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The Fiscal and Current Account Imbalances: An Empirical analysis of the Twin Deficits Hypothesis in Bangladesh

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Abstract

This paper aims to analyze the possibility of the twin deficits hypothesis existing in the context of Bangladesh using annual data from 1980 to 2017. Vector Error-Correction approach is tapped to estimate the short and long run coefficients while the pairwise Granger causality analysis is employed to understand the long run causal associations. The results suggest that budget and current account balances in Bangladesh behave as distant cousins rather than twins as perceived from a reverse causality that is found to be stemming from budget deficit to current account deficit. Moreover, budget deficit is found to deteriorate the national trade balance in Bangladesh.

JEL Classifications: E62, F32, F41, H62

Keywords: twin deficits, trade deficit, budget deficit, current account deficit, VEC

1. Introduction

Public expenditure is understood to play a central role in dictating socioeconomic development within a nation (Dieleman *et al.* 2016; Shen, Yang and Zanna 2018; Lee and Gunderson 2018). The Keynesian, New Keynesian and Post-Keynesian schools of thought have also postulated the need for expansionary (contractionary) fiscal policies to restore long run equilibrium following a recessionary (inflationary) gap within the economy (Kronenberg 2010; Coddington 2013). Moreover, many empirical studies have often referred to the size of the government being correlated to the growth of the economy (Ram 1986; Lin 1994; Gwartney, Lawson and Holcombe 1998). However, the developing economies have often encountered revenue shortfalls whereby fiscal expansion for attainment of growth purposes has always stimulated deterioration of the budget balances within these nations. Thus, sustained Budget Deficit (BD) seems to be a common characteristic of all less developed economies across the globe (Klitgaard 1989).

Furthermore, economists often refer BD to be one of the core reasons behind the completion of public projects being deferred for indefinite period of time which not only increases the associated cost but also slows down the overall growth momentum as well

(Corsetti and Roubini 1991; Fischer 1993). Under such circumstances when the government fails to bridge the fiscal gap via tapping the domestic financial institutions for funds, external financing of the BD seems to be the last resort (Dornbusch 1984; Fischer and Easterly 1990; Osinubi, Dauda and Olaleru 2010). However, it is said that reliance on such foreign sources of funds not only triggers the debt-servicing burdens of the government but it also tends to adversely affect the overall economy, particularly via deteriorating the current account. Thus, economists often refer to this simultaneous deterioration in budget and current accounts as the Twin Deficits Hypothesis (TDH) whereby a rise in the BD is alleged to stimulate a hike in the Current Account Deficit (CAD) as well (Abell 1990; Islam 1998; Antonakakis 2019).

The TDH originated from the simultaneous deterioration of the United States' budget and current account balances in the 1980s and was therefore initially thought to be appropriate in the context of the developed economies only (Hutchison and Pogott 1984; Hutchison and Throop 1985; Fountas and Tsoukis 2004). However, empirical evidence documented in the relevant macroeconomic discourse suggests that the TDH is prevalent within the less developed economies as well (Fidrmuc 2003; Kouassi, Mougoue and Kymn 2004). Thus, the persistent fiscal and current account imbalances have always been in the economic spotlight particularly due to the keeping into consideration the policy implications that would foster long term growth strategies especially within the underdeveloped nations.

Against this backdrop, this paper aims to probe into the dynamics attached to the BD and CAD in the context of Bangladesh, an emerging South Asian economy that has experienced persistent growth in its BD and trade deficits. Bangladesh is claimed to be one of the rapidly growing developing economies in the world that has managed to sustain an average economic growth of more than 6% in the last decade (Amin and Murshed 2017; Murshed 2018). However, in spite of such impressive growth trajectories, the nation has faced stern difficulties in mobilizing its domestic revenues which has resulted in aggravation of the BD over the past (Murshed and Yusuf 2018). It is to be noted that although Bangladesh has displayed a somewhat favorable performance in its current account, exhibiting positive trends in the past two decades or so, it has always registered sustained deficits in its trade balance (Roy and Gupta 2013; World Bank 2018). However, despite the nation accounting for negative net exports, the current account remained positive which can largely be attributed to the robust growth in the nation's international remittance inflows (Ahmed 2010; Chowdhury 2011). However, recently Bangladesh has gone on to registering CAD which has raised concerns amidst the policy makers in anticipating a possible TDH in the future being validated in the context of Bangladesh. Moreover, the growth in the remittance inflows has also slowed

down which further points out towards the ineffectiveness of such inward sources of foreign currencies in bailing out Bangladesh's CAD in the future (The Economist 2017).

Although there has a number of studies addressing the TDH issue in the context of Bangladesh, the novelty of this paper lies in its robust approach to analyze the TDH using both the absolute value of the current account balance and the trade balance as a proxy measure of CAD in Bangladesh. Annual time series data stemming across 1980 to 2017 has been used to perform rigorous regression and causality analyses. The results from econometric analyses suggest that BD and CAD behave as distant cousins while BD and TD move together in the same direction.

The remainder of this paper organized as follows. Section 2 presents the analysis of selected macroeconomic trends in Bangladesh. A review of the theoretical framework and empirical literature addressing the TDH is provided in section 3. The methodology of research is highlighted in section 4 while the empirical model and data are discussed in section 5. The results from the econometric exercises are reported and discussed in section 6. Finally, section 7 outlines the concluding remarks and recommends the policy implications based on the results obtained in the paper.

2. Selected Macroeconomic Trends in Bangladesh during post 1990s

Mobilization of domestic public revenue has always been a concerning issue for the government of Bangladesh (Murshed and Saadat 2018). According to local reports, more than two-thirds of the population within the taxable income bracket refrained from filing tax returns in 2018 (The Daily Star 2018, November 09). Thus, the nation has historically exhibited persistent BD as shown in Figure 1. Within the time frame of 1990 and 2017, the nation registered its poorest fiscal shortfall worth almost 175 million US dollars in 1995. On the other hand, the current account balances projected comparatively better trends, depicting positive figures from the early 2000s that sustained almost one and a half decades before experiencing a sharp fall in 2015. Recently, the nation has accounted for the worst performance in its current account balance which was around 2.5% of the GDP. Thus, the sudden inversion of the current account balance, along with the predominantly deficit budget balance in Bangladesh, has become a matter of concern for the policymakers.

Although, the current account did turn negative very recently in Bangladesh, the trade account has always been subject to deficits due to the monetary value of imports outweighing the corresponding export earnings figures. The trade deficit in Bangladesh increased from 1.89 billion US dollars in 1990 to almost 17 billion US dollars by the end

of 2017, implying increase in the deficit by almost 10 times during the three decades or so. The narrow export basket of Bangladesh and the loss of preferential export treatments can be referred to as the two major reasons behind such aggravation of the trade deficit figures. A closer look into Figure 1 shows that although BD and CAD do not follow similar trends, similar trends can be associated between BD and trade deficit in patches between 1990 and 2017 which tends to point out towards a possible causation between these macroeconomic aggregates in Bangladesh.

3. Review of Literature

This particular section has been classified into two subsections with the former laying down a conceptual framework addressing the TDH while the latter shedding light on the relevant studies documented in the empirical literature.

3.1. Conceptual Framework

The national income accounting can framework can be tapped to understand how a simultaneous deterioration in the BD and CAD can take place in the economy:

$$Y = C + I + G + (X - M) \text{ ----- (1)}$$

where Y refers to the national income; C denotes private consumption demand; I refers to the private investment; G comprises of public expenditure and X-M refers to the net exports. It is to be noted that a negative value of X-M can also be viewed as CAD due to trade balance being one of the two components of the national current account.

Similarly, referring to domestic absorption, national income can also be written as:

$$Y = C + S + T \text{ ----- (2)}$$

where S refers to the national savings that is derived from the summation of private and public savings, while T refers to public revenue. Thus, equating equations (1) and (2) gives us:

$$(X - M) = (T - G) + (S - I) \text{ ----- (3)}$$

whereby X-M, as mentioned earlier, can be described as the CAD while the BD is given by (T-G), assuming both import and government expenditure outweighing export and government revenue respectively. Hence, assuming the domestic savings and investment gap (S-I) to be constant, a rise (fall) in the BD is likely to be reflected through

a one-to-one rise (fall) in the CAD, thus, explaining the TDH. However, in explaining the TDH correctly, the nature of causality between the BD and CAD is of critical importance.

The TDH can also be primarily understood from the nature of the correlative and causal associations between the BD and CAD. For instance, in the case of the causation running from BD to CAD without any feedback can be viewed as the TDH as economists refer the TDH being caused by deterioration in the current account balance that is triggered by a worsening of the budget balance, but not the other way round. Thus, the case of a reverse causation stemming from CAD to BD cannot be claimed as an evidence of the TDH. On the other hand, bidirectional causality can also be associated with the BD and CAD whereby these macroeconomic deficits can influence one another. In such circumstances, the TDH is also said to hold.

3.2. Empirical Evidence

Empirical works investigating twin deficits in light of the RE and the FHP revealed multifarious results from different countries. Although a good number of studies have concluded in favor of the validity of the TDH, there is still ambiguity regarding the nature of the association between these two macroeconomic deficits.

Saleh, Nair and Agalewatte (2005) explored the interlinkage between Sri Lanka's BD and CAD using the Autoregressive Distributed Lag (ARDL) methodology. Annual time series data between 1970 to 2003 was employed in the econometric analysis which resulted in the BD being positively correlated to the CAD. Moreover, the authors also concluded in support of the a unidirectional causality running from BD to CAD in the long run as the causality test results did provide statistical evidence regarding the validity of the TDH in the case of Sri Lanka.

In a study by Onafowora and Owoye (2006), the TDH in the context of the small, open and oil-dependent economy of Nigeria was empirically examined using annual data stemming across 1970 and 2001. The authors used a wide array of econometric tools including time series cointegration and vector error-correction model techniques, Granger long-run causality tests and the generalized impulse response analysis to comment on the validity of the TDH. In line with the estimations, the authors concluded in favor of the TDH holding to be true in Nigeria. However, although the authors did unearth a positive correlation between BD and CAD, a reverse causation was found to be running from CAD to BD in the country. Thus, they recommended in

favor of fiscal consolidation through which the BD can be reduced which in turn would also put a hold on the CAD as well.

In a study on the macroeconomic impacts of BD in Uganda, Lwanga and Maweje (2014) used Vector Error-Correction modeling tapping quarterly data from 1999 to 2011. The authors also used pairwise Granger causality test to understand the long run causal association between the macroeconomic aggregates considered in their paper. The results confirm the validity of the TDH both in the long and the short run. Furthermore, using variance decomposition analysis, the authors also found that the variance in the nation's current account balance was mostly explained by its budget balance that remained negative all throughout the aforementioned data period. Based on the aggregated findings, deterioration of the BD was inferred to be the core phenomenon behind Uganda's deteriorating current account.

Halicioglu and Eren (2017) empirically tested the validity of the TDH in the context of Turkey using annual time series data from 1987 to 2004. A bounds testing cointegration procedure had been implemented in this paper along with the causality tests between the concerned variables augmenting the regression model. According to the empirical results, a weak positive correlation between the current account and fiscal deficits was concluded by the authors, providing statistical support to the existence of the TDF in Turkey.

Therefore it can be seen that there exists quite a bit of ambiguity with regard to the validity of the TDH across the globe. A summary of other relevant empirical studies shedding light on the TDH is provided in Table 1 (see appendix).

4. Methodology

As part of the econometric methodology, the Augmented Dickey-Fuller (ADF) unit root test is considered to check whether the variables considered in the regression models are mean reverting or not. This is followed by the Johansen test for cointegration in order to assess whether or not the variables move together in the long run. This paper employs the Vector Error-Correction (VEC) approach to predict the short and long run correlations between the concerned variables while the Granger causality test is tapped to deduce the direction of causality between the macroeconomic deficits considered in this paper.

4.1. Vector Error-Correction Approach

A VEC model is a restricted Vector Autoregressive (VAR) model structured to employ non-stationary series that are known to be cointegrated. It is restricted in the sense that the VEC model has cointegrating relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The cointegration term is known as the Error Correction Term (ECT) which provides the pace at which any deviation from the long-run equilibrium in the previous lag is corrected in the next lag through a series of partial short-run adjustments. This is referred to as the error-correction mechanism.

Engle and Granger (1987) showed that a VEC model is an appropriate method to model the long-run as well as short-run dynamics among the cointegrated variables. However, in context of a multivariate regression analysis, the VEC approach is preferred to provide only the short-run causality among the variables. Causality inferences in the multi-variate framework are made by estimating the parameters of the following VEC equations:

$$\Delta Y = \alpha + \sum_{i=1}^m \beta_i \Delta Y_{t-i} + \sum_{j=1}^n \gamma_j \Delta X_{t-j} + \sum_{k=1}^0 \delta_k \Delta M^s + \sum_{l=1}^p \zeta_l \Delta N + \theta Z_{t-1} + \varepsilon_t \quad \dots\dots\dots$$

(1)

$$\Delta X = a + \sum_{i=1}^m b_i \Delta Y + \sum_{j=1}^n c_j \Delta X_{t-j} + \sum_{k=1}^0 d_k \Delta M^s + \sum_{l=1}^p e_l \Delta N + f Z_{t-1} + \xi_t \quad \dots\dots\dots (2)$$

Z_{t-1} is the error-correction term which is the lagged residual series of the cointegrating vector. The error-correction term measures the deviations of the series from the long run equilibrium relation. For example, from equation (13), the null hypothesis that X does not Granger-cause Y is rejected if the set of estimated coefficients on the lagged values of X is jointly significant. Furthermore, in those instances where X appears in the cointegrating relationship, the hypothesis is also supported if the coefficient of the lagged error-correction term is significant. Changes in an independent variable may be interpreted as representing the short run causal impact while the error-correction term provides the adjustment of Y and X toward their respective long-run equilibrium. Thus, the VEC model representation allows us to differentiate between the short- and long-run dynamic relationships. The Chi-Square test statistic is used to determine the short run causalities between pairs of variables in the model.

In the context of a panel of N countries, three regressors (X, Y and Z) across T time period, the VEC model can be given by:

$$\begin{bmatrix} \Delta X_{it} \\ \Delta Y_{it} \\ \Delta Z_{it} \end{bmatrix} = \begin{bmatrix} \omega_{1i} \\ \omega_{2i} \\ \omega_{3i} \end{bmatrix} + \sum_{k=1}^q \begin{bmatrix} \alpha_{11ik} & \alpha_{12ik} & \alpha_{13ik} \\ \alpha_{21ik} & \alpha_{22ik} & \alpha_{23ik} \\ \alpha_{31ik} & \alpha_{32ik} & \alpha_{33ik} \end{bmatrix} \begin{bmatrix} \Delta X_{it-k} \\ \Delta Y_{it-k} \\ \Delta Z_{it-k} \end{bmatrix} + \begin{bmatrix} \gamma_{1i} \\ \gamma_{2i} \\ \gamma_{3i} \end{bmatrix} ECT_{it-1} + \begin{bmatrix} \mu_{1it} \\ \mu_{2it} \\ \mu_{3it} \end{bmatrix} \quad \dots\dots\dots (3)$$

where Δ denotes first difference transformation of the variables.

5. Empirical Model and Data

This paper considers a linear regression model to express CAD as a function of its lagged value, BD and other control variables:

$$\Delta CAD_t = \alpha + \sum_{i=1}^{k-1} \beta_i \Delta CAD_{t-1} + \sum_{j=1}^{k-1} \rho_j \Delta BD + \sum_{m=1}^{k-1} \rho_m \Delta Z_{t-m} + \lambda ECT_t + \varepsilon_{1t} \quad \dots\dots\dots (4)$$

where Δ represents the difference operator, k-1 is the one period reduced lag length k, the subscript t refers to the particular time period of data, λ is the speed of restoration of equilibrium following a deviation from the equilibrium in the previous lag and ECT is the error-correction term. The variable Z contains a set of control variables which include public borrowing from local financial sources (PBOR), real exchange rate (RER), GDP growth rate (GDPG), inflation (INF), globalization index (GI) and terms of trade (TOT). The CAD and BD are expressed as percentages of GDP. For robustness check, trade deficit (TD), also measured as a percentage of GDP, is used as an alternative aggregate for CAD in Bangladesh due to the trade balance being an integral part of the nation current account. The TD model is given by:

$$\Delta TD_t = \alpha + \sum_{i=1}^{k-1} \beta_i \Delta TD_{t-1} + \sum_{j=1}^{k-1} \rho_j \Delta BD + \sum_{m=1}^{k-1} \rho_m \Delta Z_{t-m} + \lambda ECT_t + \varepsilon_{1t} \quad \dots\dots\dots (5)$$

Annual time series data from 1980 to 2017 is accumulated from different sources and incorporated into the econometric analyses. The BD variable is sourced from the Bangladesh Economic Review (2000, 2005, 2010, 2017) reports published by the Ministry of Foreign Affairs of the People’s Republic of Bangladesh. The GI data is compiled from the KOF Swiss Economic Institute database (KOF Globalization Index 2017). The rest of the variables are sourced from the World Development Indicators database of the World Bank (2018).

6. Results and Discussion

Selection of the optimal lags for the regression model is very important. Thus, the lag optimality was checked for both the regression models using the VAR lag order selection method. The corresponding results are tabulated in Table 2. The optimal lags are selected using multiple information criteria. According to the estimates, the information criteria almost unanimously suggest a 2-period lag to be optimal for both the models.

The stationarity of all the variables comprised in the dataset is then checked using the ADF unit root analysis. According to the estimates, reported in Table 3, it is seen that all the variables considered in the dataset are mean reverting at their respective first differences with GI being the only exception as it is seen to be stationary at its level as well. Thus, these results nullify the possibility of the regression analyses to follow being spurious.

The long run associations between variables are then checked using the Johansen cointegration analysis. Table 4 reports both the trace and the maximum Eigen value statistics for model (4) and (5). According to the estimates, it is seen that all the variables, in both the models, are associated in the long run as indicated by the presence of cointegrating equations. These findings also provide justification behind the use of the VEC approach rather than simply estimating the models in VAR framework.

The short and long run coefficients estimated from the VEC approach are reported in Table 5. In the context of model (4), BD is found to be negatively correlated to CAD which is not in line with the notion of the TDH. The long run estimate of the coefficient attached to BD_t implies that, on average, a 1% rise (decline) in the BD attributes to more than 5% decline (rise) in Bangladesh's CAD in the long run *ceteris paribus*. Thus, this finding is not consistent with the notion of the TDH which voices in favor of a positive relationship between these two deficits. The results also point out towards an important finding that RER appreciations mitigate the CAD in the long run which tends to suggest that precautionary measures are to be taken to control that attribute to reduction in the RER, and thereby improve the net exports, which ultimately would be effective in curbing the CAD as well. Moreover, on average, the marginal effect of a 1% rise in the GI is found to account for a 0.06% fall in the CAD, *ceteris paribus*. A plausible explanation behind this key finding could be provided in the sense that as the nation becomes more financially integrated globally, there are opportunities to be sought in enhancing the net income from abroad balance, particularly via the channel of remittances from the

international migrants, which can ultimately off-set the negative impact of the deficit in the current balance to a large extent. Finally, the statistically significant error-correction term indicates that any distortion from the equilibrium in the previous lag is corrected at a rate of 18.5% in the current period.

In contrast to the VEC model estimates in the context of model (4), when TD is considered as a proxy to the CAD in model (5), it is found to be positively associated to BD both in the short and in the long runs. The estimates imply that a 1% rise (fall) in the BD contributes to a corresponding rise in Bangladesh's TD on average by 0.45% and 10.25% in the short and the long runs respectively, *ceteris paribus*. These findings coincide with the concept of the TDH, subject to meeting the appropriate causality criteria. The results also reveal the long term economic growth impacts on the trade balance of Bangladesh exhibiting a 0.006% rise in the TD following a 1% rise in the GDPG. This is a concerning finding for the economy since the benefits of growth are not being translated into export growth in Bangladesh which can be detrimental to the credibility of the export-led growth strategies pursued by the nation. Furthermore, the government's reliance on funds from the domestic sources are found to curb the TD in both the time horizons which tend to imply that public borrowing in Bangladesh does not crowd out private investment, particularly in the context of the industries specializing in producing the export goods. The error-correction term is also found to be negative and statistically significant and predicts that the disequilibrium in the previous period is corrected at a rate of 47.3% in the subsequent period.

Table 6 and Figure 2 (in the appendix) provide the diagnostic test results of the VEC models. The results broadly imply that the models are not subject to serial correlation and normality problems and are also stable to some extent. The Cumulative Sum (CUSUM) plots of the models, as shown in Figure 3 (in the appendix), confirm the stability of the regression models as well.

Finally, the pairwise Granger causality tests are performed to understand the nature of causal associations between the concerned variables in both the model. According to the estimated F- statistics reported in Table 7, a reverse causality is found to be stemming from CAD to BD which further provides statistical support to the invalidity of the TDH in the context of Bangladesh. Among the other factors, the CAD is found to be influenced by domestic financing of the fiscal deficit and TOT. However, the results tend to change upon the consideration of the TD as a proxy to the CAD. The causality estimates show that a unidirectional causal chain is extends from BD to TD which is pretty much in line with the concept of the TDH where both the deficits tend to move in the same direction. Therefore, such contrasting results tend to once again portray the

emphatic role played by the nation's robust growth in the net incomes from abroad, over the years, and thereby relieving the adverse impacts of deficit trade balances off the economy.

7. Conclusions

The simultaneous worsening of the budget and current account balances has attracted global attention over the years. Thus, economists and academician have endeavored their time in unearthing the dynamics adhering to these key macroeconomic deficits whereby contrasting country-specific and regional findings have been document in the relevant literature. The analysis of the TDH is more appropriate for the developing economies in particular due to these nations experiencing persistent deficits in their budget balances and also in most cases the respective current account balances seem to project similar trends. Thus, taking the adversities of the TDH into cognizance, this paper aimed to empirically investigate the possibility of the TDH existing in Bangladesh. This analysis is pertinent in the context of Bangladesh following the nation's aggravating BD and TD. Although the nation did manage to exhibit positive current account balances over quite a long period of time in the post-2000 period, the recent inversion of the current account seem to have raised a concern amidst the policy makers. Thus, the results from this paper are expected to draw critically important policy implications for the government.

The statistical estimates from the econometric analyses performed in this paper tend to broadly suggest the invalidity of the TDH in the context of Bangladesh as perceived from the reverse causation between BD and CAD. However, upon disaggregation of the nation's current account balance and using the TD as a proxy instead, the results seem to be mirror opposite in certain cases. Statistical evidence from both the regression and causality tests implied that the nation's budget and trade balances move together in the same directions which tend to have provided support to the validity of the TDH. Therefore, in light of the results, it can be concluded that BD and CAD in Bangladesh are more of distant cousins rather than being twins.

Therefore, the key policy implications from overall findings in this paper could be that the government should ideally strategize to ensure simultaneous mitigation of the BD and the TD while addressing the recent deterioration of the overall current account balance separately. It is believed that the contemporary CAD in Bangladesh can largely be attributed to the recent slowing-down of the nation's growth in international remittance inflows. Thus, along with public policies to boost exports and thereby reduce the gap between the imports and the exports, the government should also look forward

to take effective steps in formalization of the informal channel of remittances flowing into Bangladesh. Efficient measures to reverse this trend would not only be effective in raising the government's revenue but it would also play a crucial role in alleviating the nation's foreign exchange reserves and also improve the balance of income from abroad account as well.

As far as the easing of the budget shortfall is concerned, the government is expected to reconsider its income tax policy in order to ensure greater mobilization of domestic revenue. The government, truly speaking, should gradually prove its credibility to the people which not only would prolong the political regime but would also enhance the tax compliance rates in the country. In addition, imposition of wealth taxes into the taxation policy would also be effective in spawning greater amounts of revenue and also reduce the obnoxiously high income and wealth inequalities that exist in Bangladesh. On the other hand, broadening the nation's export basket can be key to closing the gap between imports and exports. Following the nation's eligibilities for twin graduation into the groups of developing and lower middle-income countries, preferential trade arrangements can be expected to be diminishing with time which could aggravate the TD in Bangladesh further. Thus, diversification of the export basket can be ideal in dealing with these limitations whereby the woes of the deficit trade balance can addressed to a large extent.

Data constraint is the major limitation faced in this paper whereby longer time series could not be incorporated into the econometrics analyses. Moreover, due to unavailability of data some key variables could not be incorporate into the models. As part of the future scope of research, this study can extended to understand the behavior of the macroeconomic aggregates that contribute to the BD, TD and CAD in Bangladesh which could provide better insights on the possible policy implications.

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Appendix

Table 1: Summary of Empirical Literature on the TDH

Study	Country	Time Period	Relevant Methodology	Results
Zamanzadeh and Mehrara (2011)	Iran	1959 – 2007	Vector Error-Correction Model	Bidirectional Causality between BD and CAD
Sobrino (2013)	Peru	1980Q1 – 2012Q1	Granger Causality Test	Reverse Causality from CAD to BD
AZGÜN (2012)	Turkey	1980 – 2009	Granger Causality Test	Unidirectional causality from BD to CAD
Ratha (2013)	India	1998 – 2009 (both monthly and quarterly data)	Bounds Testing and Error-Correction Modeling	TDH holds true in the short run only
Tang (2014)	United States	1960Q1 – 2013Q1	Toda & Yamamoto Causality Test	CAD Granger causes BD
Saeed and Khan (2012)	Pakistan	1972 – 2008	Error-Correction Modeling	Causality runs from CAD to BD
Sen <i>et al.</i> (2014)	Turkey	1980 – 2010	Dolado-Lütkepohl Granger Causality Analysis	No causal association between BD and CAD
Ganchev (2010)	Bulgaria	2000M1 – 2010M12	Granger Causality Test	Bidirectional causality between BD and CAD
Merza, Alawin and Bashayreh (2012)	Kuwait	1993Q4 – 2010Q4	Granger Causality Test	Causality runs from CAD to BD
Bakarr (2014)	Sierra Leone	1980 – 2012	Bounds Testing and Toda & Yamamoto Causality analysis	Unidirectional causality runs from BD to CAD
Elhendawy (2014)	Egypt	1980 – 2011	Error-Correction Modeling	Bidirectional causality between BD and CAD
Wanjiru (2017)	Kenya	1980 – 2015	Autoregressive Distributed Lag (ARDL) approach	BD positively influences CAD
Egwaikhide (1997)	Nigeria	1973 – 1993	Ordinary Least Squares	BD negatively affects Current Account Balance
Perera and Liyanage (2012)	Sri Lanka	1960 – 2009 (both annual and quarterly data)	Granger Causality Test	Causality runs from BD to CAD
Bagheri, Pirae and Keshtkaran (2012)	Iran	1971 – 2007	Granger Causality Test	Unidirectional causality from BD to CAD

Table 2: VAR Lag Order Selection Criteria results

Mode	Information Criterion (IC)					
	Optimal Lags	FPE ^a	AIC ^b	HQIC ^c	BIC ^d	
1	(4)	2	1.9e+10 *	42.01 *	43.91* *	48.59 *
	(5)	2	4.1e+10 *	42.79 *	44.68* *	49.37 *

Source: Author's own

Notes: * refers to optimal lag order as per corresponding information criterion

a denotes Akaike's Final Predictor Error (FPE) information criterion

b denotes Akaike Information Criterion (AIC)

c denotes Hannan-Quinn Information Criterion (HQIC)

d denotes Bayesian Information Criterion (BIC)

Table 3: ADF Unit Root Test Results (Lags=2)

Variable	Level I(0)		1 st Difference I(1)		Order of Stationarity
	ADF Stat. ^a	ADF Stat. ^b	ADF Stat. ^a	ADF Stat. ^b	
CAD	-1.064	-1.411	-3.112***	-3.158**	I (1)
BD	-2.496	-2.969	-3.601**	-3.256	I (1)
TD	-2.166	-1.811	-4.142*	-4.209*	I (1)
PBOR	1.338	2.805	-2.906*	-3.178**	I (1)
RER	-0.601	-0.756	-3.415*	-2.756*	I (1)
GDPG	-1.302	1.230	2.379	3.701*	I (1)
GI	-0.201	-2.080**	-4.539*	-2.221**	I (0) and I (10)
INF	-2.012	-1.161	-4.326*	-4.485*	I (1)
TOT	-2.160	-0.848	-2.289	-2.477**	I (1)

Notes: a: considering trend and intercept; b: considering drift and intercept; *, ** and *** denote statistical significance at 1%, 5% and 10% respectively

Table 4: Johansen Cointegration Test Results

Mode	Trace Test				
	Null Hypo.	Alt. Hypo.	Trace Statistic	95% Critical Value	Decision
1	r <= 0	r = 1	106.18	94.15	1 cointegrating equation
	Eigen Value Test				
	Null Hypo.	Alt. Hypo.	Max. Eigenvalue Stat.	95% Critical Value	Decision
	r <= 1	r = 2	35.56	33.46	2 cointegrating equations
	Trace Test				
	Null Hypo.	Alt. Hypo.	Trace Statistic	95% Critical Value	Decision
(5)	r <= 0	r = 1	99.30	94.15	1 cointegrating equation
	Eigen Value Test				

Null Hypo.	Alt. Hypo.	Max. Eigenvalue Stat.	95% Critical Value	Decision
$r = 0$	$r = 1$	55.13	45.28	No cointegrating equation

Source: Author's own.

Table 5: The VEC Model short and long run estimates

Dependent Variable	CAD _t	TD _t
Model	(4)	(5)
Long run analysis		
Regressors	Coefficient	Coefficient
BD _t	-5.263* (0.154)	10.426* (0.599)
PBOR _t	-1.21e-10 (2.31e-09)	-2.20e-10* (1.32e-12)
RER _t	0.010* (0.000)	0.020* (0.001)
GDPG _t	0.003* (0.000)	0.006* (0.003)
GI _t	-0.063* (0.001)	-0.122* (0.005)
INF _t	0.001 (0.001)	0.000 (0.002)
TOT _t	-0.003* (0.000)	-0.005* (0.001)
Constant	-0.092** (0.041)	-0.080** (0.039)
Short run analysis		
Regressors	Coefficient	Coefficient
Δ CAD _{t-1}	-0.085 (0.117)	---
Δ TD _{t-1}	---	-0.449*** (0.219)
Δ BD _t	0.090 (0.506)	0.314* (0.116)
Δ PBOR _t	-1.03e-11 (1.00e-11)	-1.31e-11* (8.63e-10)
Δ RER _t	0.002 (0.001)	-0.001 (0.001)
Δ GDPG _t	0.004 (0.02)	0.003 (0.002)
Δ GI _t	0.001 (0.007)	0.004 (0.006)
Δ INF _t	-0.002 (0.002)	0.002 (0.002)
Δ TOT _t	0.003 (0.002)	0.001 (0.002)
Constant	-0.015	-0.071*

	(0.014)	(0.019)
ECT _{t-1}	-0.185*	-0.310*
	(0.031)	(0.000)
R ²	0.349	0.473
No. of observations	36	36

Source: Author's own

Note: *, ** and *** denote statistical significance at 1%, 5% and 10% levels respectively; the standard errors are provided within the parentheses.

Table 6: The VEC Model Diagnostic Test results

Mode 1	Tests	
	Autocorrelation ^a	Normality ^b
	Lagrange Multiplier Statistic	Jarque-Bera Statistic
(4)	51.74 (0.36)	14.71 (0.39)
(5)	53.83 (0.29)	10.61 (0.71)

Source: Author's own

Notes: (a): The Breusch-Godfrey lagrange multiplier test with the null hypothesis of no serial correlation ;(b): The Jarque-Bera test with the null hypothesis of residuals being normal.

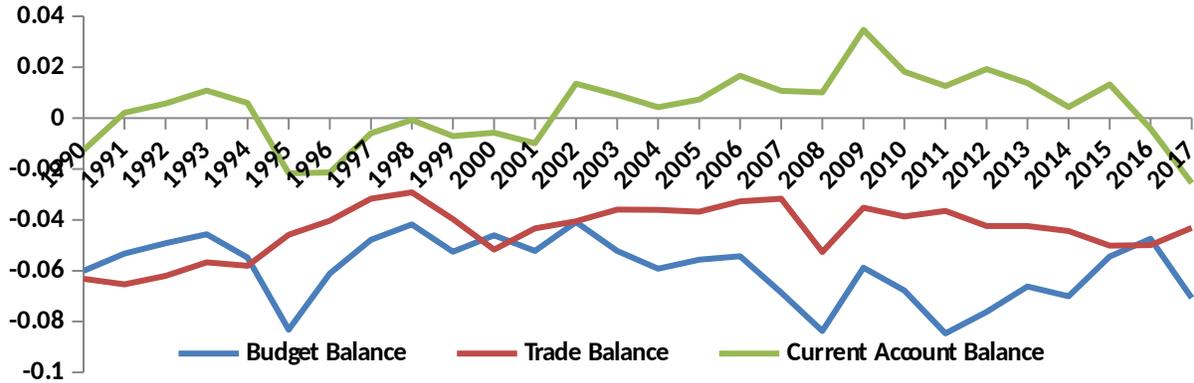
Table 7: Pairwise Granger Causality Test results

Model (4)		
Null Hypothesis	F-Stat.	Type of causation
BD does not Granger cause CAD	1.26	CAD → BD
CAD does not Granger cause BD	2.71***	
PBOR does not Granger cause CAD	7.21*	PBOR → CAD
CAD does not Granger cause PBOR	0.03	
RER does not Granger cause CAD	0.01	No Causality
CAD does not Granger cause RER	0.33	
INF does not Granger cause CAD	1.97	No Causality
CAD does not Granger cause INF	0.09	
GI does not Granger cause CAD	0.42	No Causality
CAD does not Granger cause GI	0.02	
GDPG does not Granger cause CAD	0.02	No Causality
CAD does not Granger cause GDPG	0.33	
TOT does not Granger cause CAD	2.79***	TOT ↔ CAD
CAD does not Granger cause TOT	3.39**	
Model (5)		
Null Hypothesis	F-Stat.	Type of causation
BD does not Granger cause TD	4.04*	TD → BD
TD does not Granger cause BD	9.42*	
PBOR does not Granger cause TD	20.01*	PBOR ↔ TD

TD does not Granger cause PBOR	4.63**	
RER does not Granger cause TD	0.23	TD → RER
TD does not Granger cause RER	3.21***	
INF does not Granger cause TD	2.29***	TD ← INF
TD does not Granger cause INF	5.23**	
GI does not Granger cause TD	1.90	No Causality
TD does not Granger cause GI	0.24	
GDPG does not Granger cause TD	6.40*	GDPG → TD
TD does not Granger cause GDPG	2.09	
TOT does not Granger cause TD	0.23	TD → TOT
TD does not Granger cause TOT	9.57*	

*Note: The estimated F-statistics are tested to be statistically significant at 5% and 10% levels of significance; *, ** and *** denote statistical significance at 1%, 5% and 10% levels.*

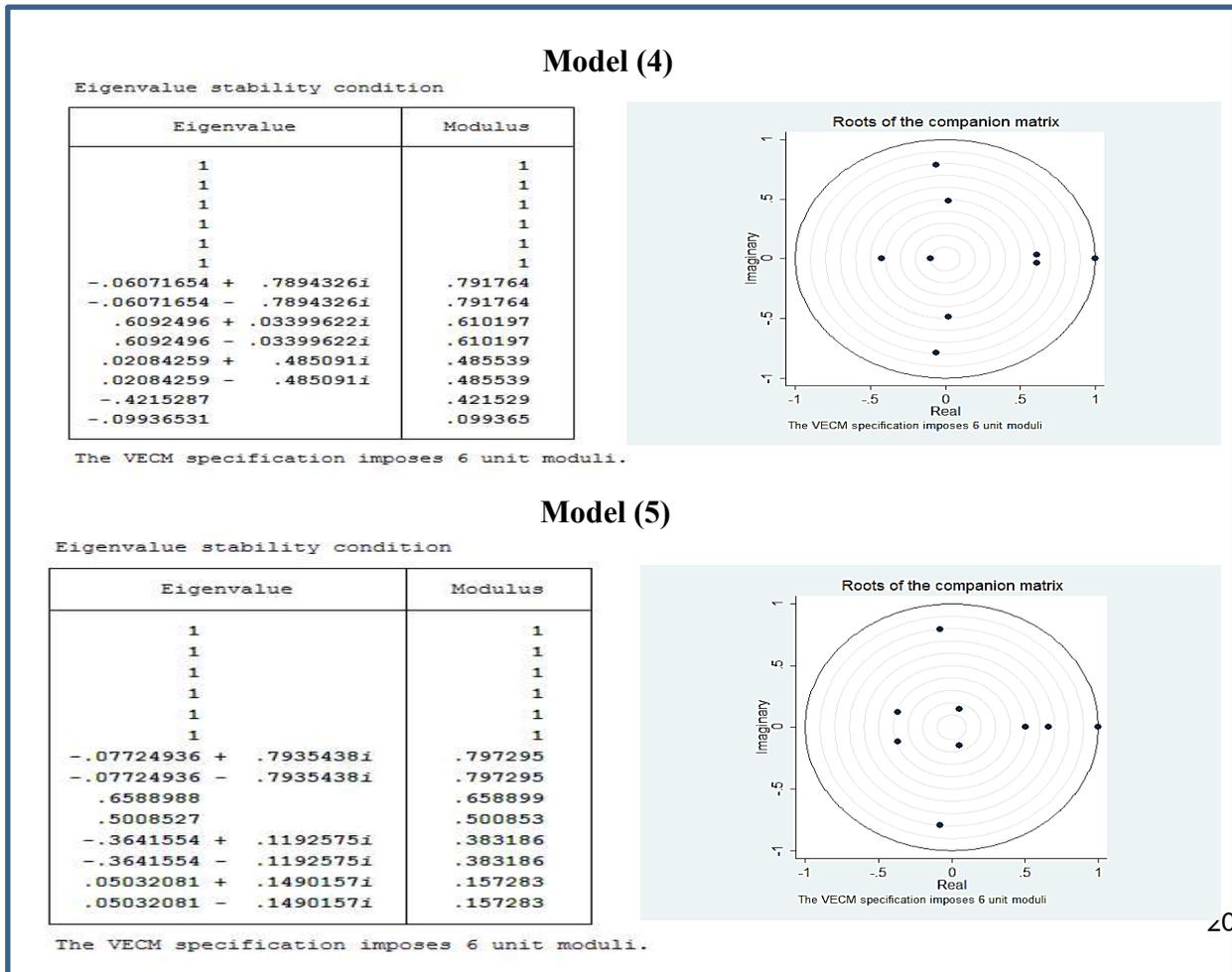
Figure 1: Trends in the Budget, Trade and Current Account Balances in Bangladesh



Note: All the figures are expressed as a ratio of GDP.

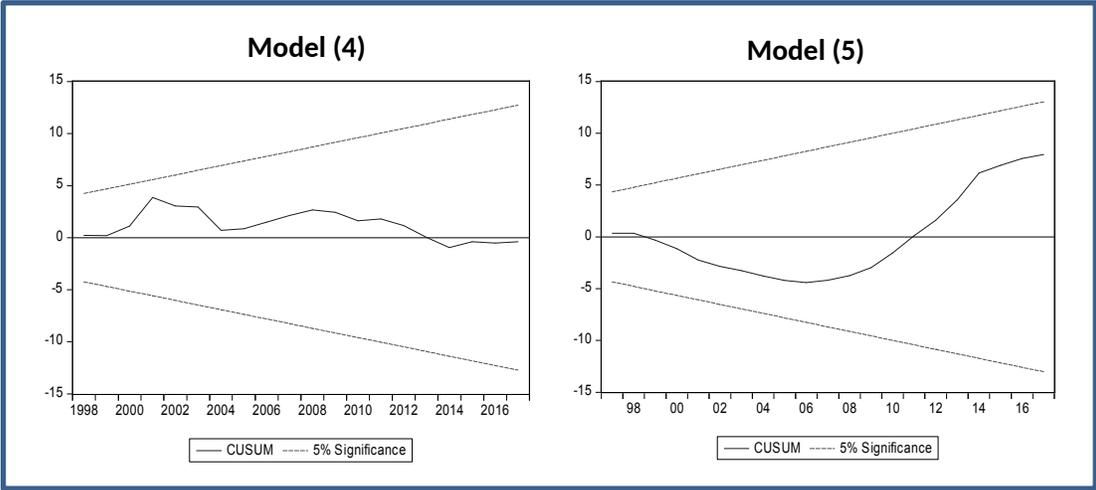
Source: World Bank (2018) and Bangladesh Economic Review (2018).

Figure 2: The Eigenvalue Stability of the VEC Models



Source: Author's own

Figure 3: The CUSUM charts in the context of models (4) and (5)



Source: Author's own