

## **ASYMMETRIES IN TWIN DEFICITS HYPOTHESIS: AN EMPIRICAL ASSESSMENT FOR PAKISTAN**

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**Abstract.** Variations in fiscal policy can lead to predictable developments in an open economy's current account performance, although this remains a contentious issue. The twin deficits hypothesis holds that budget and current account deficits are so closely intertwined that reductions in the former are both necessary and sufficient conditions for improving the latter's performance. The present study has attempted to re-examine the validity of the twin deficits phenomenon in Pakistan over the period from 1980 to 2018. For the empirical investigation, the study has employed the Non-Linear Auto Regressive Distributed Lag (NARDL) technique. The findings of the study exhibit an asymmetric impact of budget balance on current account balance both in the short-and long-run. The asymmetric relationship between both the macroeconomic variables gives compelling arguments for developing policies that are adaptive to changing dynamics in both the internal and external sectors.

**Keywords:** Twin Deficits, Asymmetries, NARDL, Pakistan

**JEL Classification:** F32, F41, F43, H62

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## I. INTRODUCTION

The increased reliance on fiscal policy has greatly been encouraged by economists and policymakers, particularly, in the post Keynesian world where the role of monetary policy as a stabilization tool has considerably been reduced. However, roughly for the past three decades, huge fiscal imbalances have been witnessed in most of the developed and developing countries. Over the course of time, there are growing concerns about the consequences and macroeconomic implications of fiscal imbalances, specifically of large fiscal deficits. Some of the important fears raised are the influence of budgetary imbalances on private savings, interest rate, inflation and current account balance. Therefore, prevalence of fiscal discrepancies comes under great scrutiny in an effort at aligning them with progressive path of economic performance rather bearing the grueling consequences.

For instance, the Reagan fiscal experiment during 1981-1985 in the United States of America (USA) resulted in an exceptional rise in fiscal deficit as well as appreciation of dollar in real and nominal terms, combined with an unusual increase in trade deficit (Shastri et al., 2017). The mutual occurrence of both current account and budget deficits was later known as twin deficits, given that they moved in the same direction and were suggested to be derived from same economic fluctuations (Lau and Baharumshah, 2004). Additionally, the resurgence of huge budget deficit in the USA following the global financial crisis of 2007-08 revived the focus and attention of economists towards the Siamese twin deficits debate. Furthermore, in the aftermath of the global financial crisis of 2007-08, current account position has become the direct incitement for discrimination by foreign lenders. Consequently, making it necessary for economies to correct and restore current account imbalances but for that it is important to pin point the causative elements of current account dynamics.

Theoretically, within the twin deficits debate, primarily, the literature is divided into two main streams. One that follows the Keynesian income-expenditure approach, which incorporates the Mundell-Fleming Model and implies a unidirectional causality from the budget deficit to the trade (or current account) deficit. The notion proposes that an increase in interest rates due to a rise in the budget deficit leads to foreign

capital inflows and a strengthening of the local currency in terms of foreign currencies, which reduces exports and increases imports, resulting in a current account deficit (Froyen,1999). The Ricardian Neutrality hypothesis, on the other hand, suggests that the two deficits are unrelated. It is proposed that rational economic agents increase their private savings in expectation of future taxes (equal to the fall in public savings due to the budget deficit), thus neutralizing the overall impact and maintaining aggregate demand (Khalid and Guan,1999).

Pakistan makes a good case study, given that for well over four decades it has been suffering from twin deficits. In early 1980s, the trade and fiscal balances averaged -3.9% and -6.6% of GDP, respectively. However, in the latter half of 1980s, higher increase in budget deficit as compared to trade deficit has been witnessed. The situation remained precarious and somewhat unchanged between late 1980s and early 1990s. While, the average fiscal balance stood at-7.0% of GDP in 1990s and trade balance reached-4.0% of GDP, owing to the fiscal profligacy and incompetency (Zaidi, 2012). Whereas, for roughly 5 years post Asian Financial Crisis of 1997, the balances improved due to the improvement in revenue and rationalization of expenditures (fiscal balance) as well as, the increased transfer of money (trade balance).

Succeeding this alleviation, the imbalances started deteriorating and recorded at an all-time high in 2007 owing to the global financial crisis (budget balance is reported -8.9 % while current account balance touched the figure -8.2% of GDP). The overall picture of 2000s is better than other periods in considerations as the average budget balance for the whole decade was -1.93% of GDP while current account balance stood at -4.9% of GDP. Following the crisis, the situation remained deplorable and Pakistan has yet to recover from the burgeoning twin deficits. For the last eight years, budget and current account balances have shown fluctuating trend while the former averaged -2.6% of GDP and the latter 6.4% of GDP<sup>1</sup>.

Notably, Figure 1 illustrates fluctuating trend of both balances, one following the other but clearly one not stepping on the other. Average

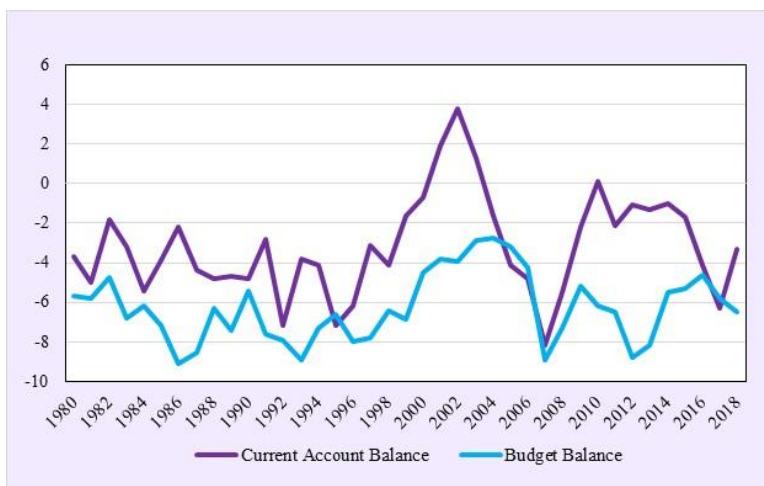
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<sup>1</sup> Pakistan Economic Survey (various issues)

budget deficit remains higher than average current account deficit throughout the selected time period. Moreover, the highest average budget and current account deficits were observed during 1990s, while the lowest average of both the deficits were recorded during 2000s. Also, the degree of change in both deficits is fairly different from each other which is suggestive of co-movement, however, with varying degrees or not in a linear manner.

FIGURE 1

Trend of Current Account Balance (CAB) and Budget Balance (BB)



Source: Pakistan Economic Survey (various issues).

The persistence of both the deficits in Pakistan has caused grave concern among researchers and policymakers, necessitating new insights into the dynamics of the twin deficits relationship. Pakistan has undergone various structural and political changes over the study's sample period. For instance, the adoption of structural adjustment programs, trade liberalization, financial sector reforms, and transition from a fixed to a managed exchange rate system, all of which necessitated the shifts in the formulation of stabilization policies i.e. a more active and discretionary role of fiscal and monetary policies can be seen as an adjustment mechanism. It is pertinent to note that the last 15-18 years in our sample belong to a period when Pakistan was confronted with significant internal and external conflicts, which imposed a significant fiscal burden in the form of increased non-developmental

expenditures and, as a result, a higher budget deficit. On the other hand, the country has seen enormous capital outflows because of rising macroeconomic uncertainty and a widening trade imbalance, putting the country's current account balance in jeopardy. In sum, historically, there are continuous fluctuations in the budget deficit as well as in the current account deficit. Because both deficits have become a major source of worry at the national level in Pakistan, this topic has a lot of scope for policy debate. Some empirical attempts to examine the nature and extent of the relationship between the two deficits have been done previously. These investigations, on the other hand, have shown evidence for a linear or symmetric association between the two deficits but have yielded equivocal results as to the nature of the relationship between the two variables.<sup>2</sup> As a result, new insight into Pakistan's two deficits relationship is required.

Our research makes two significant contributions. Firstly, we argue that if the relationship between the two indicators (budget balance and current account balance) is non-linear yet we estimate a linear relationship, the policy implications derived will be misleading. As a result, the importance of this study lies in the fact that it is the first to employ an asymmetric framework to examine the relationship between budget balance and current account balance in Pakistan. In this regard, we want to see whether a positive change in budget balance has the same effect on the current account balance as a negative change in budget balance. Variations in macroeconomic dynamics in the context of twin deficits are expected, given the fragility of Pakistan's economy and current socio-economic and political situations. To this end, the Non-Linear Autoregressive Distributed Lag (NARDL) cointegration is employed to achieve the basic aim of the study, in case of Pakistan. Secondly, our study tests the twin deficits hypothesis in presence of trade openness and other control variables, namely, real GDP growth rate and real exchange rate to deal with the omitted variables bias. The findings of this study are expected to provide guidelines to policymakers for devising

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<sup>2</sup> Notably, Burney *et al.*, (1992), Burney *et al.*, (1989), Aqeel and Nishat (2000), Kazimi (1992), Mukhtar *et al.*, (2007), Hakro (2009), Siddiqui (2011), Saeed and Khan (2012), Mudassar *et al.*, (2013), and Tufail *et al.*, (2014) tested the twin deficits hypothesis for Pakistan by employing different econometric techniques over varying sample periods

separate strategies for current account management in response to a favourable change in budget balance as compared to an adverse change in budget balance.

The remainder of the paper is organized as follows: section II contains a brief review of empirical literature that will shed light on the ongoing twin deficits debate as well as help rationalize the study's significance; the theoretical framework and econometric methodology employed to attain the study's goal are presented in section III; the research findings and subsequent discussion are presented in section IV; and finally, section V concludes the paper.

## **II. LITERATURE REVIEW**

The empirical testing of the twin deficits hypothesis can be categorised in to four strands. First strand of literature supports the conventional view that fiscal deficit results in current account deficit. These studies establish a close association between budget and current account imbalances, with causality flowing from the former to the latter. For instance, Abell (1990), Dibooglu (1997), Zietz and Pemberton (1990), Bachman (1992), Rosensweig and Tallman (1993), Kasa (1994), Vamvoukas (1999), Aqeel and Nishat (2000), Piersanti (2000), Leachman and Francis (2002), Akbostancı and Tunç (2002), Fidrmuc (2003), Cavallo (2005) and Erceg, Guerrieri, and Gust (2005), Salvatore (2006), Lau and Tang (2009), Bagnai (2010), Perera and Liyanage (2012), Forte and Magazzino (2013), Bartolini and Lahiri (2006), Šulíková, Siničáková and Horváth (2014), Ravinthirakumaran et al., (2016) and Banday and Aneja (2016, 2019) support the conventional view of twin deficits hypothesis.

In a close affinity with the above-mentioned findings, the second strand of literature has been successful in identifying a bi-directional relationship between the twin deficits. To this end, studies by Darrat (1988), Kearney and Monadjemi (1990), Biswas et al., (1992), Islam (1998), and Normandin (1999) establish a two-way relation between fiscal and trade deficits. Adding to this, similar results ascribing bidirectional causality are reported by Kouassi, Mougoue and Kymn (2004), Lau and Baharumshah (2004), Mukhtar et al., (2007), Malindretos and Arize (2008), Mosayeb and Saleh (2009) and Omoniyi et al., (2012). Additionally, Asrafuzzaman and Gupta (2013) report that

the relationship between the deficits in the long-run is conditional on overall macroeconomic environment.

The third set of literature is inconsistent with the twin deficit theory and aligns with the Ricardian Neutrality Hypothesis advocating the intertemporal shift between the deficits. Studies such as Laney (1984), Seater and Mariano (1985), Miller and Russek (1989), Dewold and Ulan (1990), Boucher (1991), Winner (1993), and Kim (1995) are unsuccessful in providing evidence of a stable long-term association between the two deficits. Kouassi *et al.*, (2004) suggest that the countermeasure to the imbalances is the effectiveness of fiscal and monetary policies in improving productivity, exchange rate and monetary stance. Likewise, other studies advocating the Ricardian Neutrality hypothesis include Enders and Lee (1990), Bartlett (1999), Yi and Papaioannou (2001), Kuştepelı (2001), Kaufmann, Scharler and Winckler (2002), Daly and Siddiki (2009), Aksu and Başar (2009), Raju and Mukherjee (2010), Ganchev, Stavrova and Tsenkov (2012), Özdemir *et al.*, (2014), Tosun, Varol İyidoğan and Telatar (2014), Eldemerdash *et al.*, (2014), Forte and Magazzino (2013), Şen and Kaya (2016), Aloryito, Senadza and Nketiah-Amponsah (2016), and Magazzino (2017).

Deviating from the conventional view are the findings that provide evidence of a strong and stable relation between the deficits, however, with existence of reverse causality running from current account deficit to fiscal deficit. The reverse causality is symptomatic of failure of fiscal policy in the short run with regard to current account balance (Sobrinho, 2013). Researchers remained successful in finding reverse causality include Reisen (1998), Khalid and Guan (1999), Alkswani (2000), Hatemi-J and Shukur (2002), Onafowora and Owoye (2006), Kim and Kim (2006), Marinheiro (2008), Kalou and Paleologou (2012), Iyidogan (2013), Çoban and Balıkçioğlu (2016), Turan and Karakaş (2017), Rehman and Saeed (2017) and Helmy (2018).

The presence of asymmetries in the twin deficit paradigm has been the subject of the recent research. For example, Trachanas and Katrakilidis (2013) document that negative fiscal shocks have a greater impact on the current account deficit than the opposite. Other studies that too have examined the twin deficits nexus while allowing for asymmetries include Ahmad *et al.*, (2015) and Bhat and Sharma (2018),

and Karras (2019). In fourteen Middle Eastern and Northern African (MENA) nations, Raouf (2020) aims to investigate the presence of a non-linear relationship between the current account deficit, budget deficit, and saving-investment gap, i.e. the triple deficits. From the findings, the validity of triple deficits hypothesis is confirmed only in the long run. Ayinde et al., (2021) use the NARDL technique to show that the budget deficit and current account deficit in Nigeria have an asymmetric relationship. Moreover, the extent of financial development and openness plays significant role in determining the twin deficits in the country. Mallick et al., (2021) explore the asymmetric relationship between India's current account deficit and budget deficit, concluding that there is an asymmetrical relationship between both the deficits in the short- and long-run.

From the above survey of literature, it can be seen that none of the previous studies on Pakistan have explored the possibility of the twin deficits theory, which is characterized by asymmetric dimension in both the short- and long- run. The claim of a symmetric (i.e. linear) relationship between macroeconomic variables is constraining, particularly when economic policy intervention occurs in a given economy within the time span. As a result, it would be more sensible to use nonlinear econometric methodologies for modelling the relationship between the variables of interest. Hence, there is a compelling case for studying the asymmetric component of Pakistan's twin deficits hypothesis and to fill this vacuum in the literature. Overall, employing the asymmetric cointegration technique to evaluate the twin deficits hypothesis in Pakistan would be a fruitful empirical exercise in the macroeconomics literature relevant to emerging nations.

### III. ANALYTICAL FRAMEWORK

#### Theoretical Background

The national income identity (NII) provides the theoretical foundation for the link between current account balance (CAB) and budget balance (BB) as follows:

$$CAB = (X - M) + F$$



$F$  indicates foreign capital inflows and is considered to play a passive role in determining the  $CAB$ . Therefore,  $CAB$  is parallel to trade balance ( $X-M$ ). The current account is generally financed through government external borrowings or by drawing down of foreign exchange reserves. Alternatively, NII states that

$$S = Y - C - G + CAB \quad \text{OR}$$

$$S = I + CAB$$

where ( $Y - C - G = I$ )

$$\text{As } S = S_p + S_g$$

$$S_p = (Y - T) - C$$

$$S_g = T - (G + R) \supset T - G - R$$

where,  $Y$ ,  $I$ ,  $C$ ,  $T$ ,  $S$ ,  $S_p$ ,  $S_g$ ,  $R$ ,  $G$ , and  $CAB$  stand for level of national income, private investment, private consumption spending, tax revenue, total savings, private savings, government savings, government transfers, government expenditure and current account balance, respectively. Hence,

$$S = (Y - T - C) + (T - G - R)$$

$$S = Y - T - C + T - G - R$$

$$S = Y - C - G - R$$

$$S = I + CAB$$

$$S_p + S_g = I + CAB$$

Rearranging for private savings:

$$S_p = I + CAB - S_g$$

$$S_p = I + CAB - (T - G - R)$$

$$CAB = S_p - I + (T - G - R)$$

where,  $T - (G + R)$  is termed as government budget balance or negative public savings. Private savings, on the other hand, takes three important forms; private domestic investment ( $I$ ), foreign savings ( $CAB$ ), and

purchase of government's newly issued debt. Given the above national income identity, if private sector savings are stable, government sector imbalances will be transferred to external sector resulting in the twin deficits phenomenon. Conversely, the alternate strand argues that public sector imbalances are completely offset by the private sector. A tax cut, for instance, will increase the future savings for payment of future tax increase, thus government deficit does not lead to current account deficit, hence providing rationale for non-existence of any relationship between CAB and BB.

### Econometric Methodology and Data

The study aims at investigating the relation between budget balance and current account balance by incorporating asymmetries. By following the standard practice, we start with a single equation framework while keeping *CAB* as dependent variable and *BB* as independent variable. Considering the studies by Mukhtar et al., (2007), Saeed and Khan (2012), Sakyi and Opoku (2016), Turan and Karakas (2018), and Karras (2019) among others, the econometric model is formulated as:

$$CAB = f(BB, GDPGR, LRER, TOP) \quad (1)$$

$$CAB_t = b_0 + b_1BB_t + b_2GDPGR_t + b_3LRER_t + b_4TOP_t + u_t \quad (2)$$

where, *CAB*, *BB*, *GDPGR*, *LRER* and *TOP* represent current account balance as percent of GDP, budget balance as a percent of GDP, real GDP growth rate, log of real exchange rate, and trade openness respectively. The current account balance is defined as the difference between the external receipts and external payments for trade in goods and services (X-M). Budget balance, on the other hand, is the gap between government revenues and expenditures. The overall trade openness is defined as the sum of exports and imports as percent of GDP. The growth rate of real gross domestic product is obtained in order to measure the extent of economic activity. Whereas, real exchange rate is the nominal rate adjusted for domestic and foreign inflationary pressures,  $RER = NER (P^* / P)$  where *NER* is nominal exchange rate, *P\** is foreign price level and *P* is domestic price level. As US dollar is the

vehicle currency, therefore, US dollar is taken as a benchmark currency to compute real exchange rate.

The relationship between CAB and BB is established by the Keynesian income expenditure approach implying that a negative government savings leads to external borrowing or drawing down of foreign exchange reserves, thus leading to negative current account balance. Economic activity can have both favourable as well as unfavourable effects on CAB. Theoretically, GDP growth is an important determinant of imports. Higher income (GDP) leads to higher induced imports thus leading to current account deterioration. Exchange rate not only determines the value of domestic currency in terms of international currency but it is also used as a tool for balance of payment adjustment mechanism. Exchange rate depreciation/devaluation encourages exports (discourages import) and consequently improves current account balance, and vice versa. However, the size of improvement in CAB is conditional on the elasticity of foreign exchange demand and supply with respect to exchange rate. Finally, TOP determines the level of international supply and demand of a country. Relatively higher demand leads to current account deterioration and vice versa, therefore, TOP can impart favourable as well as unfavourable impact on CAB. In case of Pakistan, TOP has historically resulted in more imports than exports, therefore, we expect an unfavourable impact of TOP on CAB.

The study is based on a yearly data ranging from 1980 to 2018. The data on nominal exchange rate, GDP growth rate and trade openness are taken from the World Development Indicators (2019) published by the World Bank. While, the data on budget balance and trade balance are sourced from various issues of Pakistan Economic Survey, issued by the Government of Pakistan.

### **Estimation Technique**

The estimation is carried out by employing the nonlinear ARDL (NARDL) technique presented by Shin *et al.*, (2014). The NARDL has substantial advantages over previous approaches in terms of modelling asymmetries and cointegration dynamics in a single phase, hence, increasing the cointegration test's performance in small samples. It also adds flexibility by reducing the cointegration model's assumptions about

the time series features of the regressors, which require that they be integrated of the same order. One of the biggest advantages of the NARDL technique is that it is helpful in computing the short- and long-run asymmetric relationship through partial sum decomposition of regressors. In order to test an asymmetric association between BB and CAB, we begin with the linear ARDL:

$$\begin{aligned}
 DLCAB_t = & a_0 + a_1 CAB_{t-1} + a_2 BB_{t-1} + a_3 GDPGR_{t-1} + a_4 LRER_{t-1} + a_5 TOP_{t-1} \\
 & + \sum_{i=1}^{p-1} g_1 \Delta CAB_{t-i} + \sum_{i=0}^{q-1} g_2 \Delta BB_{t-i} + \sum_{i=0}^{q-1} g_3 \Delta GDPGR_{t-i} + \sum_{i=0}^{q-1} g_4 \Delta LRER_{t-i} + \sum_{i=0}^{q-1} g_5 \Delta TOP_{t-i} + e_t
 \end{aligned} \quad (3)$$

The transformation of linear expression into asymmetric or nonlinear requires for the decomposition of budget balance into its positive and negative components (partial sums) which, respectively, represent improvement and deterioration in BB. Following Shin et al., (2014) the asymmetric decomposition of BB is done as:

$$BB_t = BB_0 + BB_t^+ + BB_t^- \quad (4)$$

$BB_0$  denotes no change in the  $BB$  series (i.e. a threshold value of zero),  $BB_t^+$  is the partial sum of positive changes in the  $BB$  series given by:

$$BB_t^+ = \sum_{i=1}^t \Delta BB_i^+ = \sum_{i=1}^t \max(\Delta BB_i^+, 0) \quad (5)$$

$BB_t^-$  is the partial sum of negative changes in the  $BB$  series calculated by:

$$BB_t^- = \sum_{i=1}^t \Delta BB_i^- = \sum_{i=1}^t \min(\Delta BB_i^-, 0) \quad (6)$$

Next, expression (3) can be transformed into the asymmetric error correction model (ECM) as follows:

$$\begin{aligned}
 DLCAB_t = & a_0 + a_1 CAB_{t-1} + a_2^+ BB_{t-1}^+ + a_2^- BB_{t-1}^- + a_3 GDPGR_{t-1} + a_4 LRER_{t-1} + a_5 TOP_{t-1} + \\
 & \sum_{i=1}^{p-1} g_1 \Delta CAB_{t-i} + \sum_{i=0}^{q-1} \{g_2^+ \Delta BB_{t-i}^+ + g_2^- \Delta BB_{t-i}^- + g_3 \Delta GDPGR_{t-i} + g_4 \Delta LRER_{t-i} + g_5 \Delta TOP_{t-i}\} + e_t
 \end{aligned} \quad (7)$$

where,  $\Delta$  denotes the first difference operator,  $\alpha_0$  depicts the drift component,  $\alpha_i$  indicate long run coefficients, while  $\gamma_i$  represent short run

coefficients,  $i = 1 \dots 5$ , and  $e_t$  is usual white noise random error term. Expression (7) can be more compactly written as:

$$\Delta CAB_t = \alpha_1 ECT_{t-1} + \sum_{i=1}^{p-1} \gamma_1 \Delta CAB_{t-i} + \sum_{i=0}^{q-1} \left\{ \begin{aligned} &\gamma_2^+ \Delta BB_{t-1}^+ + \gamma_2^- \Delta BB_{t-1}^- + \gamma_3 \Delta GDPGR_{t-1} \\ &+ \gamma_4 \Delta LRER_{t-1} + \gamma_5 \Delta TOP_{t-1} \end{aligned} \right\} + e_t \tag{8}$$

where,  $ECT_t = CAB_t - d_1^+ BB_t^+ - d_1^- BB_t^- - d_2 GDPGR_t - d_3 LRER_t - d_4 TOP_t$  is the nonlinear error correction term and  $\delta_1^+ = \frac{\alpha_2^+}{\alpha_1}, \delta_1^- = \frac{\alpha_2^-}{\alpha_1}, \delta_2 = \frac{\alpha_3}{\alpha_1}, \delta_3 = \frac{\alpha_4}{\alpha_1}, \delta_4 = \frac{\alpha_5}{\alpha_1}$  are the associated normalized long run parameters.

Two important considerations are taken for the asymmetric analysis of  $BB$  and  $CAB$  under the NARDL technique. Firstly, to check for the existence or absence of co-integration between  $CAB$  and the selected set of independent variables, F-test of Pesaran et al., (2001) is applied. In particular, the null hypothesis of No co-integration (i.e.  $\alpha_1 = \alpha_2^+ = \alpha_2^- = \alpha_3 = \alpha_4 = \alpha_5 = 0$ ) is tested by using lower and upper bounds of F-test statistics as provided by Pesaran et al., (2001). If null hypothesis is rejected, it will indicate presence of long- run relationship between  $CAB$  and  $BB$  together with other explanatory variables given in model (7). Second, if cointegration between  $CAB$  and all the explanatory variables is established, long-run asymmetry inference in model (7) or (8) can be drawn using the Wald test and the following null hypothesis of symmetry:

$$\text{Null Hypothesis: } -\frac{\alpha_2^+}{\alpha_1} = -\frac{\alpha_2^-}{\alpha_1} \text{ or } -\delta_1^+ = -\delta_1^-$$

In the same way, the short-run asymmetric association is identified using the Wald test on the following null hypothesis of symmetric influence of  $BB$  on  $CAB$  in Pakistan:

$$\text{Null Hypothesis: } \sum_{i=0}^{q-1} \gamma_2^+ = \sum_{i=0}^{q-1} \gamma_2^-$$

#### IV. RESULTS AND DISCUSSIONS

We need to evaluate the order of integration of a specified set of variables because we want to use the NARDL approach to analyze the asymmetric nature of the relationship between *CAB* and *BB*. We have used the Augmented Dickey Fuller (ADF) unit root test to do this. The results of the ADF test are listed in table 1. The results reveal that GDP growth rate and *BB* are integrated of order zero i.e.  $I(0)$ . The remaining variables, *CAB*, *TOP*, and *LRER*, appear as  $I(1)$ . Because the regressors contain a mixed order of integration while the dependent variable is  $I(1)$ , it is permissible to use the NARDL technique to test for the short- and long-run nexus between *CAB* and *BB* on econometric grounds.

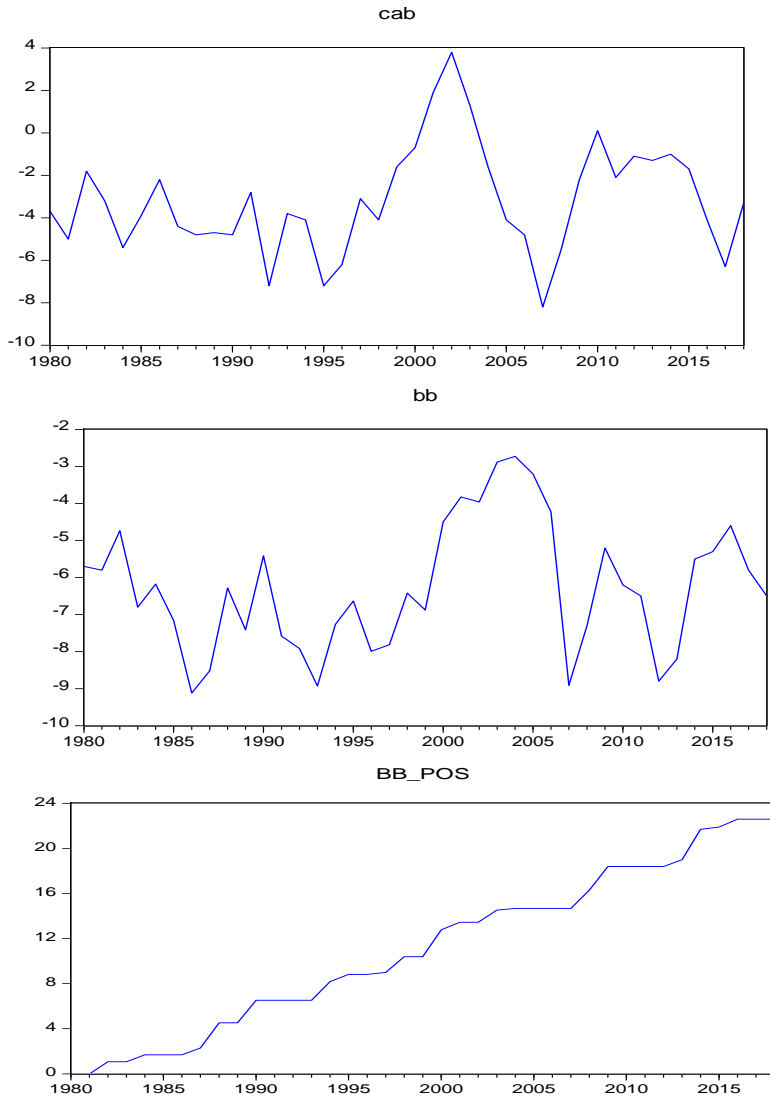
TABLE 1  
Estimates of Unit Root Test

Variables	Level	First Diff	Critical Value (5%)	Decision
CAB	-3.04	-6.16***	-3.19	$I(1)$
BB	-3.07	-6.78***	-3.19	$I(0)$
GDPGR	-3.36***	-	-3.19	$I(0)$
LRER	-1.17	-4.61***	-3.19	$I(1)$
TOP	-2.83	-7.51***	-3.19	$I(1)$

We split the positive and negative components of the series in order to employ the NARDL. Figure 2 shows the negative and positive components of the series. The figure indicates that the positive component of the *BB* series has a less fluctuating trend than the negative component, which has a more fluctuating tendency. Notably, for the chosen time period, the overall *BB* series reveals a highly fluctuating tendency.

As mentioned earlier, to examine the co-integration between *CAB* and selected variables, it becomes mandatory to test the null hypothesis using FPSS test proposed by Pesaran et al., (2001). Under the FPSS test, null hypothesis states that  $H_0: \alpha_1 = \alpha_2^+ = \alpha_2^- = \alpha_3 = \alpha_4 = \alpha_5 = 0$

FIGURE 2  
Current Account Balance (a), Budget Balance (b), Positive  
and Negative components of BB (c & d)



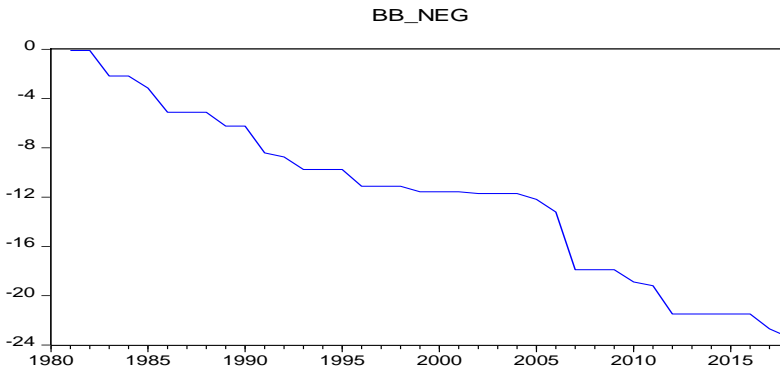


Table 2 shows that the null hypothesis of “No co-integration” is rejected at the 1% level of significance. As a result, a long-run equilibrium relationship exists between *CAB* and all of the model’s (7) explanatory variables. The joint significance of the lagged level variables has an F-test value of 18.67.

TABLE 2

Estimates of F Test (Bound Test)

Value (p-value)	df
18.67*** (0.00)	(5, 34)

The Wald test is then used to see whether there is an asymmetric relationship between *CAB* and *BB* in the long-run. The goal is to test the null hypothesis that both positive and negative *BB* components have the same effect on *CAB*. Table 3 shows that the null hypothesis stating that the positive and negative components of *BB* have the same effect on *CAB* is rejected. As a result, it can be inferred that an increase in *BB* has a different effect on *CAB* than a decrease in *BB* during the chosen time period. As a result, this result justifies the use of the NARDL technique to examine the long-run relationship between *CAB* and *BB*. Alternatively, our findings show that utilising linear ARDL for this relationship will produce deceptive results.



TABLE 3  
Long Run Asymmetry (Wald Test)

Test Statistic	Value (p-value)	df
Chi Square	13.61 *** (0.00)	1

After establishing an equilibrium relationship between CAB and all explanatory variables, including BB in the longrun, we estimate the long run parameters of all the regressors presented in model 7. Table 4 displays the results. According to the findings, the coefficients of BB\_POS and BB\_NEG carry positive signs. A 1% rise in BB (BB\_POS) appears to raise CAB by 0.95 percent, whereas a 1% decrease in BB (BB\_NEG) appears to decrease CAB by 0.29 percent. This result implies that an increase in BB has a different impact on CAB than a reduction in BB. The positive component, in particular, has a stronger influence than its negative counterpart. As a result, we can say that positive and negative aspects of BB have shaped CAB differently in the long run during the study's sample period in Pakistan. This finding is justified as Pakistan, being a small open economy, continuously experiences fiscal pressure as well as external sector imbalances during the selected time period. The period of Post 1995 till 2009 shows huge increase in budget deficit and current account deficit while the decline in either is not appreciable as exhibited from figure 1. Similarly, the peak and trough of both CAB and BB appear in the same time spans. This highlights that there is close association between two balances. Hence, our findings support the Keynesian proposition that changes in fiscal policy does matter for bringing variations in external sector balance. Additionally, it can be stated that BB and CAB are not twins rather they are siblings because increase and decrease in BB do not have equal impact on CAB. Our findings are new and interesting as the literature in respect of Pakistan is limited to the linear testing of the twin deficits hypothesis<sup>3</sup>. This outcome

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<sup>3</sup>The symmetric evidence on twin deficits hypothesis is explained by numerous studies. For instance, the positive relationship between *BB* and *CAB* is supported by Mukhtar et al., (2007) and Chowdhary and Saleh (2007), Saeed and Khan (2012), Hakro (2009), and Siddiqui (2011). Tufail et al. (2014), on the other hand, reports bidirectional causality between the double deficits. While Mudassar et al., (2013) found causality from current account deficit towards the

raises question regarding the validity of the earlier findings reporting linear/symmetric relationship between BB and CAB in the context of Pakistan. Moreover, the policy implications derived from the linear perspective need to be revisited. The asymmetric relationship between both balances is documented by Turan and Karakas (2018) for CEE countries. Similarly, Karras (2019) reported an asymmetric impact of BB on CAB for seventeen developed countries in the post war period.

The remaining regressors also render theoretically expected results. For instance, GDP growth rate exhibits an adverse impact on CAB. Theoretically, imports are determined by the income level of a country. Increase in income increases imports and thus deteriorates CAB. This finding is supported by Khan et al., (2017) who also report worsening current account balance as a consequence of increase in domestic income in Pakistan. However, our result contradicts the evidence documented by Sakyi and Opoku (2016) indicating a rise in national income tends to improve external balance in Ghana.

Next, while the TOP coefficient is statistically significant, it has a negative sign, implying that trade openness is having a negative impact on CAB. Pakistan's experience with trade liberalization has also shown that openness has resulted in more imports than exports. Furthermore, heavy machinery, oil, and manufactured products make up the import component, whilst primary commodities and semi-manufactured goods make up the export composition. As a result, the import bill remained much larger than the export revenues across the study's sample period, putting downward pressure on CAB in Pakistan. Chowdhary and Saleh (2007) likewise conclude that increased trade openness in Sri Lanka leads to a greater current account deficit. According to Khan et al., (2017), the impact of trade liberalization is dependent on the degree of liberalization. Decreasing tariff barriers, for example, has improved the current account balance, whereas lowering non-tariff obstacles has worsened the current account balance.

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budgetary deficit. Recently, Rehman and Saeed (2017) documented that twin deficits hypothesis holds for Pakistan by proving that the causality runs from current account deficit to the budgetary deficit.

Finally, the significant and positive coefficient of real exchange rate shows a favorable impact of real exchange rate appreciation on CAB. Theoretically, the depreciation of domestic currency encourages exports and discourages imports, thus improving the external sector performance. Our findings are in line with Özmen (2005) who explains that flexible exchange rate helps in adjusting the current account disequilibrium. Similarly, Edwards (2004) argues that the shock absorption capacity of countries with flexible exchange rate is higher than those with fixed exchange rate system. Our findings are also supported by Khan *et al.*, (2017) who also find that CAB improves in response to domestic currency depreciation in Pakistan. El-Baz (2014) also reports that real exchange rate forms a positive association with CAB.

TABLE 4  
Long Run Parameter Estimates<sup>4</sup>

Dependent Variable: CAB		
Selected Model: ARDL(2, 2, 2, 1, 1, 2)		
Variable	Coefficient	t-stat
BB_POS	0.95***	5.79
BB_NEG	0.29***	6.53
GDPGR	-1.18***	-8.61
LRER	0.59***	4.59
TOP	-0.48**	-2.32

The implications of the short-run analysis are intriguing. Under the null hypothesis that there is symmetric impact of rise and reduction in BB on CAB, the Wald test is used to look for the short-run asymmetries between BB and CAB. The result in Table 5 indicates that the null hypothesis is rejected, implying that positive and negative changes in BB have distinct effect on CAB. This means that even in the short-run, there is an asymmetric relationship between BB and CAB. Furthermore, we

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<sup>4</sup>Level Equation Case 3: Unrestricted Constant and No Trend.

can see that a rise in BB (BB\_POS) has a considerable positive impact on CAB, whilst a decrease in BB (BB\_NEG) has an insignificant but negative impact. Thus, we again find evidence of asymmetric relationship between BB and CAB. This finding questions the validity of the linear relationship between CAB and BB, even in the short- run. The rest of the regressors carry expected signs and all appear as significant, thus, highlighting the importance of TO, real GDP growth rate and real exchange rate in determining CAB in the short- run as well.

TABLE 5

## Short Run Asymmetry and Asymmetric Error Correction Model

Dependent Variable: D(CAB)			
Selected Model: ARDL(2, 2, 2, 1, 1, 2)			
Variable	Coefficient		t-stat
Constant	7.15***		7.76
D(CAB(-1))	0.81***		11.03
D(BB_POS)	0.43***		8.09
D(BB_POS(-1))	0.19**		2.13
D(BB_NEG)	0.03		0.49
D(BB_NEG(-1))	-0.08		-0.61
D(GDPGR)	-0.37***		-9.11
D(LRER)	0.24***		11.36
D(TOP)	-0.11		1.23
D(TOP(-1))	0.06		0.97
ECT(-1)	-0.61***		16.33
Short Run Asymmetry (Wald Test)			
Test Statistic	Value		df
Chi Square (p value)	21.85 (0.00)		1
Diagnostic Tests			
$\chi_{SC}^2=0.84(0.48)$	$\chi_H^2=0.13(0.71)$	$\chi_{FF}^2=0.57(0.61)$	$\chi_N^2=0.36(0.84)$

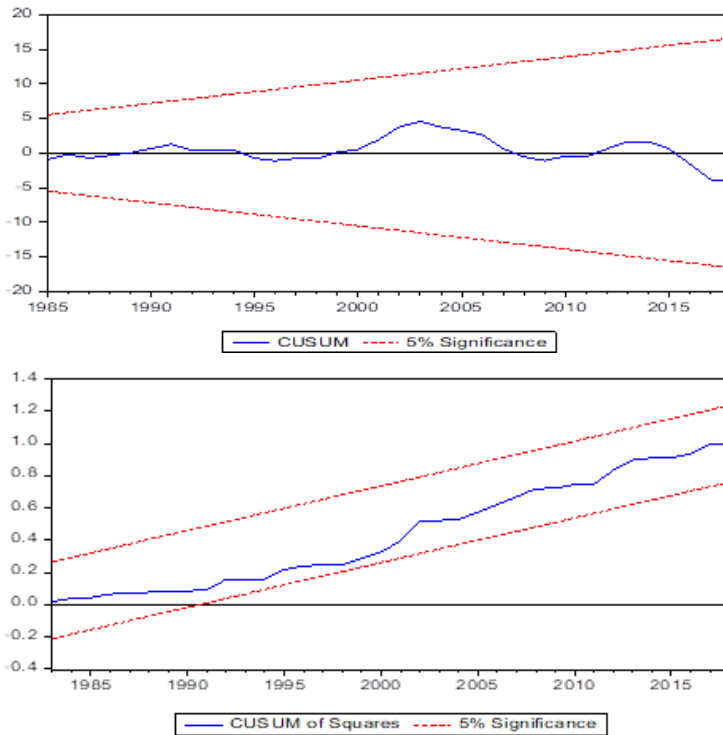
Note:\*\*\* and \*\* indicate significant at 1% and 5% levels respectively.  $\chi_{SC}^2$ ,  $\chi_H^2$ ,  $\chi_{FF}^2$  and  $\chi_N^2$  denote LM test for serial correlation, heteroscedasticity, functional form and normality. The associated p values are in parentheses.

The coefficient of lagged ECT appears as statistically significant with a negative sign implying the stability of the long- run relationship between CAB and all the selected variables given in model (7). The coefficient value of lagged ECT is -0.61 which specifies that if the long-

run equilibrium relationship between CAB and all the explanatory variables contained in model (7) gets disturbed due to any shock, in every short run, almost 61% correction will take place to restore the long-run equilibrium position.

The diagnostic tests at the bottom of Table 5 show that the model is free of serial correlation, heteroscedasticity, functional form, and normality concerns. The relevance of our findings is confirmed by these tests. Finally, the results of the CUSUM and CUSUM of squares tests add to our confidence in the stability of model (7) parameter estimations, as the plots in Figure 3 show that both tests are significant at the 5% level.

FIGURE 3  
Stability Tests (a, b)



## **V. CONCLUSIONS AND POLICY RECOMMENDATIONS**

The debate on twin deficits hypothesis proposed by the Keynesian income expenditure approach is well known and it has undergone several empirical investigations. Because of four separate sets of findings, the existing relevant literature is now inconclusive. The first set of literature seconds the twin deficit hypothesis and suggests a significant impact of budget deficit on current account deficit. The second body of research suggests that both the deficits have a bidirectional link. Another line of research suggests that the two macroeconomic variables have a reverse causal relationship. The final set of studies backs up the Ricardian neutrality hypothesis by demonstrating that the two deficits are unrelated.

This paper empirically gauges the link between budget balance and current account balance over the period 1980 to 2018 for Pakistan by allowing asymmetries in the nexus between the two macroeconomic variables. The study is justly considered as pioneer to explore this dimension for Pakistan. Moreover, it has incorporated the role of trade openness, GDP growth rate, and real exchange rate in determining the nature and degree of relationship between the two balances. Finally, it adopts relatively newer and robust estimation technique to underscore the asymmetries of the twin deficits, namely, the NARDL.

The findings support the Keynesian perspective that budget balance and current account balance are closely related with each other such that the improvement in the former are both necessary and sufficient conditions to obtain desirable performance in the latter. However, the results display an asymmetric impact of budget balance on current account balance in the short- and long- run which imply that improvement and deterioration in budget balance produce varying impact on current account balance in Pakistan. Particularly, an increase in budgetary balance has significantly higher impact on current account balance than a decline in budget balance. Moreover, all the stability tests adopted by the study support the econometric validity of the findings.

The results of the study not only raise questions regarding the soundness of the earlier outcomes on twin deficits hypothesis based on the linear assumption but it also interrogates for the policies which are formulated based upon the linear relationship between both the deficits. The nonlinear/asymmetric relationship requires different policy

framework for current account balance by keeping in perspective the improvement in budget balance relative to deterioration in budget balance.

The policymakers are required to take into account the transmission mechanism through which changes in fiscal policy instruments are transmitted to external sector. Moreover, as explained by our results, trade openness and exchange rate appeared significant contributor to current account balance, therefore, their mediating role should not be ignored by policymakers while forecasting future fiscal prudence mechanism.

Moreover, it is transcribed from our findings that the exercise for identifying the nature of relationship between two deficits ought to be repeated using quarterly and annual data for different time periods. This type of exercise will help us in reaching at relatively more conclusive evidence pertaining to the consistency of different views regarding twin deficits with Pakistan's data. Additionally, the future research may be directed to investigate the mediating role of monetary policy in the twin deficits phenomenon.

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## APPENIX

TABLE A-1

## Definition and Construction of Variables

Variable	Definition	Data source
CAB	Current account balance as percent of GDP (difference between the external receipts and external payments for trade in goods and services, X-M).	Pakistan Economic Survey, issued by the Government of Pakistan.
BB	Budget balance as percent of GDP (gap between government revenues and expenditures)	Pakistan Economic Survey, issued by the Government of Pakistan.
GDPGR	Real GDP growth. Annual percentage change in the real gross domestic product	World Development Indicators (2019) published by the World Bank.
LRER	Log of Real exchange rate. $RER = \ln(NER(P^*/P))$ . US dollar is taken as a benchmark currency (P*) to compute real exchange rate, by following the standard practice	World Development Indicators (2019) published by the World Bank.
TOP	Trade openness as percent of GDP (sum of imports and exports)	World Development Indicators (2019) published by the World Bank.