Determinants of Current Account Deficit in Developing Countries: The Case of Bangladesh

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ABSTRACT

Co-integration and Error Correction Model (ECM) are employed to study the behavior of Current Account Deficit (CAD) of Bangladesh and its determinants. The determinants of CAD include budget surplus, domestic saving, domestic income growth, foreign income growth, foreign interest rate, terms of trade, export and real exchange rate. A long-run equilibrium (co-integration) relationship is found between CAD and its determinants, although some variables are non-stationary. Out of eight independent variables only three of them namely, terms of trade, export and foreign interest rate, are found to have significant impact on CAD both in the long and short run. ECM formulation of the CAD model shows that more than 72% discrepancy between actual and long-run value of CAD is corrected in each year. The important implication of the study is that domestic economic policy has little to do with correcting CAD as all significant factors are related to the external economic conditions.

1. INTRODUCTION

In an open economy policy makers are concerned with two macroeconomic goals – internal balance and external balance. Internal balance is achieved when the economy's resources are fully utilized and stability of price level is attained. External balance is achieved when an optimal level of current account balance is attained. By optimal balance it is meant that 'a country's current account is neither so deeply in deficit that the country may be unable to repay its foreign debt in the future nor so strongly in surplus that foreigners are put in that position' (Krugmman and Obstfeld, 2003).

The current account is an important indicator of a country's economic performance. Movement of this macroeconomic indicator conveys information about actions and expectations of all market participants in an open economy (Bannaga 2004). In particular, the behavior of current account balance provides useful information about change in macroeconomic policy stance and

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autonomous shocks to the economy (Knight and Scacciavillani 1998). A current account deficit may not be that much problematic if the borrowed funds are utilized in productive investment projects that generate funds to repay the loan. But if it is not the case then, at times, external target may be imposed from abroad and the creditors may become reluctant to lend money any more. On the other hand, excessive current account surplus is also not desirable. Excessive current account surplus may result from lower domestic investment[1], which hampers future productive capacity of the economy. Current account surpluses resulted from excessive borrowing by the foreigners may give rise to the problem of non-repayment of loans if the debtors borrow in excess of their capacity.

Therefore, it is seen that the task of the policymakers at the macro level is to maintain the current account balance at a level that does not give rise to any of the problems discussed above. In other words, the problem of formulating macro policy to achieve external balance is to achieve sustainable current account balance in the long run. Although maintaining a sustainable current account balance is important in every economy, it 'has come to be of considerable interest in the context of recent episodes of macroeconomic turbulence in many emerging markets' (Chinn and Prasad, 2002). These macroeconomic crises in developing countries have underscored the need for a clear understanding of the factors underlying a country's current account position. If the factors that determine current account are identified, desirable balance could be attained by controlling or manipulating those factors.

Like most developing countries Bangladesh is suffering from current account deficit for almost the entire period after liberation. So it is very important to identify the factors that affect the current account in order to restore external balance by influencing those factors through appropriate macroeconomic policy options. The analysis is also important for the fact that Bangladesh has undertaken different reform measures in external trade regime in the 1990s in order to increase its integration with the world economy, for example tariff rationalization, opening of trade regime, foreign exchange reform leading to convertibility of taka etc. These reform measures are expected to affect external balance of the economy positively in the long run. There has been a considerable amount of research work on the determinants of current account balance in the context of developing countries, but in the context of Bangladesh current account and its determinants have not been subjected to serious research so far. Thus this field remains an untapped area of research and deserves sincere attention. In this backdrop, the present paper attempts to make some progress towards understanding the determinants of current account deficit in Bangladesh.

The reminder of the paper is organized into eight sections as follows: after introduction in section 1 research problem is discussed in section 2, next objectives of the study are spelled out in section 3 followed by review of determinants of current account deficit in section 4, section 5 contains model specification and methodology of the study, empirical estimation, analysis and findings of the study are presented in section 6 and the paper is concluded in section 7.

2. STATEMENT OF THE RESEARCH PROBLEM

Foreign trade sector of Bangladesh experienced substantial reforms in the beginning of the 1990s. Before, 1990 external sector of the country was characterized by high degree of protection – both quantitative and qualitative. After independence in 1971, foreign trade sector of Bangladesh was marked by an inward-looking policy, which resulted from nationalization of all heavy industries and financial institutions (Khan 2001). Before trade liberalization mainly traditional items constituted the bulk of the exports. Since the late 1980s and early 1990s external sector undergone radical transformation marked by a shift from traditional to non-traditional goods (Khan 1994).

Although some symptoms of opening up domestic economy were evidenced in the 1980s characterized by emphasis on the role of private sector, formal and effective trade liberalization measures were initiated at the beginning of 1990. Trade liberalization encompassed both tariff and non-tariff barriers. Reforms with regard to tariff barriers included rationalization of tariff structure, reducing the number of duty slabs and bringing down the tariff rates and their dispersion amongst similar commodities (Shahabuddin, Nath, Zohir and Roy 2004). For example, maximum tariff rate has been brought down from 350 percent in 1990-91 to 32.50 percent in 2002-03 (Hassan, Ali and Islam 2003). In case of non-tariff barriers, focus has been on elimination of quantitative restrictions on imports and deregulation of import procedures. For example, Total banned imports declined from 15.60 percent in Import Policy Order (IPO) 1991-93 to 9.80 percent in IPO 1997-2002 (Shahabuddin, Nath, Zohir and Roy 2004). Incentives have also been extended to export sector like tax rebate, export finance, export guarantee scheme etc.

Current account deficit in Bangladesh has declined remarkably during the post-trade liberalization period. Average deficit in current account during the period 1976-1989 was around 4 percent of Gross Domestic Product (GDP) as against around 0.40 percent of GDP during the period 1990-2003 (see Table-1).

Table-1: Current Account Deficit as a percentage of GDP

Year	Current Account Balance (% of GDP)	Year	Current Account Balance (% of GDP)
1976	-3.87747	1990	-1.41945
1977	-3.87044	1991	0.225484
1978	-3.9422	1992	0.589822
1979	-3.78833	1993	1.141953
1980	-5.78078	1994	0.593201
1981	-8.6744	1995	-2.20126
1982	-4.5851	1996	-2.53035
1983	-0.42879	1997	-0.72014
1984	-3.57405	1998	-0.0852
1985	-3.50158	1999	-0.84581
1986	-4.14748	2000	-0.69658
1987	-1.37651	2001	-1.2037
1988	-1.47665	2002	1.566706
1989	-5.37951	2003	0.357043
Average	-3.88595	Average	-0.37345

Source: Calculated from data in IFS-2004.

This improvement in the current account may be attributed to liberalized trade regime and higher workers remittances (Khan,

1994;Rahman, 2003). However, improved current account balance does not seem to be sustainable given the current highly concentrated export structure. In the 1970s and 1980s jute and jute goods fetched majority of the export earnings for which jute used to be called 'Golden Fiber of Bangladesh'. Since the early 1990s the export sector has become highly concentrated in Ready Made Garments (RMG) industry.

expired in the beginning of 2005. Therefore, in the years to come external sector of Bangladesh, with its narrow-based export and inadequate backward linkage industries, will face severe competition in the world market putting adverse effect on current account.

Backward linkage industry is essential for the RMG sector to remain competitive in the quota free market, because it reduces lead-

Table-2: Composition of Exports, 1989/90-2003/04

(Figures are in percentage of total)

Year	RMG	Jute Manufacture	Fish	Leather & Leather Manufactures	Raw Jute	Tea	Others
1989-90	39.80	20.70	11.10	6.40	7.60	2.40	12.00
1990-91	47.20	16.90	10.20	6.70	7.20	2.40	9.40
1991-92	54.60	15.20	8.60	7.30	5.60	2.60	6.10
1992-93	57.40	12.50	9.50	7.10	3.50	1.70	8.30
1993-94	60.10	10.20	10.80	6.70	2.70	1.90	7.60
1994-95	60.40	11.10	10.70	7.10	2.10	1.10	7.50
1995-96	64.30	9.70	10.30	7.00	2.30	1.00	5.40
1996-97	66.00	8.80	9.30	6.00	3.60	1.00	5.30
1997-98	70.30	7.40	8.30	4.50	2.70	1.20	5.60
1998-99	72.30	6.50	8.30	4.30	1.50	0.90	6.20
1999-00	73.90	5.30	8.50	3.60	1.70	0.40	6.60
2000-01	73.30	4.60	7.40	4.90	1.50	0.40	7.90
2001-02	74.20	5.40	6.50	5.00	1.50	0.40	7.00
2002-03	74.80	4.60	6.70	4.40	1.40	0.30	7.80
2003-04	74.78	3.24	5.13	2.78	1.04	0.20	12.80

Source: Annual Export Receipts, various Issues.

From Table-2 it is clear how lopsided the country's export structure is. Bangladesh's narrow-based export structure has made its foreign trade sector very vulnerable to external shocks. This lack of diversification is a major challenge for the economy. This is because Multifibre Agreement (MFA) that shielded Bangladesh's export of RMG from external competition in the quota market has

time substantially. According to a World Bank report, if yarn for RMG is produced in the country the lead time to obtain yarn drops to practically zero days from 22 days that it takes to get yarn from India, and low and decreasing lead times are becoming one of the most important aspects for sourcing decisions of the international buyers. Therefore, given the narrow export base and

lack of import substitute industry, if RMG sector loses its market share current account will face severe problem.

Another aspect that will have negative impact on export competitiveness and thereby on current account balance in post MFA era is low productivity of labor compared to other south Asian countries as shown in Table-3 below.

Table-3: Relative Labor Productivity

Country	Unit labor cost ($/shirt)	Wages ($/year)	Productivity (Shirt/ worker/year)
Bangladesh	0.11	290	2536
India	0.26	668	2592
Pakistan	0.43	1343	3100

Source: The World Bank, 2005

From the table it is seen that although unit labor cost and yearly wage are lower in Bangladesh than in India and Pakistan, labor productivity is lower than those countries. This low productivity of labor will be a vital impediment for the export sector to achieve competitive position in the quota free world market.

Although Bangladesh rationalized its tariff structure substantially since 1990, it still remains one of the most protectionist countries in the world, which creates anti-export bias. The ratio of effective exchange rate for imports (EER_m) to that of export (EER_x) is used as an indicator of a country's anti-export bias- the higher the ratio above 1.00, the higher the bias against export.

From Table-4 it is seen that anti-export bias in Bangladesh has reduced from 1.72 in 1991-92 to 1.27 in 2003-04 as average protection rate decreased from 73.60 percent to 29.10 percent during the same period. However it still is reasonably high. With this extent of anti-export bias *the structure of incentives created by the trade policy still favors the production of import substitutes and*

Table-4: Anti-export Bias

Year	Average protection rate (%)	(EER_m)	(EER_x)	Anti-export bias
1991-92	73.60	66.24	38.53	1.72
1992-93	60.50	62.83	39.76	1.58
1993-94	45.90	58.36	40.50	1.44
1994-95	37.60	55.29	40.52	1.37
1995-96	32.00	53.89	41.24	1.31
1996-97	31.60	56.20	43.17	1.30
1997-98	33.20	60.53	46.10	1.31
1998-99	32.40	63.64	49.13	1.30
1999-00	29.40	65.09	51.56	1.26
2000-01	28.50	69.36	55.22	1.26
2001-02	29.40	74.33	59.35	1.25
2002-03	26.40	73.20	59.05	1.24
2003-04	29.10	76.01	60.05	1.27

Source: The World Bank, 2005

constitutes a significant barrier to the emergence of new areas of exports (World Bank, 2005; p.19).

Given the problems in the foreign sector discussed above it remains a question of considerable interest how Bangladesh will maintain external balance in the face of global competition. To answer this question it is imperative to identify the factors that affect the current account deficit in Bangladesh in order to manipulate them to achieve a desirable and sustainable balance consistent with the goal of economic growth.

3. OBJECTIVES OF THE STUDY

This paper addresses the issue of the determinants of current account deficit in Bangladesh to fill a gap in the literature. To be specific the objectives of the study may be enumerated as follows:

1. To determine the determinants of Current Account Deficit (CAD) and examine their short run as well as long-run equilibrium relationship with CAD; and

2. To examine whether the CAD model experience any structural break due to introduction of different reform measures, such as, tariff rationalization, opening of trade regime, foreign exchange reform leading to convertibility of taka etc. in the 1990s.

4. DETERMINANTS OF CURRENT ACCOUNT DEFICIT (CAD) – A BRIEF REVIEW

Literature on current account balance encompasses both developed and developing countries. Present study focuses on the determinants of current account deficit in developing countries. Accordingly this section reviews some research works that studies the factors that contribute significantly in shaping the size of current account balance in developing countries.

Debelle and Faruqee (1996) use a panel of 21 industrialized countries over the period 1971-1993 and an expanded cross-sectional data set that include an additional 34 industrial and developing countries. Their paper attempts to explain long-term variations and short-run dynamics of the current account by specifying cross-section and panel data model respectively. They find that the fiscal surplus, terms of trade and capital control do not play significant role on the long-term variations of the current account in developing countries, while relative income, government debt and demographics do. Furthermore with the purpose of estimating short-run effects, they estimate both a partial-adjustment model with fixed effects and an error correction model. In both cases they find that short-run changes in fiscal policy, movement in terms of trade and exchange rate affect the current account balance of the industrialized countries.

Craigwell and Samaroo (1997), using cointegration theory and error correction models (ECM) over the period 1967 to 1991, examine the current account behavior of two Caribbean developing countries, Trinidad and Tobago and Barbados. They find that for Trinidad and Tobago, in both long run and ECM, the important explanatory variables of current account are the exchange rate, the budget surplus to Gross Domestic Product (GDP) ratio, the level of foreign income and lagged current account. In case of Barbados,

they find that the terms of trade and the budget surplus are influential in the long run while long-term capital flows to GDP ratio and the budgetary variables are important in the short run. They also estimated a pooled regression model, which confirms most of the findings of the error correction model.

Calderon, Chong and Loyza (1999) study the determinants of current account deficits in developing countries. They use an unbalanced panel of 753 annual observations from 44 developing countries over the period 1966-95. They use annual data and non-overlapping five-year averages to study transitory and permanent (trend) effects respectively of domestic output growth, growth of industrialized countries, savings, exports, real exchange rate, terms of trade, international interest rate and inflation on current account deficit. They find that domestic output growth and reduction in international interest rate have both transitory and permanent positive effect on current account deficit. Growth rates of industrialized countries, private and public saving and inflation are found to have transitory negative effect on current account deficit. Only export relative to Gross Domestic National Income (GDNI) shows positive permanent effect contrary to its negative transitory effect on current account deficit. Savings and appreciation of real exchange rate or worsening of terms of trade are found statistically insignificant permanent effect on current account deficit.

Chinn and Prasad (2000) examine medium term determinants of current account in 18 industrialized and 71 developing countries over the period 1971-1995 and employed cross-section and panel regression to investigate the relationship between current account and its determinants across countries and over time. They find that government budget balances, initial net foreign asset positions are positively correlated with current account balance. They also find that among developing countries, higher terms of trade volatility is associated with larger current account surpluses. The degree of openness to international trade appears to be weakly associated with larger current account deficits among developing countries. However, their study finds that a potentially important variable, average GDP growth does not bear any systematic relationship with current account balances.

Sarisoy-Guerin (2003) examines the relationship between current accounts and capital accounts in a set of industrialized and developing countries. Using panel fixed-effect regression analysis the paper addresses the question whether cyclical volatility in current accounts can be explained by the volatility of capital flows. Second Sarisoy-Guerin addresses the issue of causal relationship between capital flows and current account imbalance. In doing so, cointegration and Granger-causality and causality test on Error Correction Model (ECM) are conducted. The overall finding of the study is that for industrialized countries no causal relationship exists between current account imbalance and capital flows volatility, whereas result for developing countries indicates that there is causal effect of capital flows volatility on current account imbalances. The author ascribes this difference of results on the degree of capital control in industrialized and developing countries and also on the ability to borrow in the international capital market.

Bannaga (2004) attempts to assess whether the adjustment and stabilization policies in Sudan adopted in 1978 have succeeded in improving the country's current account position and identify the factor affecting Sudan's current account deficit over the period 1960-2000. Applying cointegration and Error Correction Model (ECM) this study evaluates the long run and short run effect on current account deficit of GDP growth as a proxy of macroeconomic policy performance, changes in black market exchange rate as a proxy of the inefficiency of exchange rate policy, level of per capita income as a proxy of stage of development and demographic factors, and terms of trade shocks as a proxy of external non-policy factors. The paper finds that the government's own reform were more effective than those imposed by IMF or the World Bank. With regard to the long run equilibrium relationship the paper finds that they are cointegrated. In the long run GDP growth rate and per capita income level are found to have significant negative effect of current account deficit, whereas changes in black market exchange rate is found to be positively and significantly associated with the same. In the ECM formulation of the model, GDP growth rate and terms of trade are found to be significant with a highly significant error correction term.

The determinants of current account deficit (CAD) that are reviewed above have also been widely used in many other studies as cited in Calderon, Chong and Loyza (1999) to evaluate the impact on the current account balance of fiscal policy (Leideman and Razin 1991; Frenkel and Razin, 1996), real exchange rate (Stockman, 1987), terms of trade (Obsfeld, 1982; Svensson and Razin, 1983; Greenwood, 1983; Mendoza, 1995; Tornell and Lane, 1998; Mansoorian, 1998), capital control (Mendoza, 1991) and global productivity shocks (Glick and Rogoff, 1995; Razin, 1995).

So far current account deficit specifically has not been subjected to any research work in the context of Bangladesh. However, issues relating to foreign trade sector have been addressed in some studies. For example, Rahim and Taheruddin (1975), Taheruddin (1978) examines the balance of payments problem in Bangladesh; Rahman (1991) reviews the performance and policies of Bangladesh's external sector during the 1980s; Khan (1994) addresses the issues of problems and prospects of foreign trade in Bangladesh; Ashrafuzzaman (2000) conducted an econometric analysis of Bangladesh's export supply function; Eusufzai (2000) addresses the issue of trade liberalization in the context of India-Bangladesh trade relations; Ray and Karim (2001) evaluates the performance of export credit guarantee scheme in promoting exports in Bangladesh; Khan (2001) examines the evolution of Bangladesh's external sector from inwardness to openness; Hassan, Islam and Ali (2003) makes a critical evaluation of trade liberalization in Bangladesh; Islam (2004) looks into the aspects of trade liberalization, foreign private investment and process of Bangladesh's integration in the world economy. So it is seen that determinants of current account deficit in Bangladesh remains an area to be given due attention, which the present paper attempts to do.

From the above review of determinants of CAD in developing countries, depending on the availability of data, following variables are selected for the purpose of empirical

model specification and classifies them into factors that are related to internal and external economic conditions as follows:

1. Internal Economic Conditions

i. **Budget Surplus**: Variety of models predicts positive relationship between budget surplus and current account balance. Overlapping generation model suggests that budget deficit induce current account deficit by redistributing income from future to present generation (Obstfeld and Rogoff, 1998). That is, increase in budget surplus reduces CAD and vice versa, implying a negative relationship between budget surplus and CAD.

ii. **Domestic saving**: Current account balance is defined as the difference between saving and investment. So, for a country experiencing CAD, increase in domestic saving relative to investment leads to reduction in CAD. So there is negative relationship between domestic saving (relative to investment) and CAD**.**

iii. **Domestic income growth**: Kraay and Ventura (2000) argue that the sign of current account response to transitory income shock depends on the share of foreign assets in a country's total assets. Under some plausible assumptions, they show that the current account response to a transitory income shock is equal to the increase in savings generated by the shock times the share of foreign assets in the country's total assets. This rule implies that favorable income shock lead to current account deficit in debtor countries and surplus in creditor countries. Besides, increase in income increases consumption, part of this increased consumption expenditure is spent on imported items, which widens current account deficit. Therefore, in accordance with both reasoning, for Bangladesh, which is a debtor country, there should be positive relationship between domestic income growth and CAD.

2. External Economic Conditions

i. **Real Exchange Rate:** Real exchange rate has historically been an important determinant of current account balance. An appreciation of domestic currency, i.e. an increase in real exchange rate, increases import and decreases export, making CAD wider. A deprecation of domestic currency has the opposite effect on CAD, that is, real exchange rate and CAD are positively related.

ii. **Terms of Trade:** The relationship between current account and terms of trade is not unambiguous (Carigwell and Samaroo, 1997). Recently Backus (1993) found that the sign of relation between terms of trade and current account balance is governed by the elasticity of substitution between foreign and domestic goods. For example, if the elasticity of substitution exceeds unity, then improvement in the terms of trade will improve the current account balance, i.e., reduce CAD. On the other hand, if the elasticity of substitution is below unity, improvement in the terms of trade will worsen current account balance, i.e., increase CAD. Therefore, *a priori* it is not clear the exact sign of the relationship between terms of trade and CAD.

iii. **Foreign interest rate:**

Foreign interest rate affects the demand for international capital by the developing

countries. According to Reisen (1998), net debtor countries, as most developing countries are, widen their demand for international capital in response to interest rate reduction. So, according to this argument, there is negative association between foreign interest rate and CAD.

iv. **Export:** An increase in export, relative to GDP, has the effect of lowering the CAD through its positive impact on trade balance (Calderon, Chong and Loyza, 1999). That is, there is negative relationship between export and CAD.

v. **Foreign income:** An increase in the income of the trading partners reduces CAD. Because increase in foreign income increase demand for exports, which, through its impact on trade balance, reduces CAD. So there is negative association between foreign income and CAD.

5. EMPIRICAL SPECIFICATION OF *CAD* MODEL AND METHODOLOGY

5.1 The Current Account Deficit (CAD) Model: In the light of the discussion presented in section-4, a model of

CAD is specified as under, which is estimated using Ordinary Least Square (OLS) method:

$$CAD = \beta_1 + \beta_2 BS + \beta_3 SAV + \beta_4 DGDP + \beta_5 RER + \beta_6 TOT + \beta_7 FIR + \beta_8 EX + \beta_9 FGDP + \mu_t$$

$$(\beta_2 < 0, \beta_3 < 0, \beta_4 > 0, \beta_5 > 0, \beta_6 < 0, Or > 0, \beta_7 < 0, \beta_8 < 0, \beta_9 < 0) \quad (1)$$

Where, CAD = Current account deficit as a percentage of GDP; BS = Budget surplus as a percentage of GDP; SAV = Domestic saving as percentage of Investment; DGDP = Growth rate of domestic real GDP; RER = Real exchange rate; TOT = Terms of trade; FIR = Foreign interest rate; EX = Export as a percentage of GDP; FGDP = Growth rate of foreign real GDP and μ_t is a normally distributed, serially uncorrelated, homoscedastic disturbance term.

5.2 Data consideration: This study uses annual data spanning from 1976 to 2002 taken from two sources —*Statistical Year Book of Bangladesh*, and *International Financial Statistics (IFS)-2004*, CD-ROM version. Data on BS, TOT and SAV are taken from *Statistical Year Book of Bangladesh*, various years. All other data are collected from *IFS-2004*. Bi-lateral real exchange rate between Taka and US dollar is used as a proxy for RER and is calculated as the ratio of US CPI to Bangladesh CPI time nominal exchange rate. Real GDP growth rate of USA is used as the proxy for foreign income and USA federal fund rate is used as the proxy for FIR.

5.3 Methodology: This section presents methodology followed in this study. Standard econometric issues that are addressed in this section are unit root test, co-integration and Error Correction Model (ECM).

5.3.1 Unit Root Test: Empirical works based on time series data assumes that the underlying time series is stationary. 'A time series is said to be stationary if its mean, variance and auto-covariance (at various lags) remain the same no matter at what time we measure them' (Gujarati, 1995). If the underlying series is not stationary, least square methods and classical inferences made from these series are generally not valid (Carigwell and Samaroo, 1997). Two widely used statistical tests that are available for identifying stationary property of time series

data are Dickey-Fuller (1979, 1981), hereafter DF test and Phillips-Perron (1988), hereafter PP test. For any time series Y_t, Augmented Dickey-Fuller (ADF) test requires estimation of a regression of the following form:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t$$

Where; ***t*** is the time or trend variable and ***m*** is number of lagged differenced term needed to achieve white noise residuals. When *m = 0* the ADF collapses to the DF test. The test statistics test the null hypothesis that ***‰=0***, that is Y_t is non-stationary against the alternative hypothesis that ***‰ <0***, that is, Y_t is stationary. The ***t*** statistic on ***‰*** is known as ***Ù*** (tau) statistic and follows what is known as Dickey-Fuller distribution (see Dickey and Fuller, 1979). Like the ADF test, PP's method allows for the possibility that in the DF formulation $\hat{\mathbf{A}}_t$ may not be identically and independently distributed. Phillips and Peron (1988) propose a non-parametric method of controlling for higher order serial correlation in a series and is based on the following first order auto-regressive [AR(1)] process:

$$\Delta y = a + \beta y_{t-1} + \varepsilon_t ;$$

Where, Δ is the first-difference operator, a is the constant, β is the slope and y_{t-1} is the first lag of variable y. The correction for the serial correlation in ε is nonparametric since an estimate of the spectrum of at frequency zero is used that is robust to heteroscedasticity and autocorrelation of unknown form. The Newey and West (1987) method is used to construct an estimate of the error variance from the estimated residuals $\hat{\varepsilon}_t$ as follows:

$$\frac{1}{N}\sum_{t=1}^{N}\hat{\varepsilon}_t^{\,2} + \frac{2}{N}\sum_{S=1}^{l}\omega(s,l)\sum_{t=S+1}^{N}\hat{\varepsilon}_t\hat{\varepsilon}_{t-S}$$

$\omega(s,l)$; Where l is a truncation lag parameter and is a window.

5.3.2 Co-integration: Engle and Granger (1987) suggest that a vector of non-stationary time series, which may be stationary only after differencing, may have stationary linear combination without differencing and then the variables are said to have cointegrated relationship. If the variables are non-stationary and not co-integrated, the estimation result of regression model gives rise to what is called 'spurious regression'. In that case one may obtain a very high R^2, although there is no meaningful relationship between the variables. To ascertain cointegrating relationship between two variables, say, X_t and Y_t residuals from regression model $Y_t = \beta_1 + \beta_2 X_t + \mu_t$ are subjected to DF test as under:

$$\hat{\mu}_t = \delta\hat{\mu}_{t-1} + \upsilon_t$$

A significant *t* statistic indicates that dependent and independent variables are cointegrated.

6.3.3 Error Correction Mechanism (ECM): Another important result of co-integration analysis is Error Correction Model (ECM), first used by Sargan (1984) and latter popularized by Engle and Granger (1987) which deals with modeling short-run dynamics of long-run equilibrium relationship. Despite co-integrated or having long-run equilibrium relationship between a set of variables, in the short-run there may be disequilibrium. ECM corrects for that disequilibrium. The ECM presentation of relationship of the two variables, X_t and Y_t, takes the following form:

$$\Delta Y_t = \beta_1 + \beta_2 \Delta X_t + \beta_3 \hat{\mu}_{t-1} + \varepsilon_t$$

Where $\hat{\mu}_{t-1}$ the one period lagged value of the residual from regression , measures the discrepancy between actual and long run or equilibrium value of Y_t that is corrected each period.

Besides, the estimated CAD model is subjected to various tests to satisfy the assumption of OLS, such as multicollinearity, heteroscedasticity, autocorrelation, normality of residuals, model specification etc. in order to ensure the adequacy of the estimated model.

6.ESTIMATION RESULTS, ANALYSIS AND FINDINGS

6.1 Estimation Results

The analysis starts with the examination of stationarity property of the underlying time series data. ADF and PP unit root tests results are reported in Table-5 below:

Table-5: PP and ADF Unit Root Test

Variable	PP test statistic	ADF test statistic
CAD	**-3.6061**^{S}	-2.7113
BS	-3.3665	-3.3355
FIR	-2.7082	-2.6400
RER	**-4.5340**^{S}	**-3.5908**^{S}
TOT	-2.4462	-2.4436
DGDP	-12.473^{S}	**-4.6263**^{S}
EX	-0.96852	-1.2767
FGDP	**-3.5986**^{S}	**-3.5923**^{S}
SAV	**-3.4651**^{S}	**-3.5110**^{S}
Critical value at 5%	-3.4620	-3.4620

Note: 'S' indicates stationary.

According to both test results RER, DGGDP, FGDP and SAV are **I(0)** and BS, FIR, TOT and EX are **I(1).** CAD is **I(0)** as per PP test and **I(1)** as per ADF test.

Next, in order to examine whether variables are co-integrated OLS is run for the regression model (1) and DF test is performed on the residuals. First OLS estimation results are obtained as under:

CAD = -5.9775 + 0.24873 BS - 0.37177 FIR + 0.053668 RER + 0.19594 TOT –

t statistics = (-2.176) (1.30) (-2.800) (0.7396) (3.461)

0.016808DGDP – 0.44330 EX – 0.094095 FGDP - 0.086152 SAV (2)

(-0.1010) (-2.030) (-0.6121) (-0.7465)

R^2 = 0.7998; Adjusted R^2 = 0.7055; DW = 2.06; RESET [F (3, 14)] = 1.6519;

B-P-G[x^2(9)] = 7.789; NRM [x^2(2)]= 0.4666; Harvey-Collier (1977) Recursive T-test = -1.0969

Granger and Newbold (1974) have suggested **R^2>DW** is a good rule of thumb to suspect that the estimated regression suffers from spurious regression. In the above case **R^2<DW**, therefore, as a first approximation it can be concluded that the estimated regression is not a spurious one. Moreover, according to Co-integrating Regression Durbin-Watson (CRWD) test, variables are co-integrated as the computed DW value (= 2.06) is well above the critical values of 0.511, 0.386 and 0.322 at 1%, 5% and 10% level respectively, the null hypothesis of co-integration cannot be rejected. However, formal EG co-integration test is performed to examine whether the variables in regression model (1) are co-integrated. To do so, residuals from equation (2) are subjected to DF test as follows:

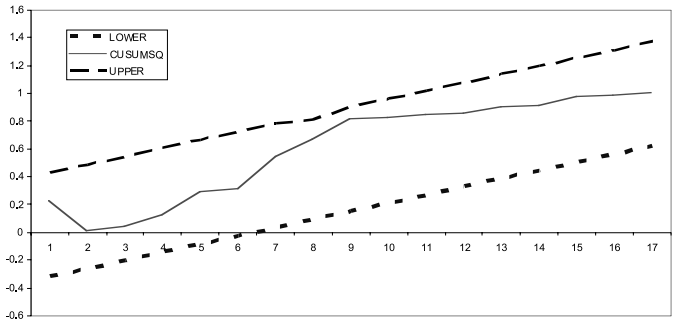
$$\Delta\hat{\mu}_t = -1.0366\hat{\mu}_{t-1}$$

t = (-5.052)

The calculated test statistic exceeds Engle and Granger (1987) critical values of –2.5899, -1.9439 and –1.6177 at 1%, 5% and 10% significance levels respectively, that means

the residual is stationary and the variables are co-integrated. That is, there is long-run equilibrium relationship between–CAD and its determinants as specified in model (1). According to different diagnostic tests the estimated regression model (2) performs quite well. Durbin-Watson (DW) statistic indicates that the residuals are free from serial autocorrelation. Ramsey's **RESET** test results show that F statistic is insignificant at 1%, 5% and 10% significance levels, so the null hypothesis that the model is mis-specified can be rejected. **B-P-G** test statistic does not exceed the critical value at even 10% level of significance, which fails to reject the null hypothesis of homoscedasticity of residuals. **NRM** (***Jraque-Bera*** normality test) statistic shows that the probability of obtaining a χ^2 value of 0.4666 is above 0.75, which is quite a large probability. Therefore, the null hypothesis that the residuals are normally distributed cannot be rejected. In short, the residuals of the regression mode are homoscedastic, normally distributed and not serially auto-correlated. Stability of model is examined through Harvey-Collier (1977) Recursive T-test and plotting cumulative sum of square (CUSUMSQ) of recursive residuals. Insignificant ***t*** ratio in Harvey-Collier (1977) Recursive T-test rejects the hypothesis of model instability. Graphical representation of **CUSUMSQ** of recursive residuals (see Figure-1 below) also gives the same impression. It is clear from Figure-1 that **CUSUMSQ** does not cross either of the bounds at 5% significance level implying that the model does not have any structural break over the study period. Therefore, the model can be taken as an adequately specified one as it passes all diagnostic checking successfully.

Figure-1: Cumulative Sum of Square (CUSUMSQ) of Recursive Residuals



The long-run equilibrium relationship between CAD and its determinants logically leads to the examination of short-run dynamics of this long-run behavior through ECM. However, before moving to ECM some observations are in order. The estimation result of regression equation (2) shows that the $\mathbf{R}^2$ is quite high but out of eight independent variables, only three (FIR, TOT and EX) of them are statistically significant. This indicates that possibly there is some degree of multicollinearity among some of the independent variables. So, multicollinearity is examined by correlation matrix that is presented in Table-6.

Examination of correlation matrix shows that TOT is highly and positively correlated with EX and SAV and EX is highly and positively correlated with SAV. Therefore, in order to avoid the problem of multicollinearity TOT, SAV and EX are included separately in regression equations as follows:

Table-6: Correlation Matrix

BS	1.000							
FIR	-0.11346	1.000						
RER	-0.0481	-0.2677	1.000					
TOT	0.03213	-0.70353	0.46488	1.000				
DGDP	0.18941	-0.22378	0.09197	0.08364	1.000			
EX	-0.04777	-0.6019	0.47140	**0.91267**	0.09943	1.000		
FGDP	-0.10434	-0.2021	-0.1886	0.07260	0.39055	0.01943	1.000	
SAV	0.01701	-0.5799	0.52720	**0.79133**	0.40389	**0.83115**	0.0177	1.000
	BS	FIR	RER	TOT	DGDP	EX	FGDP	SAV

$$CAD_t = \beta_1 + \beta_2 BS + \beta_3 FIR + \beta_4 RER + \beta_5 TOT + \beta_6 DGDP + \beta_7 FGDP + \mu_{t1} \quad (3)$$

$$CAD_t = \beta_1 + \beta_2 BS + \beta_3 FIR + \beta_4 RER + \beta_5 DGDP + \beta_6 EX + \beta_7 FGDP + \mu_{t2} \quad (4)$$

$$CAD_t = \beta_1 + \beta_2 BS + \beta_3 FIR + \beta_4 RER + \beta_5 SAV + \beta_6 DGDP + \beta_7 FGDP + \mu_{t3} \quad (5)$$

Where *a priori* signs of the coefficients of the regression models are same as in model (1).

Table-7: Estimation Result of Regression Models 3, 4 & 5

Variables	Model 3	Model 4	Model 5
BS	0.39427	0.40496	0.40333
	(1.632)	(1.528)	(1.514)
FIR	-0.40606	-0.56950	-0.57923
	(-2.716)**	(3.894)*	(-4.026)*
RER	0.00973	0.008535	0.008729
	(0.4220)	(0.9881)	(0.9818)
TOT	0.064737		
	(1.917)***		
DGDP	-0.15289	-0.19012	-0.20913
	(-1.060)	(-1.222)	(-1.213)
EX		0.044915	
		(0.3451)	
FGDP	0.0004229	0.20868	0.02753
	(0.00257)	(0.1168)	(0.1508)
SAV			0.02141
			(0.2401)
R^2	0.7122	0.6586	0.6575
Adjusted R^2	0.6213	0.5508	0.5494
DW	1.9950	1.8917	1.8784

*Note: Figures in the parenthesis are 't' ratios. *, ** and *** indicates significant at 1%, 5% and 10% level respectively.*

Estimation results of these equations are reported in Table-7. Results indicate that the effort to avoid multicollinearity problem does not yield better result. Most of the variables are still highly insignificant and adjusted R^2s are well below than that of equation (2).

As the effort to take care of multicollinearity does not yield better result, the regression model (2) is retained as the preferred model and short run dis-equilibrium of long run relationship between CAD and its determinants is examined through ECM. ECM specification of regression model (2) and its estimation result is reported below:

$\Delta CAD = 0.27124 - 0.12737\ \Delta BS - 0.69185\Delta FIR + 0.005204\Delta RER + 0.1978\Delta TOT$

t = (0.9878) (-0.5560) (-4.551) (0.9773) (3.579)

$+ 0.3208\Delta DGDP - 1.2125\Delta EX - 0.0418\Delta FGDP - 0.05672\Delta SAV + 0.72185EC_{t-1}$

(0.02508) (-3.579) (-0.2957) (-0.5309) (3.086) (6)

R^2 = 0.7982; Adjusted R^2 = 0.6846; DW = 2.04; RESET[F(3, 13)] = 2.1198;

B-P-G[$x^2(9)$] = 6.637; NRM[$x^2(2)$]=1.7814.

Δ is first the difference operator. Various diagnostic tests show that this ECM specification is adequately specified. Residuals are normally distributed, homoscedastic and serially uncorrelated. The coefficient of error correction term (EC_{t-1}) in regression equation (8) is negative and significant which is the requirement of valid co- integration.

6.2 Analysis and Findings

Estimation results of regression equation (2) show that CAD has a long-run equilibrium relationship with it determinants as specified in model (1). Except DGDP, signs of response of these variables are as per expectation. But only three variables, namely FIR, TOT and EX, have statistically significant relationship with CAD. In the long-run a 1% increase in FIR reduces CAD by 0.372%, that is, increase in FIR reduces demand for international capital which reduces CAD. TOT has positive impact on CAD. 1% increase in TOT is associated with 0.196% increase in CAD. This positive association between TOT and CAD indicates that elasticity of substitution between foreign and domestic goods is less than unity as pointed out by Backus (1993). EX is negatively related to CAD as expected. 1% increase in EX reduces CAD by 0.44%. This negative impact comes through EX's impact on trade balance.

Other variables in the regression model (2) do not have statistically significant relationship with CAD in the long-run. All insignificant variables have expected sign except DGDP. Theoretically it was postulated that DGDP is positively associated with CAD. But the estimation result shows that DGDP is negatively related to CAD. This negative impact may be due to the fact that increase in income increases consumption but less than the increase in income, which raises saving and reduces CAD. Thus DGDP's negative impact might be exerted through its impact on saving. RER has expected sign, but its insignificance may be due to the use of bi-lateral RER instead of a weighted average RER. Bangladesh is a relatively less open economy. It is categorized as a below average open economy by Least Developed Countries Report, 2004. For this reason foreign income (FGDP) increase may not have significant impact on CAD. Impact on CAD of BS is through redistribution of income from future to present generation. BS in Bangladesh may not be so instrumental in increasing income of the economic agents, which is reflected in insignificant impact of BS on CAD. Average consumption in Bangladesh is very low because of low per capita income. For this reason income growth may not add to saving (SAV) enough to reduce CAD significantly. Besides, small sample size may well be responsible for insignificance of these variables. The error correction specification of regression (2) presented in equation (6) indicates that the speed of adjustment is quite high. More than 72% of the discrepancy between actual and the long-run value of CAD is eliminated or corrected in each year.

Another important finding of the study is that different reform measures in the external sector (i.e. tariff reduction, current account liberalization through current account convertibility etc.) did not appear to have any

significant impact on CAD. The CAD model examined in this paper is found to remain stable over the study period.

7. CONCLUSIONS

This section concludes the paper by summarizing some of the main results followed by a brief discussion of direction of future research. The aim of the paper was to examine the behavior of current account deficit of Bangladesh in the long-run and short-run using co-integration and error correction theory. Specifically the paper examines the impact of government budget surplus, domestic saving, domestic income, real exchange rate, terms of trade, foreign interest rate, foreign income on current account deficit. The study covers the period from 1976 to 2003 and uses annual observations. Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests suggests that variables are integrated to different orders, but Co-integrating Regression Durbin-Watson **(CRWD)** and Engle-Granger (EG) co-integration test suggest that in the long run variables are co-integrated. Both long-run static and short-run dynamic ECM indicate that the important explanatory variables in determining current account deficit are foreign interest rate (FIR), terms of trade (TOT) and export as percentage of GDP (EX). Foreign interest rate and export are negatively whereas term of trade is positively associated with current account deficit. Short-run adjustment of long-run dis-equilibrium is quite high as found in ECM framework. The noteworthy finding of this study is that no internal economic conditions do have significant impact on current account deficit in Bangladesh; all factors are related to external economic conditions. One important implication of this result is that domestic macroeconomic policies do not have much to do to affect current account deficit. All significant factors are governed by the state of world economic conditions. This ineffectiveness of domestic policy is further evidenced in the fact that despite different reform measures, the model of current account deficit remains stable over the entire study period.

This study makes an effort to identify the factors that affect current account deficit of Bangladesh in the long and short run. There is still further scope to extend the analysis in other South Asian countries. Moreover sustainability of current account deficit of Bangladesh may well be a potential area of future research.

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