0.2632	0.3017	1	0.8228	0.5573	0.3589
IF	-0.3996	0.1600	0.5145	0.8453	0.4372	0.3205	0.8228	1	0.7544	0.3274
FF	0.0899	0.1822	0.0692	0.7703	0.5753	0.3318	0.5573	0.7544	1	0.0829
GDP	-0.3959	0.1944	0.4772	0.3323	0.1818	0.3300	0.3589	0.3274	0.0829	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.63: Developed Markets - Asia-Pacific: Variance Inflation Factor

VA	8.5372
PV	2.7892
GE	16.8762
RegQ	24.2902
RL	10.4311
CC	3.9917
TF	5.1881
IF	7.6232
FF	14.1241
GDP	1.4050

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.64: Developed Markets - Asia-Pacific: Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:			
			index_returns	
	Pooled OLS	Between Estimator	First Differences	Fixed Effects
	(1)	(2)	(3)	(4)
Constant	−0.408388	0.051212	−0.004590	
	(0.780663)		(0.060028)	
PV	−0.056538	−0.399670	−0.530652	0.095201
	(0.243388)		(0.532789)	(0.319271)
CC	0.086663	0.244404	0.309989	0.441844
	(0.157067)		(0.993291)	(0.371340)
TF	0.004212	0.000194	0.030280	0.006637
	(0.009199)		(0.035049)	(0.021809)
GDP	0.004828		−0.010648	0.006384
	(0.012139)		(0.014808)	(0.013256)
Observations	48	4	44	48
R^2	0.031369	1.000000	0.059626	0.062537
Adjusted R^2	−0.058736		−0.036823	−0.101520
F Statistic	0.348135		0.618210	0.667083
Notes:	***Significant at the 1 percent level.			
	**Significant at the 5 percent level.			
	*Significant at the 10 percent level.			

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.65: Emerging Markets - Americas: Estimated Coefficients for Pooled OLS, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:		
	index_returns		
	Pooled OLS	First Differences	Fixed Effects
	(1)	(2)	(3)
Constant	0.712887	−0.024400	
	(1.382705)	(0.075241)	
VA	−0.402012	−0.016187	−0.263428
	(0.933812)	(1.593319)	(1.076767)
PV	0.224377	0.270878	0.406511
	(0.309526)	(0.451706)	(0.360799)
GE	−0.624742**	−1.091111	−1.058092*
	(0.291434)	(0.690675)	(0.589487)
RegQ	0.469911	−0.752252	−0.674173
	(0.476453)	(0.973856)	(0.698335)
RL	−0.214208	1.341231	0.210714
	(0.367168)	(0.833458)	(0.617624)
CC	0.416065	−0.311568	0.365286
	(0.463883)	(0.786997)	(0.458782)
TF	−0.004419	−0.002180	−0.007107
	(0.013949)	(0.017890)	(0.014653)
IF	−0.008322	−0.019727	−0.006456
	(0.009677)	(0.014971)	(0.009941)
FF	0.008862	0.013278	−0.005877
	(0.012188)	(0.019584)	(0.013301)
GDP	−0.041319*	−0.052892**	−0.031024
	(0.022260)	(0.020639)	(0.021937)
Observations	60	55	60
R^2	0.214848	0.361559	0.310870
Adjusted R^2	0.054613	0.216458	0.096474
F Statistic	1.340834	2.491784**	2.029969*

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.66: Emerging Markets - Americas: Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.9305	0.7732	0.7244	0.9069	0.8994	0.2603	0.3972	0.2301	-0.1051
PV	0.9305	1	0.6745	0.6232	0.7762	0.7363	0.3229	0.3703	0.1575	-0.1705
GE	0.7732	0.6745	1	0.9100	0.9084	0.8727	0.4592	0.6533	0.5539	-0.0777
RegQ	0.7244	0.6232	0.9100	1	0.8654	0.8766	0.5955	0.7740	0.6735	0.1081
RL	0.9069	0.7762	0.9084	0.8654	1	0.9566	0.3159	0.5809	0.4877	-0.0675
CC	0.8994	0.7363	0.8727	0.8766	0.9566	1	0.2831	0.5048	0.4823	0.0821
TF	0.2603	0.3229	0.4592	0.5955	0.3159	0.2831	1	0.7741	0.3627	-0.0495
IF	0.3972	0.3703	0.6533	0.7740	0.5809	0.5048	0.7741	1	0.6519	-0.0096
FF	0.2301	0.1575	0.5539	0.6735	0.4877	0.4823	0.3627	0.6519	1	0.0492
GDP	-0.1051	-0.1705	-0.0777	0.1081	-0.0675	0.0821	-0.0495	-0.0096	0.0492	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.67: Emerging Markets - Americas: Variance Inflation Factor

VA	68.8611
PV	20.0678
GE	11.3319
RegQ	27.4806
RL	31.5910
CC	52.3880
TF	4.6980
IF	7.0058
FF	3.7924
GDP	1.8944

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.68: Emerging Markets - Americas: Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:			
	index_returns			
	Pooled OLS	Between Estimator	First Differences	Fixed Effects
	(1)	(2)	(3)	(4)
Constant	−0.228023	−0.082894	−0.020493	
	(0.745668)		(0.068560)	
TF	0.004286	0.013776	−0.003933	−0.016172
	(0.010849)		(0.017605)	(0.013815)
IF	−0.012606	0.004272	−0.015671	−0.009584
	(0.007567)		(0.014567)	(0.008558)
FF	0.014467	−0.020172	0.022823	0.003599
	(0.008813)		(0.017781)	(0.011880)
GDP	−0.013709	0.031715	−0.065815***	−0.038571**
	(0.016533)		(0.019706)	(0.019058)
Observations	60	5	55	60
R^2	0.086054	1.000000	0.260852	0.179547
Adjusted R^2	0.019586		0.201721	0.050848
F Statistic	1.294657		4.411371***	2.790189**

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.69: Emerging Markets - Europe, Middle East and Africa: Estimated Coefficients for Pooled OLS, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:		
	index_returns		
	Pooled OLS	First Differences	Fixed Effects
	(1)	(2)	(3)
Constant	0.257367	−0.007467	
	(0.575553)	(0.055425)	
VA	−0.037979	−0.354601	-0.753335^{**}
	(0.079121)	(0.725862)	(0.352012)
PV	0.003133	0.273393	0.109133
	(0.091666)	(0.377034)	(0.220536)
GE	−0.339503	−0.614739	−0.745851
	(0.243443)	(0.676874)	(0.465907)
RegQ	0.221902	0.447370	0.164539
	(0.256176)	(0.553225)	(0.319513)
RL	−0.351741	−0.679399	−0.083671
	(0.235599)	(0.717012)	(0.424890)
CC	0.339082^{**}	1.395334^{**}	0.939810^{**}
	(0.152647)	(0.644822)	(0.362537)
TF	−0.004356	0.000548	−0.012949
	(0.007720)	(0.016109)	(0.009619)
IF	0.002608	−0.003239	−0.000456
	(0.004903)	(0.012965)	(0.007133)
FF	0.003290	−0.013091	−0.002567
	(0.005060)	(0.010839)	(0.007416)
GDP	-0.020874^{**}	-0.080822^{***}	-0.034554^{***}
	(0.009943)	(0.014738)	(0.011989)
Observations	108	99	108
R^2	0.102326	0.308381	0.143215
Adjusted R^2	0.009783	0.229788	−0.030067
F Statistic	1.105708	3.923766^{***}	1.487669
Notes:	***Significant at the 1 percent level.		
	**Significant at the 5 percent level.		
	*Significant at the 10 percent level.		

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.70: Emerging Markets - Europe, Middle East and Africa: Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.5976	0.4989	0.7410	0.7229	0.3963	0.6322	0.6498	0.7347	-0.2530
PV	0.5976	1	0.8357	0.8517	0.8435	0.7680	0.5562	0.2784	0.6022	-0.0887
GE	0.4989	0.8357	1	0.9043	0.8694	0.9077	0.6966	0.3020	0.6286	-0.0874
RegQ	0.7410	0.8517	0.9043	1	0.9440	0.8160	0.7651	0.5439	0.7780	-0.1149
RL	0.7229	0.8435	0.8694	0.9440	1	0.8200	0.7686	0.6040	0.7688	-0.1530
CC	0.3963	0.7680	0.9077	0.8160	0.8200	1	0.6851	0.2881	0.5209	0.0179
TF	0.6322	0.5562	0.6966	0.7651	0.7686	0.6851	1	0.6303	0.6771	-0.1565
IF	0.6498	0.2784	0.3020	0.5439	0.6040	0.2881	0.6303	1	0.7648	-0.0344
FF	0.7347	0.6022	0.6286	0.7780	0.7688	0.5209	0.6771	0.7648	1	-0.1138
GDP	-0.2530	-0.0887	-0.0874	-0.1149	-0.1530	0.0179	-0.1565	-0.0344	-0.1138	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.71: Emerging Markets - Europe, Middle East and Africa: Variance Inflation Factor

VA	4.5292
PV	6.0469
GE	16.7057
RegQ	20.2952
RL	17.2040
CC	7.9183
TF	3.7165
IF	6.0813
FF	5.0931
GDP	1.2876

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.72: Emerging Markets - Europe, Middle East and Africa: Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
			index_returns		
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.262958	0.447155	−0.021672		0.262958
	(0.414383)	(0.293083)	(0.052703)		(0.414383)
VA	−0.042885	0.025779	0.048662	−0.264541	−0.042885
	(0.049189)	(0.035330)	(0.643438)	(0.246608)	(0.049189)
TF	−0.001800	−0.005522	0.002402	−0.008146	−0.001800
	(0.005190)	(0.003800)	(0.014837)	(0.008830)	(0.005190)
GDP	−0.012495	0.028161*	−0.073755***	−0.025193**	−0.012495
	(0.009095)	(0.011070)	(0.013539)	(0.010677)	(0.009095)
Observations	108	9	99	108	108
R^2	0.029510	0.670925	0.239536	0.060709	0.029510
Adjusted R^2	0.001515	0.473479	0.215521	−0.046918	0.001515
F Statistic	1.054133	3.398028	9.974551***	2.068246	3.162398

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.73: Emerging Markets - Asia-Pacific: Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:			
	index_returns			
	Pooled OLS	Between Estimator	First Differences	Fixed Effects
	(1)	(2)	(3)	(4)
Constant	0.480996	0.310136	−0.017972	
	(0.693599)		(0.080182)	
VA	0.046341	−0.011223	1.312298	0.216897
	(0.099212)		(0.941985)	(0.454195)
PV	0.036592	−0.066254	0.032893	−0.118888
	(0.159660)		(0.493506)	(0.307888)
GE	0.038474	0.003518	0.409775	0.387121
	(0.349498)		(0.851788)	(0.529618)
RegQ	0.433160	−0.237717	−0.218738	0.225843
	(0.379565)		(1.157588)	(0.626557)
RL	−0.201742	−0.429987	0.127654	−0.399893
	(0.385286)		(1.176015)	(0.661912)
CC	−0.354604	0.740340	−1.301688	−0.601196
	(0.432828)		(0.855470)	(0.563242)
TF	−0.005634		−0.009086	−0.006879
	(0.008285)		(0.019454)	(0.009904)
IF	0.000363		0.002146	0.003789
	(0.006149)		(0.016961)	(0.008613)
FF	−0.004160		0.014709	−0.000181
	(0.006223)		(0.018858)	(0.009777)
GDP	0.026853		0.011588	0.028233
	(0.018513)		(0.023122)	(0.020859)
Observations	84	7	77	84
R^2	0.094391	1.000000	0.064040	0.089084
Adjusted R^2	−0.029665		−0.077773	−0.128449
F Statistic	0.760877		0.451580	0.655232

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.74: Emerging Markets - Asia-Pacific: Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.2250	0.2111	0.3621	0.4971	0.4122	0.1139	0.6189	0.3537	-0.3455
PV	0.2250	1	0.8539	0.8169	0.8166	0.8965	0.4892	0.6284	0.0691	-0.2103
GE	0.2111	0.8539	1	0.9250	0.9059	0.9213	0.5137	0.6439	0.2457	-0.3568
RegQ	0.3621	0.8169	0.9250	1	0.8947	0.9199	0.6121	0.7840	0.4775	-0.4661
RL	0.4971	0.8166	0.9059	0.8947	1	0.9530	0.3421	0.7513	0.2724	-0.3775
CC	0.4122	0.8965	0.9213	0.9199	0.9530	1	0.4406	0.7429	0.2522	-0.3369
TF	0.1139	0.4892	0.5137	0.6121	0.3421	0.4406	1	0.4292	0.4925	-0.4553
IF	0.6189	0.6284	0.6439	0.7840	0.7513	0.7429	0.4292	1	0.5322	-0.4012
FF	0.3537	0.0691	0.2457	0.4775	0.2724	0.2522	0.4925	0.5322	1	-0.5243
GDP	-0.3455	-0.2103	-0.3568	-0.4661	-0.3775	-0.3369	-0.4553	-0.4012	-0.5243	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.75: Emerging Markets - Asia-Pacific: Variance Inflation Factor

VA	3.4445
PV	8.6594
GE	19.6348
RegQ	23.2825
RL	25.3877
CC	24.5506
TF	3.3537
IF	4.5620
FF	3.3461
GDP	1.7085

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.76: Emerging Markets - Asia-Pacific: Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
	index_returns				
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.133439	−0.287318	−0.043413		0.133439
	(0.434368)	(0.923356)	(0.074858)		(0.434368)
VA	−0.009906	0.029860	1.023249	−0.064002	−0.009906
	(0.070431)	(0.062217)	(0.898397)	(0.384569)	(0.070431)
TF	−0.001261	0.005323	−0.000858	−0.006209	−0.001261
	(0.005632)	(0.006470)	(0.017553)	(0.009189)	(0.005632)
IF	−0.000474	−0.004219	0.005126	−0.001249	−0.000474
	(0.004205)	(0.005112)	(0.015061)	(0.007184)	(0.004205)
FF	−0.000355	0.000803	0.010067	−0.001390	−0.000355
	(0.004451)	(0.008704)	(0.017255)	(0.008690)	(0.004451)
GDP	0.027245	0.034660	0.010710	0.030267	0.027245
	(0.017435)	(0.055325)	(0.022392)	(0.019902)	(0.017435)
Observations	84	7	77	84	84
R^2	0.064495	0.875746	0.028937	0.048816	0.064495
Adjusted R^2	0.004527	0.254479	−0.039447	−0.096503	0.004527
F Statistic	1.075482	1.409612	0.423156	0.739031	5.377411
Notes:	***Significant at the 1 percent level.				
	**Significant at the 5 percent level.				
	*Significant at the 10 percent level.				

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.77: Frontier Markets - Europe, Middle East and Africa: Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:				
	index_returns				
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.733550***	0.347631	−0.008732		0.733550***
	(0.257338)	(0.974452)	(0.037393)		(0.257338)
VA	0.039797	0.092472	0.030914	−0.148480	0.039797
	(0.038664)	(0.102952)	(0.340751)	(0.140837)	(0.038664)
PV	0.061304	−0.015948	0.237900	0.058361	0.061304
	(0.053049)	(0.158760)	(0.254496)	(0.149779)	(0.053049)
GE	0.019319	−0.015760	0.363767	0.214965	0.019319
	(0.116575)	(0.215064)	(0.420814)	(0.261618)	(0.116575)
RegQ	0.025052	0.056606	−0.810155*	−0.459387*	0.025052
	(0.119433)	(0.133492)	(0.456146)	(0.266953)	(0.119433)
RL	0.001656	0.026857	0.343296	−0.073777	0.001656
	(0.153778)	(0.217122)	(0.515468)	(0.270847)	(0.153778)
CC	−0.064884	0.049058	−0.317736	0.098157	−0.064884
	(0.107908)	(0.274469)	(0.490494)	(0.260497)	(0.107908)
TF	−0.009614**	0.000022	−0.003251	−0.009674**	−0.009614**
	(0.003876)	(0.021672)	(0.006360)	(0.004596)	(0.003876)
IF	0.000711	−0.004546	−0.011304	−0.001468	0.000711
	(0.002900)	(0.011691)	(0.008308)	(0.003703)	(0.002900)
FF	0.000683	−0.001345	0.019291*	0.001996	0.000683
	(0.002838)	(0.005732)	(0.010413)	(0.007012)	(0.002838)
GDP	−0.004179	0.014263	−0.015723**	−0.005149	−0.004179
	(0.006147)	(0.063982)	(0.007801)	(0.006667)	(0.006147)
Observations	156	13	143	156	156
R^2	0.067448	0.824385	0.115434	0.083349	0.067448
Adjusted R^2	0.003134	−0.053687	0.048422	−0.068278	0.003134
F Statistic	1.048728	0.938858	1.722575*	1.209334	10.487280

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.78: Frontier Markets - Europe, Middle East and Africa: Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	0.5479	0.4598	0.5447	0.4378	0.4162	0.4669	0.5743	0.3517	-0.1776
PV	0.5479	1	0.8004	0.7898	0.8067	0.7873	0.5883	0.6215	0.5059	-0.1160
GE	0.4598	0.8004	1	0.8713	0.9285	0.8585	0.5602	0.6995	0.7040	-0.1409
RegQ	0.5447	0.7898	0.8713	1	0.8810	0.8036	0.7339	0.8144	0.7952	-0.1248
RL	0.4378	0.8067	0.9285	0.8810	1	0.9317	0.5738	0.7627	0.7105	-0.1054
CC	0.4162	0.7873	0.8585	0.8036	0.9317	1	0.4833	0.7010	0.6717	-0.0794
TF	0.4669	0.5883	0.5602	0.7339	0.5738	0.4833	1	0.7445	0.6428	-0.2191
IF	0.5743	0.6215	0.6995	0.8144	0.7627	0.7010	0.7445	1	0.7479	-0.1399
FF	0.3517	0.5059	0.7040	0.7952	0.7105	0.6717	0.6428	0.7479	1	-0.0199
GDP	-0.1776	-0.1160	-0.1409	-0.1248	-0.1054	-0.0794	-0.2191	-0.1399	-0.0199	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.79: Frontier Markets - Europe, Middle East and Africa: Variance Inflation Factor

VA	1.8900
PV	4.7942
GE	9.1227
RegQ	9.8436
RL	18.4440
CC	8.9104
TF	3.3337
IF	4.9128
FF	3.9412
GDP	1.1274

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.80: Frontier Markets - Europe, Middle East and Africa: Estimated Coefficients for Pooled OLS, Between Estimator, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:				
	index_returns				
	Pooled OLS	Between Estimator	First Differences	Fixed Effects	Random Effects
	(1)	(2)	(3)	(4)	(5)
Constant	0.696513***	0.451222**	−0.014219		0.696513***
	(0.215647)	(0.154156)	(0.035964)		(0.215647)
VA	0.046193	0.061352**	0.070938	−0.115554	0.046193
	(0.034086)	(0.017742)	(0.314015)	(0.113059)	(0.034086)
PV	0.047861	0.022874	0.254340	−0.006479	0.047861
	(0.032560)	(0.017055)	(0.247531)	(0.126806)	(0.032560)
TF	−0.008345***	−0.004482*	−0.004612	−0.011790***	−0.008345***
	(0.003108)	(0.002254)	(0.006284)	(0.004282)	(0.003108)
FF	0.000578	−0.000559	0.017247*	0.000839	0.000578
	(0.001904)	(0.001057)	(0.010221)	(0.006815)	(0.001904)
GDP	−0.004095	−0.000796	−0.019308**	−0.004783	−0.004095
	(0.005956)	(0.009954)	(0.007599)	(0.006419)	(0.005956)
Observations	156	13	143	156	156
R^2	0.063457	0.762750	0.070391	0.060368	0.063457
Adjusted R^2	0.032239	0.593286	0.036464	−0.055383	0.032239
F Statistic	2.032713*	4.500956**	2.074770*	1.773211	10.163570*

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.81: Frontier Markets - Asia-Pacific: Estimated Coefficients for Pooled OLS, First Differences, Fixed Effects and Random Effects Using All Explanatory Variables

	Dependent variable:		
		index_returns	
	Pooled OLS	First Differences	Fixed Effects
	(1)	(2)	(3)
Constant	0.844642	−0.067308	
	(1.122766)	(0.128284)	
VA	−0.602926	−2.668737	−2.189200
	(0.602264)	(1.811406)	(1.326016)
PV	−0.171527	1.153156*	0.331527
	(0.246502)	(0.562680)	(0.445865)
GE	−1.057682	−1.112601	−0.919735
	(1.468453)	(1.737862)	(1.477927)
RegQ	1.141836	0.266028	−0.763429
	(1.253344)	(2.661771)	(2.098062)
RL	0.545699	0.571676	1.819225
	(0.845451)	(1.491869)	(1.260605)
CC	−0.536189	0.714780	−0.909970
	(0.705673)	(1.215157)	(0.802534)
TF	−0.006896	0.008406	0.002323
	(0.007301)	(0.014493)	(0.009957)
IF	−0.007049	−0.016540	−0.014860
	(0.009494)	(0.017592)	(0.011764)
FF	−0.002914	−0.067148	−0.047996
	(0.025313)	(0.049183)	(0.041636)
GDP	−0.052371	−0.142711	−0.083112
	(0.079015)	(0.084398)	(0.084810)
Observations	36	33	36
R^2	0.167548	0.276845	0.229232
Adjusted R^2	−0.165433	−0.051862	−0.172907
F Statistic	0.503175	0.842225	0.684038

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.82: Frontier Markets - Asia-Pacific: Pearson's Correlation between Explanatory Variables

	VA	PV	GE	RegQ	RL	CC	TF	IF	FF	GDP
VA	1	-0.7380	-0.4055	0.0797	0.0313	-0.1174	-0.2718	0.4978	-0.0187	-0.1317
PV	-0.7380	1	0.6155	0.3402	0.2771	0.3581	0.4914	-0.4301	0.3375	-0.1756
GE	-0.4055	0.6155	1	0.8382	0.8497	0.8602	0.6576	-0.5603	0.7713	-0.1145
RegQ	0.0797	0.3402	0.8382	1	0.9089	0.8736	0.5941	-0.2907	0.8604	-0.1430
RL	0.0313	0.2771	0.8497	0.9089	1	0.8648	0.5987	-0.3431	0.8534	-0.0691
CC	-0.1174	0.3581	0.8602	0.8736	0.8648	1	0.6762	-0.3277	0.7827	-0.0997
TF	-0.2718	0.4914	0.6576	0.5941	0.5987	0.6762	1	-0.1197	0.6574	-0.1177
IF	0.4978	-0.4301	-0.5603	-0.2907	-0.3431	-0.3277	-0.1197	1	-0.2594	0.0087
FF	-0.0187	0.3375	0.7713	0.8604	0.8534	0.7827	0.6574	-0.2594	1	-0.1100
GDP	-0.1317	-0.1756	-0.1145	-0.1430	-0.0691	-0.0997	-0.1177	0.0087	-0.1100	1

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.83: Frontier Markets - Asia-Pacific: Variance Inflation Factor

VA	13.5240
PV	5.3971
GE	29.6190
RegQ	21.7768
RL	12.5237
CC	7.2370
TF	2.7109
IF	2.1175
FF	5.1613
GDP	1.5705

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Table B.84: Frontier Markets - Asia-Pacific: Estimated Coefficients for Pooled OLS, First Differences, Fixed Effects and Random Effects After Adjusting for Multi-collinearity

	Dependent variable:		
	index_returns		
	Pooled OLS	First Differences	Fixed Effects
	(1)	(2)	(3)
Constant	0.952246*	−0.034591	
	(0.517518)	(0.111026)	
TF	−0.006800	−0.007546	−0.007343
	(0.004091)	(0.009520)	(0.006262)
IF	−0.008524	−0.005734	−0.008223
	(0.005978)	(0.015534)	(0.009295)
GDP	−0.008919	−0.089361	−0.006989
	(0.057759)	(0.074094)	(0.060017)
Observations	36	33	36
R^2	0.118243	0.065524	0.119499
Adjusted R^2	0.035579	−0.031146	−0.027251
F Statistic	1.430399	0.677815	1.357176

textitNotes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Where VA = Voice and Accountability, PV = Political Stability and Absence of Violence/Terrorism, GE = Government Effectiveness, RegQ = Regulatory Quality, RL = Rule of Law, CC = Control of Corruption, TF = Trade Freedom, IF = Investment Freedom, FF = Financial Freedom, GDP = Gross Domestic Product (growth rate in % per annum), index_returns = returns of broad market indices

Appendix C

Unit Root Tests

C.1 The Augmented Dickey-Fuller (ADF) Test

The ADF test (Dickey & Fuller 1979) is an extension of the Dickey-Fuller (DF) test. The DF test checks the presence of unit root in an auto-regressive (AR) model[59], AR (1), equation such as:

$$X_t = \rho X_{t-1} + e_t \tag{C.1}$$

To do that, X_{t-1} is subtracted from both sides of the above equation,

$$\begin{aligned} X_t - X_{(t-1)} &= \rho X_{t-1} - X_{t-1} + e_t \\ \Delta X_t &= (\rho - 1) X_{t-1} + e_t \\ \Delta X_t &= \delta X_{t-1} + e_t \end{aligned} \tag{C.2}$$

If the estimated $\delta = 0$, then ρ will be equal to 1. This implies that the time series has a unit root and X_t is non-stationary. On the other hand, when $\delta < 0$, ρ will be less than 1 and X_t is stationary.

When a series has unit root, it is important to identify the type of non-stationarity in order choose the correct DF specification for transforming the series. There are three types of non-stationary time series: series with stochastic trend called random walk - without drift and with drift, series with deterministic trend and series with a combination of stochastic and deterministic trend called random walk with drift and deterministic trend. Based on these characteristics, there are three specifications for the DF test.

Test for random walk without drift	$\Delta X_t = \delta X_{t-1} + e_t$	(C.3)
Test for random walk with drift	$\Delta X_t = a_1 + \delta X_{t-1} + e_t$	(C.4)
Test for random walk with drift and deterministic trend	$\Delta X_t = a_1 + a_2 t + \delta X_{t-1} + e_t$	(C.5)

Correct identification of the type of non-stationarity in the time series will allow selection of the correct DF specification. However, since there is no established way to select the correct specification, a sequential testing with different specifications is recommended.

The null hypothesis H0: $\delta = 0$ or that the time series has a unit root is tested against the alternative hypothesis H1: $\delta < 0$ or that the time series is stationary. The acceptance or rejection of the null hypothesis is dependent on the comparison of the t-values against the critical values from the DF tables. If the t-value is less than the critical value, the null hypothesis is rejected and if the t-value of greater than the critical value, the null hypothesis is accepted.

The ADF test is built on the DF test and it involves testing of the residuals for autocorrelation. The ADF test removes autocorrelation by adding lagged values of the dependant variable, ΔX_t, to equations (C.3) and (C.5) until there is no autocorrelation in the time series.

The ADF regression equation becomes:

$$\Delta X_t = a_1 + a_2 t + \delta X_{t-1} + \Delta X_{t-1} + \Delta X_{t-2} + \cdots + \mu_t \tag{C.6}$$

Where a_1 is the intercept, $a_2 t$ is a deterministic time trend, $\Delta X_{t-1} = X_{t-1} - X_{t-2}$ and μ_t is

[59]AR model is model where the explanatory variable is a lagged value of the dependant variable.

white noise[60].

The ADF test, thus, determines the non-stationarity of the time series. If a time series is found to be stationary at level then the testing stops there, if not then further testing is carried out by taking the first difference of the series and re-checking for stationarity until it is achieved. Rejecting the null hypothesis leads to the conclusion that the series is stationary and integrated of the same order.

C.2 The Phillips-Perron (PP) Test

The PP test (Phillips & Perron 1988) is considered as an improvement over the DF test because it incorporates the Newey-West heteroskedasticity and autocorrelation-consistent covariance matrix estimator (Newey & West 1987). The objective of this estimator is to overcome heteroskedasticity and autocorrelation in the error term, e_t, of the regression equation. Thus, it can be said that the PP test has better ability to handle heteroskedasticity and autocorrelation than the DF test.

[60]Serially uncorrelated random variables having zero mean and finite variance.