ABSTRACT
This study re-examines the relationship between the budget deficit and the trade deficit in Lebanon during 1970-2004. In contrast to earlier studies, we test for a unit root in the presence of structural change using the innovational outlier (IO) model. We also utilize the newly proposed autoregressive distributed lag (ARDL) approach to examine this relationship. The endogenously determined break times coincide with observed real events which occurred during the Lebanon Civil War and after the Israeli invasion of Beirut in 1982. The results show that the trade deficit in Lebanon has a long-run impact on the budget deficit.

JEL Classification: C13, C22, E62

Keywords: Budget deficit, trade deficit, structural break, ARDL, Lebanon.

INTRODUCTION
Lebanon had never experienced high budget deficits before 1975. It had always enjoyed a balanced budget and the government had never resorted to borrowing. This situation deteriorated during the Civil War of 1975-1990, which had a severe effect on the Lebanese economy. Figure 1 shows the increase in public deficits in Lebanon which occurred after 1974. The largest of these occurred after 1980, and they peaked in 1990.

During 1975-1990, a marked deceleration in economic growth and private investment activity occurred. The budget deficit, as a proportion of GDP, increased from only three per cent in 1975 to 32.3 per cent in 1989, representing one of the highest amongst the Middle Eastern countries (Eken et al., 1995). Increased government expenditure and declining government revenues were both responsible for the steep increase in public sector deficits. Total government expenditure as a proportion of GDP in Lebanon increased from 15.4 per cent in 1972 to 39.4 per cent in
1990. The dramatic increase in total government expenditure was mainly made up of current expenditure, generous salaries paid to government employees and interest payments on the public debt. However, government revenues remained very low as a proportion of GDP during 1975–1990 (around six per cent), due to the slowdown of economic activity and the government's inability to collect revenues during the Civil War.

![Figure 1: Lebanese Budget Deficit as a Percentage of GDP: 1970–2004](image)

Sources: Banque du Liban (various years); Ministry of Finance (various years); Eken et al. (1995); Eken and Helbling (1999) and author's calculations.

The Lebanese economy started reconstruction after the end of the Civil War, commencing in the early 1990s (1991–2003). As a result of rebuilding the infrastructure and the economy, there was an acceleration in the growth of government capital expenditure, together with large and expanding current expenditure. This led to sizable fiscal imbalances. Consequently, government budget deficits increased from 9.2 per cent of GDP in 1993 to 20.6 per cent in 1996, before declining to around 15 per cent in 2003 (BDL, 2003).

This study re-examines the relationship between the budget deficit and the trade deficit in Lebanon over the period 1970–2004. This relationship was previously examined by Pattichis (2004), whose study was performed over a short period (1982–1997), and used the traditional ADF unit root test to test for stationarity. Pattichis also applied the traditional cointegration techniques proposed by Johansen (1991). Two main weak points can be identified in Pattichis's study. First, it did not address the issue of structural change when dealing with time series data. It is now accepted that conventional unit root tests (such as ADF and PP tests) are biased towards the non-rejection of the unit root null hypothesis in the presence of structural breaks. Second,
conventional cointegration procedures (such as Johansen's, 1991) are not valid for a small sample size.

The present study tests for a unit root in the presence of structural change, at an unknown time of the break. It also utilizes the autoregressive distributed lag (ARDL) approach to cointegration, newly proposed by Pesaran (1997) and Pesaran et al. (2001). This approach is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1), or mutually cointegrated. The ARDL approach is more robust and performs well for small sample sizes (such as in this study). By using the ARDL approach, the long-run and short-run components of the model can be estimated simultaneously. This method can also distinguish which series is the dependent variable from the F-test when cointegration exists.

The rest of the paper is organized as follows. Section 2 presents the theoretical background and empirical studies. Section 3 presents the methodology. Section 4 reports the empirical findings, and Section 5 presents some conclusions and policy implications.

THEORETICAL BACKGROUND AND EMPIRICAL STUDIES

A positive relationship between the government budget and trade balance is evident in the context of a simple Keynesian open-economy model. In an open economy, gross domestic product, \( Y \), is the sum of private consumption expenditures, \( C \), gross private domestic investment expenditures, \( I \), government expenditures, \( G \), and exports, \( X \), over imports, \( M \):

\[
Y = C + I + G + X - M
\]  

(1)

Alternatively, \( Y \) equals private consumption expenditures, \( C \), savings, \( S \), and taxes, \( T \):

\[
Y = C + S + T
\]  

(2)

Substituting (2) into (1) and rearranging terms yields:

\[
(X-M) = (S-I) + (T-G)
\]  

(3)

Equation (3) suggests that net exports equal private and public savings. Assuming there is a balanced fiscal budget (\( T-G = 0 \)) and balanced trade (\( X-M = 0 \), that is, net exports are 0), then equation (3) suggests that private domestic saving equals private domestic investment. This is necessarily the case in a closed economy, where domestic investment is constrained by domestic saving. However, in an open economy, such a relationship may not always exist.

An economy with a foreign sector has access to international financial markets. Studies of the "twin-deficits" relationship generally proceed from one of two theoretical bases. The hypothesis that an increase in the government's budget deficit leads to an increase in the trade deficit follows directly from the Mundell-Fleming
model (Fleming, 1962; Mundell, 1963). The Keynesian absorption theory argues that an increase in the budget deficit would induce domestic absorption, and hence import expansion, causing a current account deficit (Saleh et al., 2005b). Another view, contrary to the above, is the Ricardian equivalence (RE) theory (Barro, 1989), which argues that shifts between taxes and budget deficits has no impact on real interest rates, the quantity of investment, or the current account. This RE hypothesis does not recognize any relationship between the two deficits.

Another view (or empirical evidence), which supports a unidirectional causality that runs from current account to budget deficits, is also possible. This might be due to deterioration of the current account, which could lead to lower economic growth, which in turn may cause an increase in the budget deficit. This argument has been empirically supported by Summers (1988), Islam (1998) for Brazil, Khalid and Guan (1999) for Indonesia and Pakistan. Alkswani (2000) also supported this view in the case of Saudi Arabia.

There have been extensive empirical literatures testing the above arguments. However, empirical evidence studies on the link between trade deficit and budget deficit are mixed. For example, studies such as Abell (1990) and Tallman and Rosensweig (1991) use a simple identity to examine the relationship between the budget deficit and current account deficit. They found a strong link between the trade deficit and budget deficit. Studies by Egwaikhide (1999) and Piersanti (2000) use more complicated dynamic macroeconomic models, such as the standard portfolio models and general equilibrium models, to examine the relationship between the twin deficits. They found that the trade deficit and budget deficit have a positive relationship, and that the relationship is statistically significant. In contrast, other studies, such as Evans (1988) and Bachman (1992), found no evidence for the link between the two deficits. Hence these findings support the Ricardian equivalence (RE) hypothesis, which neglects any relationship between the two variables.

Most studies that examine the relationship between the twin deficits use cases in developed countries, and very few empirical studies on developing countries exist with respect to this relationship. For example, Islam (1998) empirically examines the causal relationship between budget deficits and trade deficits for Brazil from 1973:1 through to 1991:4. Using the Granger causality test, he found that a bilateral causality between trade and budget deficits. Khalid and Guan (1999) use the cointegration technique (proposed by Johansen and Juselius, 1990) to investigate the causal relationship between budget and current account deficits. They conducted the study for five developed countries (US, UK, France, Canada, and Australia) and five developing countries (India, Indonesia, Pakistan, Egypt, and Mexico). They conclude that there is a strong, long-run relationship between the two deficits for developing countries, compared to developed countries, and the direction of causality for developing countries is mixed. For example, for India, the direction of causality is bidirectional. The results for Indonesia and Pakistan show that the direction of causality runs from the current account deficits to budget deficits.
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Alkswani (2000) examines the relationship between the budget deficit and the trade deficit in the case of Saudi Arabia during 1970–1999. He found a long-run relationship between deficits, and that the direction of causality runs from trade to budget deficit. Similar results are evident in another study by Akbostanci and Tunc (2002), who examine the linkages between the budget deficit and the trade deficit for Turkey during 1987–2001. They found that the twin deficits hypothesis holds. Recent studies by Saleh et al. (2005) examine the issue of the twin deficits in the case of Sri Lanka during 1970–2003 by using the ARDL model. They found a long-run relationship between the budget deficit and current account deficits, and that the direction of causality runs from budget to current account deficits.

Very few empirical studies examine the twin deficits hypothesis for the Middle East countries, and Lebanon in particular. Pattichis (2004) examines the relationship between budget deficits and trade deficits in Lebanon by using the traditional cointegration tests proposed by Johansen (1988, 1991). He found evidence supporting the Keynesian view that higher budget deficits lead to higher trade deficits.

This paper re-examines the relationship between budget and trade deficits in Lebanon, which were previously examined by Pattichis (2004), who used traditional cointegration techniques. This paper uses more robust and recent cointegration techniques — the ARDL model — introduced by Pesaran et al. (2001), and also examines the issue of structural breaks in the series. Because Lebanon suffered from many breaks and shocks during the last three decades because of the Civil War (1975–1990) and the political unrest in the Middle East region, testing the time series data in the presence of structural change in the case of Lebanon should prove vital to identify such breaks correctly.

METHODOLOGY

Innovational Outlier Models

The current study employs Perron’s (1997) innovational outlier model (IO2). This allows for the occurrence of both changes in the intercept and in the slope of the trend function.

\[ y_t = \mu + \beta t + \theta DU_t + \gamma DT_t + \delta DT_{s} + \alpha y_{t-1} + \sum_{i=1}^{k} \delta_{i} y_{t-i} + \epsilon_t \]  

(4)

Where \( T_s \) denotes the unknown time of break \((1 < T_s < T)\), \( DU_t = 1 \) if \( t > T_s \) and 0 otherwise, \( DT_s = 1 \) if \( t > T_s \) and 0 otherwise, \( DT_{s} = 1 \) if \( t = T_s \) and 0 otherwise, \( y_t \) is any general ARMA process and \( \epsilon_t \) is the white noise residual term.

The null hypothesis of a unit root is rejected if the absolute value and the t-statistics for testing \( \alpha = 1 \) is greater than the critical value. In order to determine the times of the break endogenously at an unknown break point, Perron (1997) suggests two methods. The first method selects the time of the break \( T_s \) as the value, which minimizes the
t-statistic for testing $\alpha = 1$. This selection makes it more likely to reject the null hypothesis of $\alpha = 1$ (Wilson, 2004, p. 16). The second method selects $T_b$ to minimize either the t-statistic on the parameter associated with the change in the intercept ($t_0$), or the t-statistic on the change in the slope ($t_1$), or both.

Augmented Distributed Lag (ARDL) Approach to Cointegration

This study utilizes the newly proposed autoregressive distributed lag (ARDL) approach. The error correction representation of the ARDL model is given as follows:

$$\Delta \ln BD = a_1 + \sum_{i=1}^{n} a_i \Delta \ln BD_{i-1} + a_4 \ln BD_{t-1} + a_5 \ln T D_{t-1} + a_6 \ln T D_{t-1} + \text{DumBD} + \epsilon,$$  \hspace{1cm} (5)

$$\Delta \ln TD = b_1 + \sum_{i=1}^{n} b_i \Delta \ln TD_{i-1} + b_4 \ln BD_{t-1} + b_5 \ln TD_{t-1} + b_6 \ln BD_{t-1} + b_7 \text{DumTD} + \epsilon,$$  \hspace{1cm} (6)

Where, $\ln BD$ and $\ln TD$ are the natural log of the budget and trade deficits in Lebanon, $a_2, a_3, a_4, a_6$ are the short-run dynamic coefficients of the two underlying ARDL models represented by equations (5) and (6), while $a_5, b_4, b_5, a_7$ are the long-run coefficients.

The ARDL procedure involves two stages. In the first stage, the null hypothesis of no cointegration for equation (5), defined as $H_0: a_4 = a_5 = 0$, is tested against the alternative of $H_1: a_4 \neq a_5 \neq 0$. Also, the null hypothesis of no cointegration for equation (6), defined as $H_0: b_4 = b_5 = 0$, is tested against the alternative of $H_1: b_4 \neq b_5 \neq 0$. These null hypotheses are computed using the familiar F-statistic. The calculated F-statistic is compared with critical value tabulated by Pesaran (1997).

If the computed F-statistics are greater than the upper-bound critical value, then we reject the null hypothesis of no cointegration and conclude that steady-state equilibrium exists between the variables. If the computed F-statistics are less than the lower-bound critical value, then we cannot reject the null of no cointegration. If the computed F-statistics fall within the lower-bound and upper-bound critical values, then the result is inconclusive. In this case, following Kremers et al. (1992), the error correction term should be a useful way of establishing cointegration.

The second step is to estimate the long-run coefficients of the same equation and the associated ARDL error coercion models. The second step is used to estimate the long-run and the short-run coefficients for both equations.

EMPIRICAL RESULTS

Structural Change

This paper uses annual time series data for 1970–2004. The yearly data was obtained from the IMF, the International Financial Statistics Yearbook (various years) and the
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Banque du Liban (various years). The study uses two variables: the budget deficit (BD) and the trade deficit (TD), both measured in terms of their ratios to gross domestic product.

Table 1 reports the results of the Perron (1997) IO2 model (equation 4). They show that the time series of budget deficit as a proportion of the GDP (BD/GDP) is stationary, because the \( t \) is more than the critical values. However, the time series of the trade deficit as a proportion of GDP (TB/GDP) is non-stationary, because the \( t \) is less than the critical values.

The time of the break for the budget deficit occurred during 1983, after the Israeli invasion in 1982, which had a severe impact and was a major turning point for the Lebanese economy. The invasion resulted in massive destruction in the country in terms of infrastructure, loss of human resources and so on. Therefore, the year 1983 was associated with massive fiscal deficits (24 per cent of total expenditure) and the government spent an enormous amount on military services and weapons, which registered US$800 million during this time (Al-Khalil, 1991).

In the case of the trade deficit, the time of the break occurred in 1980. Then Lebanon was in the middle its Civil War, and both the fighting and violence were uncontrolled in the capital city, Beirut. This had a severe impact on the Lebanese economy and its infrastructure, which adversely affected the export sector in Lebanon during that time.

Table 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>Time of the break (( T_b ))</th>
<th>( k )</th>
<th>( t_p )</th>
<th>( t_u )</th>
<th>( t_0 )</th>
<th>( \alpha )</th>
<th>( t_\alpha )</th>
<th>Inference</th>
</tr>
</thead>
<tbody>
<tr>
<td>BD/GDP</td>
<td>1983</td>
<td>1</td>
<td>-4.314</td>
<td>-5.486</td>
<td>5.003</td>
<td>-0.348</td>
<td>-6.125</td>
<td>Stationary</td>
</tr>
<tr>
<td>TB/GDP</td>
<td>1980</td>
<td>4</td>
<td>-2.956</td>
<td>-3.931</td>
<td>3.364</td>
<td>-0.231</td>
<td>-4.857</td>
<td>Non-stationary</td>
</tr>
</tbody>
</table>

* The results are significant at five per cent. Critical values = -6.07, -5.33 and -4.94 for one per cent, five per cent and 10 per cent respectively.

Autoregressive Distributed Lag (ARDL)

The ARDL model requires a priori knowledge or estimation of the orders of the extended ARDL. This appropriate modification of the orders of the ARDL model is sufficient to simultaneously correct for residual serial correlation and the problem of endogenous regressors. The order of the distributed lag on the dependent variable and the regressors is selected using the Akaike information criterion (AIC), because it is known for better selecting the maximum relevant lag length (Pesaran and Shin, 1998).

As mentioned above, a significant F-statistic for testing the joint level significance of the lagged level indicates the existence of a long-run relationship. When the budget deficit is the dependent variable, the calculated F-statistic equals 4.1497. This value is greater than the lower bound, and lower than the upper bound. This result indicates
an inconclusive outcome, since the calculated F-statistic is less than the upper-bound critical value, but greater than the lower-bound critical value.

In this case, following Kremers et al. (1992), we continue with the ARDL procedure and our decision on whether the long-run relationship exists or not depends on the significance of the error correction term. When the trade deficit is the dependent variable, the calculated F-statistic equals 3.424, which is lower than the lower bound. This indicates that there is no long-run relationship when the trade deficit is the dependent variable.

The second stage estimates equation (5). This estimation shows the long-run and short-run relationships between the budget deficit and the trade deficit in Lebanon over the last three decades.

The results reported in Table 2 show that the trade deficit in Lebanon has a long-run impact on the budget deficit over the period 1970–2004. An increase in the trade deficit by one per cent will have a significant long-run impact on the budget deficit of 0.22 per cent. Also, the dummy variable is found to be statistically significant at the five per cent level. This indicates that the structural break happened in 1983 as a result of the Israeli invasion, and had a significant long-run impact on the budget deficit in Lebanon during the same period. The model also passes diagnostic tests, supporting the overall validity of the short-run model.

<table>
<thead>
<tr>
<th>Regressors</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.005</td>
<td>5.419</td>
<td>0.1855</td>
</tr>
<tr>
<td>TT/GDP</td>
<td>0.2247</td>
<td>0.1008</td>
<td>2.228*</td>
</tr>
<tr>
<td>DumBD</td>
<td>-10.243</td>
<td>3.396</td>
<td>-3.0162**</td>
</tr>
</tbody>
</table>

Table 2
Long-Run Results from the ARDL Model Dependent Variable: BD/GDP

Diagnostic Tests

* Significant at 10 per cent level
** Significant at five per cent level.

Table 3 reports the short-run coefficients and the error correction term (ECT). These results show that the error correction term is statistically significant at five per cent, with the expected negative sign. The ECM represents the speed of adjustment of the change in the budget deficit to its long-run equilibrium following a shock. The significance of the ECM confirms the existence of a stable long-run relationship between the significant regressors and the dependent variable.
The ECM, in Table 3, suggests that 73 per cent of the adjustment back to long-run equilibrium is corrected after one year. The large magnitude of the coefficient of the ECM suggests that once shocked, convergence to equilibrium is very fast.

<table>
<thead>
<tr>
<th>Regressors</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.729</td>
<td>3.969</td>
<td>0.184</td>
</tr>
<tr>
<td>DTD/GDP</td>
<td>0.163</td>
<td>0.087</td>
<td>1.867*</td>
</tr>
<tr>
<td>DumBD</td>
<td>-7.431</td>
<td>3.586</td>
<td>-2.073**</td>
</tr>
<tr>
<td>ECM_{t-1}</td>
<td>-0.726</td>
<td>0.199</td>
<td>-3.652**</td>
</tr>
</tbody>
</table>

* Significant at 10 per cent level.
** Significant at five per cent level.

**POLICY IMPLICATIONS AND CONCLUSIONS**

This study re-examines the work of Pattichis (2004) on budget and trade deficits in Lebanon using the conventional cointegration technique. Using the I02 model, we found that the time of structural breaks for both variables (trade deficit and budget deficit) which occurred in 1980 and 1983 respectively, are consistent with the years of the Civil War in Lebanon and the post-Israeli invasion of Beirut in 1982. We also found, by using the ARDL model, that the trade deficit in Lebanon has a long-run impact on the budget deficit. This empirical finding is quite consistent with previous studies.

The empirical results in this paper support the Keynesian view that there is a strong link between the budget deficit and the trade deficit during 1970-2004. Using the ARDL approach and the bounds test, our results show that the budget deficit and trade deficit have a positive significant relationship in the long run. The above results are not surprising for the Lebanese economy, because from 1975-1990 the country was under the impact of the Civil War. Much of the country's economy was deteriorated in the process. To finance government expenditure and the war during the this period, the government borrowed from both internal and external sources. Therefore, the "twin-deficit" problem was also sustained during the post-war period, because of an increase in the import of capital goods (among consumption goods), mainly to rebuild the country's infrastructures and economic development. The trade deficits in the country were mainly financed from domestic and other external resources, propelling both the domestic and external public debt upward. The increase in national debt over the period also increased the cost of servicing the national debt, resulting in the government running a larger budget deficit in this period.

The empirical results from this paper have important policy implications in terms of managing effectively the "twin-deficit" problem. From this study, we surmise that stabilising the trade deficit problem could assist in managing the budget deficit
problem in Lebanon. Our results promote the view that policy measures to reduce the trade deficit could also assist in reducing the budget deficit in Lebanon. The Lebanon economy depends heavily on the service sector (including tourism, finance, and others). Many of these services are exportable, and have the potential to contribute huge sums in foreign currency. Policies and strategies to strengthen the supply side and demand side in these key sectors will improve the terms of trade in favour of Lebanon.

In addition to promoting such exports, incentives (for example, tax credits for R&D) should be provided to improve the level of innovation among industries and small and medium enterprises (SMEs) in the country. Policies to attract foreign direct investment (FDI) in key sectors of the economy should also be enhanced by introducing various fiscal incentives, such as lowering corporate tax in the country.

NOTES
2. For a more theoretical and empirical evidence on the relationship between budget deficits and current account deficits, see Saleh and Harvie (2005).
3. The relevant critical values are obtained from Pesaran (1997). The critical values in the case of one regressor are 4.042 – 4.788 at the 90 percent significance level.

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