Twin Deficits Problem in Bangladesh: Causality and Cointegration Analysis

Laila Haseen*

Abstract: *The twin deficit problem has largely been discussed both in theoretical and empirical literature, as they are the common phenomena for the developing countries. The major objective of this paper is to examine empirically the twin deficit problems for the Bangladesh economy using the time series data for the period of 1974 to 2014. The paper applies standard time series econometric techniques of cointegration and error-correction models to explain the dynamic causal relationship between budget deficit and trade deficit in Bangladesh. The paper examines the short run dynamics of the budget deficit and trade deficit relationship within a long run relationship. This a very first studies of this kind in Bangladesh using time series data. The study found that budget deficit and trade deficit are cointegrated indicating that there is a stable long term relationship between them. The implication of this result is that the twin deficit remains a persistent problem for the economy of Bangladesh. However, this is not very unusual for a developing economy like Bangladesh. The key issue is how to handle this problem as they create imbalances in other macroeconomic relationships. Therefore, both the trade policy and fiscal policy should be designed with great care to achieve the basic macroeconomic goals of higher level of output.*

1. Background and Rationale of the Study

The dynamic linkages among fiscal deficits, public debt and current account balance remained contentious and empirical issues in the literature. A wide variety of theoretical and empirical literature (Evans, 1988; Abell, 1990; Enders, 1990; Bachman, 1992, Kim, 1995; Darrat, 1998; Milne, 1998; Islam, 1998; Saleh, 2005; Hakro, 2009) has shed light on the relationship between fiscal and current account deficits over the last decades, especially in the backdrop of dramatic increase in the deficits, widely known as twin deficits, in many developing countries.

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The dynamic linkages among fiscal deficits, public debt and current account balance remained contentious and empirical issues in the literature. A wide variety of theoretical and empirical literature (Evans, 1988; Abell, 1990; Enders, 1990; Bachman, 1992, Kim, 1995; Darrat, 1998; Milne, 1998; Islam, 1998; Saleh, 2005; Hakro, 2009) has shed light on the relationship between fiscal and current account deficits over the last decades, especially in the backdrop of dramatic increase in the deficits, widely known as twin deficits, in many developing countries.

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former leads to a reduction of the later. Bangladesh, a resource scarce poor developing country has experienced different policy regimes since its independence in 1971. Before 1980s Bangladesh followed inward looking economic strategies and suffered from low economic growth and faced several structural problems like balance of payments crises. In this backdrop on being advised by the World Bank and IMF Bangladesh has adopted economic liberalization as a strategy to rapid economic growth. However, over the periods Bangladesh suffered from soaring budget deficit and deteriorating trade balances. Therefore it is necessary to examine empirically whether there is any causal relationship between the two. If so what is the channel, direction and extent of the causality. The issues involved have important policy implications. Because, understanding the causal relationship between the two call for formulating apposite fiscal as well as monetary policy so as to achieve the fundamental macroeconomic targets of higher level of output, lower unemployment and price level stability. (Hakro, 2009).

There exist a wide variety of theoretical and empirical studies that analyzes the relationship between the trade deficit and budget deficit. Theoretical works are based on either traditional simple macroeconomic model that are constructed from the behavioral relationship between them without explaining the behavior of the economic agents (Mundell, 1963; Dornbusch, 1976; Kawai, 1985; Marston, 1985; Kearney, 1990 etc.) or microeconomic foundation of macroeconomics, which is based on individual optimizing behavior (Neary, 1980; Obstfeld, 1981; Persson, 1982; Moore, 1989 etc.).

A good number of studies have been conducted on examining the dynamic linkages between budget deficit and trade deficit both in developed and developing countries; however for Bangladesh it is still remains an untouched area of research. For Bangladesh one of the early studies, for instance Ahmad (1994), examine the relationship between budget deficit and trade deficit for the period of 1974-1990 and got weak relationship between the two considered variables. This is due to the fact that the early studies suffer from methodological deficiency and omitted variable bias. This is therefore very first of this kind of study and tries to overcome the drawbacks of the early studies.

The two major objective of this study are that-

    i) Gaining an insight into the channels through which budget

deficit affect trade deficit in Bangladesh since Independence.

ii) The existence and the nature and extent of the stable long run relationship between budget deficits and trade deficit and the short run dynamics of the long run relationship between the two.

The study will be based on the annual data from 1974 to 2014. In order to analyze short-run dynamics and long-run relationships among budget deficits and trade deficits, the study makes use of Vector Autoregression (VAR) and Vector Error Correction (VEC) specifications in this study. As unrestricted VARs do not impose co-integration on its variables, a VEC model needs to be set up if the variables are known to be non-stationary and cointegrated. The study will use both the ADF and PP test to see whether the considered variables are stationary or not. Then the Johansen Juselius test will be applied to examine the cointegration of the variables. Finally error correction models and Granger causality tests will be applied to examine the short run dynamics of long run relationship between trade deficits and budget deficits.

The paper is organized as follows. After introducing the issues and rationale of the study in section 1, section 2 will present a theoretical framework on this issue. Section 3 sets out the framework for testing stationarity, cointegration, error correction models and causality among the variables. Section 4 discusses the time series properties of the variables, reports and interprets the results. Finally, section 5 concludes the paper with policy implications.

2. Theoretical Framework

The relationship between government budget and trade balance can be postulated in a simple Keynesian open economy model. We start with the national income identities of an open economy where gross domestic product (Y) is the sum of private consumption expenditure (C), gross private domestic investment expenditure (I), government expenditure (G), and exports (X) over imports (M):

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

Alternatively, Y equals private consumption expenditures (C), Savings (S), taxes (T):

$$Y=C+S+T: \dots\dots\dots\dots\dots\dots\dots(2)$$

From equation (1) and (2) we get,

$$C + 1 + G + (X - M) = C + S + T$$

$$(X - M) = (S - 1) + (T - G) \dots\dots\dots\dots\dots\dots\dots(3)$$

In general country's imports exceeds its exports and government expenditures exceeds its tax revenue, thus the left hand side of equation (3) represents trade deficits while the second term in the right hand side represents budget deficits. If trade balance and balanced budget are maintained savings in the economy is equal to the investment. However, this is usually not the case. The familiar Mundell-Fleming hypothesis (1962, 1963) states that increase in government's budget deficit leads to an increase in the trade deficit by an accompanying increase in consumer spending. An increase in government expenditure increase consumer's wealth and disposable income by increasing national output, which encourages an increase in imports. On the other hand, the traditional Keynesian absorption theory suggests that an increase in the budget deficit would induce domestic absorption and hence import expansion, causing current account deficit.

3. Data and Methodology

3.1 Data

This study is based on the annual data for the period 1974 to 2014 taken from the IMF, International Financial Statistics (IFS) CD-Rom supplemented by IMF, IFS Yearbook.

3.2 The Analytical Framework

3.2.1 Granger Causality Test

The Granger Causality test is used to examine the direction of causality between budget deficit and trade deficit. The general idea of the Granger Causality is that X causes Y if Y can be explained better by the present and lagged values of X than by the past values of Y alone assuming that both X and Y are stationary variables. In two variables framework the test is based on the following regression:

$$Y_t = a + \sum_{i=1}^{m} \beta_i Y_{t-1} + \sum_{i=1}^{n} \gamma_i X_{t-1} + v_t \quad \dots\dots\dots\dots\dots\dots\dots(4)$$

$$X_t = x + \sum_{i=1}^{m} \phi_i X_{t-1} + \sum_{i=1}^{n} \lambda_i Y_{t-1} + \vartheta_t \quad \dots\dots\dots\dots\dots\dots\dots(5)$$

where, t and t are white noise error term, and m & n are the number of lags to be specified. Equation (1) shows that current Y is related to past values of itself as well as that of X and equation (2) proposes a similar behaviour for X. Given the above specification the following cases can be distinguished (Gujrati 2003):

> i) unidirectional causality from X to Y i.e. X causes Y if H0: fi = 0, i = 1, …..n, can be rejected and (ii) does not hold;

> ii) unidirectional causality from Y to X i.e. Y causes X if H0: μi = 0, i = 1, …..n, can be rejected and (i) does not hold;

> iii) feedback or bilateral causality is said to occur if both (i) and (ii) hold; and

> iv) independence is suggested if neither (i) nor (ii) hold.

This framework can be generalized to include more variables in the system.

To check whether X causes Y the unrestricted regression involves the estimation of equation (4) using OLS. From this regression we obtain the unrestricted residual sum of squares (RSSur). Then, another version of (4) that restricts the coefficient of all lagged XÕs to zero is to be performed and obtained the restricted residual sum of squares (RSSr). To test case (i) above we rely on the following statistic:

$$F = [(RSSr - RSSur)/m] / [RSSur / (n – k)] \ldots\ldots\ldots(6)$$

Which follows F distribution with m and (n – k) df. Here m is equal to the number of lagged X terms included in the equation (4) and k is the number of parameters estimated in the unrestricted equation. X is said to Granger causes Y if the computed F statistics is significant at the conventional level. The same procedure can be applied to test causality from Y to X.

3.2.2 Cointegration Test and Error Correction Models

One important feature of macroeconomic time series is that they have the tendency to move together. This co movement of two or more time series is known as Ôcointegration, in the literature. Presences of cointegration between two variables lead to the causality in the Granger sense as least in one direction (Miller, 1999). There are two channels of causality

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1 This section draws on Hossain (2010)

between cointegrated variables –the standard Granger test and the error correction specification. Non-causality conclusion may result from failure to take the cointegratedness into account.

The notions of cointegration provide the basis for modeling both the short run and long run relationship simultaneously. If Yt and Xt are cointegrated, then Granger representation theorem (Engle and Granger, 1987) says that the relationship between the two variables can be expressed as the error correction mechanism as follows:

$$\Delta Y_t = \psi_1 Z_{t-1} + \sum_{i=1}^{k} \delta_i \Delta X_{t-i} + \sum_{j=1}^{k} \pi_j \Delta Y_{t-j} + u_{1t} \qquad \ldots\ldots(7)$$

$$\Delta X_t = \psi_2 Z_{t-1} + \sum_{i=1}^{k} \tau_i \Delta X_{t-i} + \sum_{j=1}^{k} \varsigma_j \Delta Y_{t-j} + u_{2t} \qquad \ldots\ldots(8)$$

where, Zt = Yt – YXt , and u1t and u2t are white noise error terms. In these two equations, the series Yt and Xt are cointegrated when at least one of the coefficients ?1 or ?2 is not zero. This error correction model allows us to study the short run dynamics of the long run relationship between Yt and Xt. If ? can be obtained so that Zt can be constructed, the remaining parameters in equations (7) and (8) can easily be estimated. Engle and Granger (1987) propose a two-step procedure. The first step involves OLS regression of Yt on Xt and yield a consistent estimate. The next step is the OLS estimation of equations (7) and (8) with Zt replaced by estimated Zt.

3.3 Empirical Methodology

To test the causal relationship between budget deficit and trade deficit we proceed as follows: First the time series properties of each variable are examined by unit root tests. This is performed by applying augmented Dickey-Fuller (ADF) test, which is based on the following regression equation with a constant and a trend of the form:

$$\Delta Y_t = \partial_1 + \partial_2 t + \wp Y_{t-1} + \sum_{i=1}^{m} \rho_i \Delta Y_{t-i} + \omega_t \qquad \ldots\ldots\ldots(9)$$

where, ΔYt = Yt - Yt-1 and Y is the variable under consideration, m is the number of lags in the dependent variable, is chosen by Akiake information criterion is the stochastic error term. The null hypothesis of a unit root implies that the coefficient of Yt-1 is zero. If the null hypothesis is rejected, then the series is stationary and no differencing in the series is necessary to induce stationary.

If two time series are stationary it necessary to check whether they have comovement or not i.e. to search for cointegration between variables. We relied on Johansen-Juselius (1990) cointegration technique. In this technique two test statistics are used to identify the number of cointegrating vectors, namely the trace statistic and the maximum eigenvalue test statistic. The Trace test statistic for the null hypothesis that there are atmost r distinct cointegrating vectors is

$$\lambda_{trace} = T \sum_{i=r+1}^{N} \ln(1-\lambda_i) \qquad \cdots\cdots\cdots\cdots(10)$$

where, ?iÕs are the N-r smallest squared canonical correlations between Xt-k and ?Xt (where Xt = (BDt , TDt)/ and where all variables in Xt are assumed I(1)), corrected for the effects of the lagged differences of the Xt process.

The maximum eigenvalue statistic for testing the null hypothesis of at most r cointegrating vectors against the alternative hypothesis of r + 1 cointegrating vectors is given by

$$\lambda_{max} = -T \ln(1-\lambda_{r+1}) \qquad \cdots\cdots\cdots\cdots(11)$$

Johansen (1988) shows that equations (10) and (11) have non-standard distributions under the null hypothesis and provide approximate critical values for the statistic, generated by Monte Carlo methods.

The third step involves the estimation of error correction model as specified in equation (7) and (8). Finally, causality and feed back relationship among time series are tested using standard F tests as shown in equation (6).

4. Analysis of the Result

Based on the above mentioned methodology, both the variables trade deficits and trade deficits have bee tested for unit roots suggested by ADF test and Phillips-Peron test. Unit root test identifies whether the variables are stationary or non-stationary. The lag parameters are determined by Akaike information criterion. The results are reported in Table -1.

Table 1: Unit Root Tests (Augmented Dickey Fuller) for the Period 1974 to 2014		
	Series in Levels	**First Differences**
Without Trend		
BD	-2.023 [6]	-3.0 94** [5]
TD	-0.707 [4]	-4.808* [3]
With Trend		
BD	-0.495 [7]	-3.095* [4]
TD	-0.032 [4]	-4.067* [6]

Notes: i) * and ** indicate significance at 1% and 5% respectively.

ii) Figures in the parenthesis represents the optimal lag length

as determined by Akaike information criteria.

Table 1 reveals the presence of unit roots in the original series, while first difference makes them stationary. That is both trade deficit and budget deficit are I(1).

Since both variables are I(1), the study sets out cointegration tests to determine whether there exists stable long run relationship between trade deficit and budget deficit in Bangladesh. The result of Johansen's approach is presented in Table-2.

Table 2: Johansen and Juselius Test of ointegration

Data Vector	Lag	Hypothesis	λTrace	λMax
		r <=0	14.345**	19.230**
BD, TD	3	r <=1	1.0876	1.342

Notes: i) we have experimented with a number of lags and found 3 to be the optimal lag length. ii) ** indicates significance at 5% level.

Table-2, reports the maximum eigen-value and trace tests of Johansen and Juselius (1990). Both the cointegration test and trace test suggest that the trade deficit and budget deficit are cointegrated in Bangladesh

The cointegration between trade deficit and budget deficit implies long run equilibrium relationship between them. However, in the short run

there may be out of equilibrium. Therefore, error correction mechanism is used to examine the short run dynamics between the variables. The error correction mechanism also focuses on the direction of causality between the variables. The result of error correction model can further be justified by the Granger causality test. Therefore, the study also employs Granger causality to examine the direction of bivariate causality. The results are reported in Table-3, 4 and 5.

Table 3: Estimation of Error Correction model

Dependent Variable: BD, Independent Variable: TD

Constant	Zt-1	Δ(BD)t-1	Δ(BD)t-2	Δ(BD)t-3	Δ(TD)t-1	Δ(TD)t-2	Δ(TD)t-3
0.0324	0.0345*	-0.4210	0.0451	-0.341	-0.0121	-0.2234	0.1921
[3.008]	[2.214]	[-4.121]	[0.112]	[-3.221]	[-0.085]	[-0.721]	[0.112]

Note: Figures in the Parenthesis represent t statistic.

Table 4: Estimation of Error Correction Model

Dependent Variable: TD, Independent Variable: BD

Constant	Zt-1	Δ(TD)t-1	Δ(TD)t-2	Δ(TD)t-3	Δ(BD)t-1	Δ(BD)t-2	Δ(BD)t-3
0.0133	0.0237*	-0.0128	-0.0221	-0.0312	1.5123	-1.1330	0.1227
[2.892]	[4.112]	[-1.123]	[-1.114]	[-1.203]	[6.234]	[-6.871]	[4.007]

Note: Figures in the parenthesis represent t statistic.

Table 5: Direction of Causality

	Granger Causality		Error Correction			
	F-values	Causation	t (err)	F-values	Causation	
BD does not cause TD	4.237*	BD=>TD	2.214*	8.669*	BD=>TD	
TD does not cause BD	2.743*	TD =>BD	4.684*	18.157*	TD =>BD	

Note: *, ** and *** indicate significance at 1%, 5% and 10% respectively.

Table 3, 4 and 5 represents the result of Granger causality test and error correction models. Both the Granger causality test and error correction model provides bidirectional causality between trade deficit and budget deficit, which is in line with studies of other developing countries.

5. Conclusions and Policy Implications

The paper applies standard time series econometric techniques of cointegration and error-correction models to explain the dynamic causal relationship between budget deficit and trade deficit in Bangladesh. The paper examines the short run dynamics of the budget deficit and trade deficit relationship within a long run relationship. This a very first studies of this kind in Bangladesh using time series data. The study found that budget deficit and trade deficit are cointegrated indicating that there is a stable long term relationship between them. The implication of this result is that the twin deficit remains a persistent problem for the economy of Bangladesh. However, this is not very unusual for a developing economy like Bangladesh. The key issue is how to handle this problem as they create imbalances in other macroeconomic relationships. Therefore, both the trade policy and fiscal policy should be designed with great care to achieve the basic macroeconomic goals of higher level of output.

References

Ahmad, S., (1994), "Twin Deficits in Bangladesh Economy" Bangladesh Journal of Political Economy, 8, 115-125.

Abell, J. D. (1990) Twin Deficits During the 1980s: An Empirical Investigation. Journal of Macroeconomics 12, 81–96.

Bachman, D. D. (1992) Why is the US Current Account Deficit So Large? Evidence from Vector Autoregressions. Southern Economic Journal 59, 232–40.

Burney, N. A., and N. Akhter (1992) Government Budget Deficits and Exchange Rate Determination: Evidence from Pakistan. The Pakistan Development Review 31:4, 871–882.

Darrat, A. F. (1998) Have Large Budget Deficits Caused Rising Trade Deficits? Southern Economic Journal 54, 879–887.

Dewold, W. G., and M. Ulan (1990) The Twin-Deficit Illusion. Cato Journal 10: 689–707.

Enders, W., and B. S. Lee (1990) Current Account and Budget Deficits; Twin or Distant Cousins? The Review of Economics and Statistics 72, 373-81.

Engle R. F., and C. W. J. Granger (1987) Cointegration and Error Correction in Representation, Estimation and Testing. Econometrica 66, 251–76.

Evans, P. (1988) Do Budget Deficits Affect the Current Account. Ohio State University. Unpublished Paper.

Frenkel, Jacob A., and Assaf Razin (1986) Fiscal Policies in the World Economy. Journal of Political Economy 94, 564–94.

Granger, C. W. J. (1988) Some Recent Developments in a Concept of Causality. Journal of Econometrics 39, 199–211.

Hakro, N. A. (2009) Twin Deficits Causality Link-Evidence from Pakistan. Jinternational Research Journal of Finance and Economics24, 54-70.

International Financial Statistics (Various Issues).

Johansen, S. (1988) Statistical Analysis of Cointegration Vectors. Journal of Economic Dynamics and Control 12, 231–54.

Johansen, S. (1991) Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. Econometrica 59, 1551–80.

Phillips, P. C. B., and P. Peron (1988) Testing for a Unit Root in Time Series