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Abstract

This study re-examines the relationship between the budget deficit and the trade deficit in Lebanon. In contrast to earlier studies, we start by testing for a unit root in the presence of structural change using the Innovational Outlier (IO) model. This study also utilizes the newly proposed autoregressive distributed lag (ARDL) approach to examine such a relationship. The results show that the endogenously determined times of the breaks coincide with observed real events occurring during the years of Civil War in Lebanon and especially after the Israeli invasion of Beirut in 1982. This study finds, as well, 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 and Lebanon

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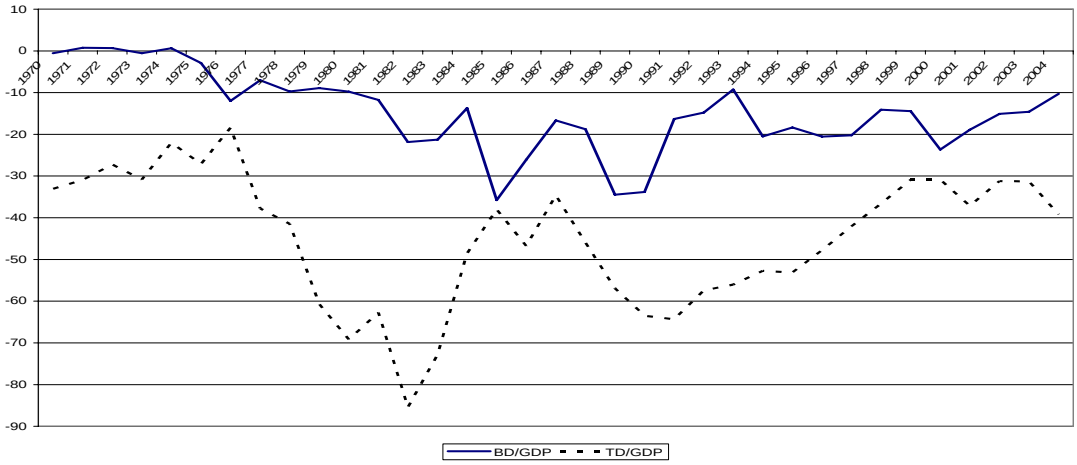
I. Introduction

Lebanon has never experienced high budget deficits prior to 1975 as it was always in balance and the government had never resorted to borrowing. This situation deteriorated during the civil war period of 1975-1990, which had a severe effect on the Lebanese economy. As shown in Figure 1, the increase in public deficits in Lebanon occurred after 1974. The largest increases occurred after 1980 and peaked in 1990. During the period 1975-1990, there was marked deceleration in economic growth and private investment (Eken et al., 1995). Increased government expenditure and declining government revenues were both responsible for the steep increase in the public sector deficits[1].

However, the Lebanese economy started the reconstruction period after the ending of the civil war in early 1990s. As a result of rebuilding the infrastructure and the economy as a whole, there was 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% of GDP in 1993 to 20.6% in 1996 before declining to around 15% in 2003 (BDL, 2003).

Figure 1. Lebanese Budget Deficit as a percentage of GDP: 1970-2004



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

[1] See Saleh and Harvie (2005a) for a detailed analysis of the public sector deficits and debt in Lebanon during the period 1970-2000.

The main aim of this study is to re-examine the relationship between the budget deficit and the trade deficit in Lebanon during the period 1970-2004. This relationship has been examined by Pattichis (2004) who used the traditional Augmented Dickey-Fuller (ADF) unit root test as well as the traditional cointegration techniques proposed by Johansen (1988, 1991). However, Pattichis's study could be criticized as follows. Firstly, it did not address the issue of structural change when dealing with time series data. It is now well known that conventional unit root tests such as ADF and Phillips-Perron (PP) tests are biased towards the non-rejection of the unit root null hypothesis in the presence of structural breaks. Secondly, a traditional cointegration procedure, such as Johansen (1991), is not appropriate for small sample sizes.

However, our study tests for a unit root in the presence of structural change (at an unknown time of the break). It also utilizes the newly proposed autoregressive distributed lag (ARDL) approach to cointegration, proposed by Pesaran (1997) and Pesaran et al. (2001). This approach is applicable irrespective of whether the underlying regressors are purely I(0) or purely I(1), and performs well for small sample sizes. The rest of the paper is organized as follows. Section 2 presents the theoretical background and methodology. Section 3 presents the empirical findings. Conclusions and policy implications are discussed in Section 4.

II. Theoretical Background and Empirical Studies

A positive relationship between the government budget and trade balance can be seen 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:

$$Y = C + I + G + X - M \quad (1)$$

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

$$Y = C + S + T \quad (2)$$

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

$$(X-M) = (S-I) + (T-G) \quad (3)$$

Equation (3) suggests 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 (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. The Mundell-Fleming Model argues that the increase in the government's budget deficit could lead to an increase in the trade deficit through increased consumer spending (Fleming, 1962; Mundell, 1963). Furthermore, the Keynesian absorption theory argues as well that an increase in the budget deficit would induce domestic absorption and therefore import expansion, causing a current account deficit (Saleh et al., 2005).

There have been extensive empirical studies testing the views of the above arguments[2]. The majority of them used the traditional cointegration techniques. Studies by Abell (1990), Tallman and Rosensweig (1991), Piersanti (2000), Akbostanci and Tunc (2002) and Saleh et al. (2005) provide support for the Keynesian view that there is a long run relationship between the budget deficit and current account deficits. In contrast, other studies such as Evans (1988) and Bachman (1992) found no evidence for the link between the two deficits. Hence these findings neither support the Ricardian Equivalence hypothesis which holds that the two deficits are nor related.

III. 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.

$$y_t = \mu + \beta t + \theta DU_t + \gamma DT_t + \delta DT_B + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-1} + e_t \qquad (4)$$

[2] For a more theoretical and empirical evidence on the relationship between budget deficits and current account deficits, please see Saleh and Harvie (2005b).

where T_B denotes the unknown time of break ($1<T_B<T$), $DU_t = 1$ if $t > T_B$, 0 otherwise, $DT_t = 1$(t) if $t > T_B$, 0 otherwise, $DT_B = 1$ if $t = T_B + 1$, 0 otherwise, y_t is any general ARMA process and e_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, two methods have been suggested by Perron (1997); the first method is that the time of the break T_b is selected as the value, which minimizes the *t*-statistic for testing $\alpha = 1$. The reason for this selection is to make it more likely to reject the null hypothesis of $\alpha = 1$ (Wilson, 2004, p.16). The second method is that T_b is selected as to minimize either the *t*-statistic on the parameter associated with the change in the intercept (t_θ), or the *t*-statistic on the change in the slope (t_γ), or both of them.

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:

$$\Delta \ln BD = a_1 + \sum_{i=1}^{k_i} a_2 \Delta \ln BD_{t-i} + \sum_{i=1}^{k_i} a_3 \Delta \ln TD_{t-i} + a_4 \ln BD_{t-1} + a_5 \ln TD_{t-1} + a_6 DumBD_t + \varepsilon_t \quad (5)$$

$$\Delta \ln TD = b_1 + \sum_{i=1}^{k_i} b_2 \Delta \ln TD_{t-i} + \sum_{i=1}^{k_i} b_3 \Delta \ln BD_{t-i} + b_4 \ln TD_{t-1} + b_5 \ln BD_{t-1} + b_6 DumTD_t + \varepsilon_t \quad (6)$$

where, ln BD and ln TD are the natural log of the Budget and trade deficits in Lebanon, a_2, a_3, b_2, b_3 are the short-run dynamic coefficients of the two underlying ARDL models represented by equations (5) and (6), while a_4, a_5, b_4, b_5 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 hypothesises are computed using the familiar F-statistic. The calculated F-statistic is compared with critical value tabulated by Pesaran and Pesaran (1997). If the computed F-statistics is greater than the upper

bound critical value, then we reject the null hypothesis of no cointegration and conclude that there exists steady state equilibrium between the variables. If the computed F-statistics is less than the lower bound critical value, then we can not reject the null of no cointegration. If the computed F-statistics falls within the lower and upper bound critical values, then the result is inconclusive. In this case, following Kremers, et al. (1992) the error correction term will 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 to estimate the long-run and the short-run coefficients for both equations.

IV. Empirical Results

Structural Change

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

The results of the Perron (1997) IO2 model (equation 4) are reported in table 1. They show that the time series of budget deficit as a percentage of the GDP (BD/GDP) is stationary as the $t_{\hat{\alpha}}$ is more than the critical values. However, the time series of the trade deficit as a percentage of GDP (TB/GDP) is non-stationary as the $t_{\hat{\alpha}}$ 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 etc. Therefore, the year 1983 was associated with massive fiscal deficits (24 % of total expenditure) and the government spent a massive amount on military services and weapons which registered US$800 million during this time (Al-Khalil, 1991).

In the case of the trade deficit, it is found that the time of the break occurred in 1980. At that time Lebanon was in the middle of civil war and both the fighting and violent became uncontrolled in the capital city Beirut. This had a severe impact on the Lebanese economy and its infrastructure. Moreover, it severely affected the export sector in Lebanon during that time.

Table 1. *IO model with a change in intercept and slope*

Variables	Time of the break (T_b)	k	t_β	t_θ	$t_{\hat{\gamma}}$	α	$t_{\hat{\alpha}}$	Inference
BD/GDP	1983	1	-4.314	-5.486	5.003	-0.348	-6.125	Stationary
TB/GDP	1980	4	-2.956	-3.931	3.364	-0.231	-4.857	Non-stationary

* The results are significant at 5%. Critical values = -6.07, -5.33 and –4.94 for 1%, 5% and 10%, 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), as it is known for selecting the maximum relevant lag length (Pesaran and Shin, 1998).

As has been mentioned before, 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 to 4.1497[3]. This value is greater than the lower bound and lower than the upper bound. This result indicates that we have an inconclusive outcome since the calculated F-statistics is less than the upper bound critical value but greater than the lower bound. 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 trade deficit is 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 trade deficit is dependent variable. However, we move to the second stage, and estimate 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.

[3] The relevant critical values are obtained from Pesaran and Pesaran (1997). The critical values in the case of one regressor are 4.042 – 4.788 at the 90% significance level.

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 1% will have a significant long-run impact on the budget deficit by 0.22%. Also, the dummy variable is found to be statistically significant at 5% level. This indicates that the structural break happened in 1983 as a result of the Israeli invasion 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 2. Long-Run Results from the ARDL Model
Dependent Variable: BD/GDP

Regressors	Coefficient	Standard Error	T-Ratio
Intercept	1.005	5.419	0.1855
TT/GDP	0.2247	0.1008	2.228*
DumBD	-10.243	3.396	-3.0162**
Diagnostic Tests			
R^2=0.53			
$F_{(3.29)} = 10.858\,[0.000]$			
Diagnostic Tests :			
Serial Correlation: $F_{(1,28)} = 0.201\,[0.886]$			
Functional Form: $F_{(1,28)} = 0.229\,[0.635]$			
Heteroscedasticity: $F_{(1,31)} = 1.082\,[0.306]$			

* Significant at 10% level, ** Significant at 5% level

The short-run coefficients and the error correction term (ECT) are reported in Table 3. These results show that the error correction term is statistically significant at 5% 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. Moreover, 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% 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 3. Short-Run Results from the ARDL Model
Dependent Variable: ΔBD/GDP

Regressors	Coefficient	Standard Error	T-Ratio
Intercept	0.729	3.969	0.184
ΔTD/GDP	0.163	0.087	1.867*
DumBD	-7.431	3.586	-2.073**
ECM_{t-1}	-0.726	0.199	-3.652**

* Significant at 10% level, ** Significant at 5% level

V. POLICY IMPLICATIONS AND CONCLUSIONS

Our study re-examined the work of Pattichis (2004) on budget and trade deficits in Lebanon using the conventional cointegration technique. We found by using the IO2 model that the time of structural breaks for both variables, the trade deficit and the budget deficit, occurred during 1980 and 1983 respectively, which is consistent with the years of the civil war in Lebanon and the post era of the Israeli invasion of Beirut in 1982. In addition, we found as well 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 linkage between budget deficit and trade deficit during the period of 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, as 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 civil war period, government borrowed from both internal and external sources. Therefore, the 'twin-deficit' problem sustained during the post war period as well, because of increase in 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. As such, both the domestic and external public debt has been on an upward trend. The increase in national debt over the period also increased the cost of servicing the national debt, resulting in the government running 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 indicate that stabilising the trade deficit problem could assist in managing the budget deficit problem in Lebanon. In this case, our results provides a view that a policy measures which can be taken to reduce the trade deficit could assist in reducing the budget deficit in Lebanon. Furthermore, Lebanon economy depends heavily on the service sector such as tourism, finance, among others. Many of the 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 mentioned above will improve the terms of trade in favour of Lebanon.

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

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