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Fiscal Deficit and Trade Deficit Nexus in Pakistan: An Econometric Inquiry

Summary: This study is an attempt to explore the short-term and long-term effects of the fiscal deficit along with other macroeconomic variables on the deteriorating trade deficit of Pakistan from 1980 to 2018 by using time series estimation techniques. The result of the autoregressive distributed lag (ARDL) bounds testing approach and error correction term revealed the existence of cointegration among variables of interest. The estimated long-run and short-run results of the ARDL approach showed a significant positive effect of fiscal deficit on Pakistan's trade deficit in the short-run, whereas a significant adverse effect is observed in the long-run. The findings validated the twin deficit hypothesis in the short-run, whereas twin divergence proposition is observed in the long-run. The study suggests prudent fiscal and monetary policies to make macroeconomic conditions favorable for the development and competitiveness of domestic production sectors engaged in the international trade.

Keywords: Trade deficit, Fiscal deficit, Granger causality, ARDL, Pakistan.

JEL: E62, F14, H62.

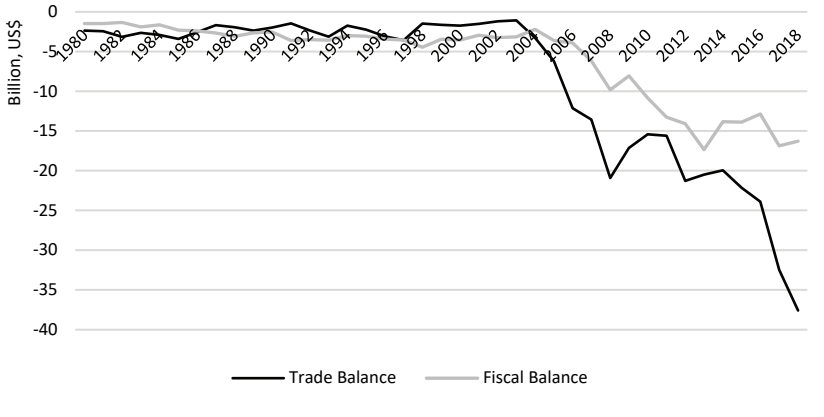
The trade deficit and fiscal deficit have attracted considerable research attention in the development economics because of a persistently large increase in these deficits across the lower competitive developed and developing countries. Pakistan is a small open economy that is facing chronic trade and fiscal imbalances (deficits) throughout the sample period. The increase in the external trade deficit reveals distortion in overall national competitiveness and economic performance. The large and increasing trade deficit is deteriorating the net international investment position by increasing external borrowing. The recent years have witnessed a considerable distortion in the domestic production capacity and international competitiveness of Pakistan in major tradeable sectors (Shujaat Abbas and Abdul Waheed 2017). Pakistan is also facing a persistent and sizeable fiscal deficit because of lower tax revenues and large government expenditures. The tax revenue is dominated by indirect taxes, accounting for 12.9% GDP, whereas direct taxes account for only 2.2% GDP. Ideally, this composition should be reversed, as an increase in domestic prices because of indirect taxes can distort required domestic absorption. Similarly, the government expenditure is dominated by the current expenditure, which remains greater than the total government revenue for most of the sample period, as reported in Table 1. The major portion of fiscal deficit is financed either by public borrowing or an increase in indirect taxes.

The growing fiscal and trade imbalances are creating a nuisance to the sustainable long-term economic growth prospects. The empirical studies on the fiscal and trade deficit are replete with studies claiming contradictory theoretical arguments and supporting empirical evidence. The available empirical literature in Pakistan is not sufficient to establish any robust short-run and long-run relationship. This study investigates the nexus between the fiscal deficit and Pakistan's trade deficit by estimating two eclectic models, constructed by incorporating *per capita* GDP, the official exchange rate, domestic price level, and trade openness as other explanatory variables by using ARDL bounds testing approach. The methodological framework used would provide robust short-run and long-run estimates.

1. Trade Deficit and Fiscal Deficit

This section explores the behavior of the trade balance and fiscal balance of Pakistan from 1980 to 2018. The trade balance is an essential indicator of the overall economic performance and competitiveness. It is a medium of income and employment distribution among nations, and every nation is striving to increase its gains from international trade. The recent increase in international trade wars among developed and developing countries indicates the emergence of mercantilism and the significance of international economic interests.

Pakistan is witnessing a persistent and increasing trade deficit since its inceptions that has considerably increased in recent years to unsustainable 37.58 billion US dollars in 2018. The primary reason is sluggish export growth and the phenomenal increase in imports. The graph in Figure 1 shows a significant distortion in the trade balance after 2003. Abbas and Waheed (2017, 2019) associate the post-2003 distortion in trade deficit with the domestic economy's openness to international trade under WTO agreements.



Notes: Data is collected from the State Bank of Pakistan (2015) and Government of Pakistan - Finance Division (2015).

Source: Authors' construction.

Figure 1 Fiscal Balance and Trade Balance of Pakistan, from 1980 to 2018

The lower-cost intra-industry imports from China, India, Bangladesh, Turkey, and other textile exporters pose a severe threat to domestic intermediate industries. In recent years, especially after 2003, the trade deficit increased considerably and approached 37.6 billion US dollars in 2018. Pakistan's external trade is highly concentrated on some lower value-added exports of labor-intensive agriculture and textile sectors. These two sectors are contributing more than 80% of total merchandise exports. Moreover, international trade relations are confined with few trading partners. On average, Pakistan's external trade balance deteriorates by roughly 9.14% of GDP per annum from 2008 to 2018.

The rising external trade deficit has resulted in a considerable increase in external debt, which has now reached unsustainable levels. The domestic producers' primary problem is their fading competitive behavior, which is aggravated by the imprudent macroeconomic policies. In contemporary macroeconomics, fiscal policy has an important role to play in the process of economic growth. Control of the fiscal expenditures has always remained a difficult task for the policymakers. The revenue collection remains low because of massive tax evasion, as significantly large part of the economy is undocumented. The government revenue is dependent on indirect taxes, which transforms into the economy in the form of an increase in the domestic price level. Moreover, the fiscal deficit financed using domestic and external borrowing would increase the domestic price and distort domestic cost efficiency. The unfavorable security situation has also professed severe threats to the fiscal sustainability efforts of Pakistan.

Table 1 The Fiscal Position of Pakistan (% GDP)

Fiscal year	Fiscal deficit	Government expenditure			Government revenue		
		Total	Current	Develop*	Total	Tax	Non-tax
2008	7.3	21.4	17.4	4.0	14.1	9.9	4.2
2009	5.2	19.2	15.5	3.5	14.0	9.1	4.9
2010	6.2	20.2	16	4.4	14.0	9.3	4.1
2011	6.5	18.9	15.9	2.8	12.3	10.2	3.0
2012	8.8	21.6	17.3	3.9	12.8	9.8	2.6
2013	8.2	21.5	16.4	5.1	13.3	9.8	3.5
2014	5.5	20.0	15.9	4.9	14.5	10.2	4.3
2015	5.3	19.6	16.1	4.2	14.3	11.0	3.3
2016	4.6	19.9	16.1	4.5	15.3	12.6	2.7
2017	5.8	21.3	16.3	5.3	15.5	12.4	3.0
2018	6.5	21.6	16.9	4.7	15.1	12.9	2.2
Average	**6.35**	**20.47**	**16.35**	**4.30**	**14.11**	**10.65**	**3.44**

Notes: Data is collected from Government of Pakistan - Finance Division (2015).

Source: Authors' construction.

Table 1 shows considerably higher total government expenditures as compared with the revenue collection. The average total expenditures, from 2008 to 2018, are approximately 20.47% of GDP with the current expenditure of 16.35% of GDP and development expenditures of only 4.30% of GDP, whereas average government revenue is 14.11% of GDP with tax revenue of 10.65% of GDP and non-tax revenue of

3.44% of GDP. The share of direct taxes in total tax revenue is negligibly low, and the country is dependent on the indirect taxing system, Government of Pakistan - Finance Division (2015). The persistent and increasing trade deficit and the fiscal deficit have significantly contributed to increasing public debt. The total public debt in Pakistan was greater than 93.9% of GDP during June 2019 with an external debt of 39.3% of GDP (State Bank of Pakistan 2019) and is expected to increase. The principal and interest payments on the external public debt increased considerably because of the depreciation of the exchange rate and higher interest rates. The total debt servicing was consuming a considerably large portion of fiscal revenue and emerged as a significant expenditure on national income accounts.

Moreover, political and regional uncertainties and the global recessionary trend, because of the emerging trade wars among major powers, demand efficient utilization of resources in the development of domestic production and services sectors. The imprudent austerity measures and the contractionary monetary policy would further aggravate the conditions required for the development of domestic tradable sectors, including developing import-competing industries.

2. Review of Literature

The theoretical and empirical literature on the fiscal and trade deficit relationship is replete with several different contradicting theories and findings. According to Emmanuel Anoruo and Sanjay Ramchander (1998), twin deficits have been in the economic focus because of the important implications for their long-term economic growth and development. There are three different contradicting approaches to explain this relationship in contemporary economic literature, that is, twin deficit hypothesis, Ricardian Equivalence hypothesis, and twin divergence phenomena.

2.1 Twin Deficit Hypothesis

This section discusses the literature on the conventional view on the fiscal deficit and trade balance relationship, that is, twin deficit hypothesis. The Keynesian believes that an increase in the government budget deficit results in a corresponding increase in the trade deficit. Some proponents of this view contend that an increase in the fiscal deficit increases domestic absorption and income, which induces demand for imports that eventually reduce trade surplus or increase the trade deficit. The Mundell-Flaming open economy macroeconomic model with perfect capital mobility presented by the J. Marcus Fleming (1962) and Robert A. Mundell (1963) urged that an increase in fiscal expenditure induces aggregate demand. This exerts upward pressure on the interest rate that leads to the inflow of foreign capital and appreciation of the domestic currency. As a result, exports fall, imports rise, and the trade balance are deteriorating considerably.

In recent decades, the increase in international competition distorted trade balance and fiscal balance in lower specialized developed and developing economies, and twin deficits have become a major concern for policymakers and economies worldwide. The empirical literature on fiscal balance and the trade balance has sufficient literature that validates twin deficits across the regions or countries. Mark J. Holmes

(2010) explained the relationship between the fiscal deficit and current account deficit in the USA and the findings of the twin deficit in both series. George A. Vamvoukas (2010) investigated the relationship between the fiscal deficit and trade deficit in Greece's small open economy using cointegration analysis, error correction modeling, and Granger trivariate causality analysis for the period from 1948 to 1994. The study's findings revealed the existence of both short- and long-run positive causal effects on the trade deficit. The existence of the twin deficit hypothesis in southern Eurozone countries is confirmed by the Nikolina E. Kosteletou (2013), by testing the twin deficit in the context of a portfolio model containing variables from the financial sector.

In more recent studies, Veronika Šuliková, Marianna Siničáková, and Denis Horváth (2014) investigated the causal relationship between the fiscal deficit and current account deficit in three small open Baltic economies, that is, Estonia, Latvia, and Lithuania from 999Q1 to 2011Q2 using the cointegration analysis, vector error correction model (VECM), Granger causality, and variance decomposition. The findings reveal the existence of a significant positive long-run relationship between the fiscal balance and current account balance in Estonia and Lithuania, whereas no relationship is observed in Latvia. Hubert Gabrisch (2014) scrutinized budget deficits' impact on the current account deficit in three post-transition countries, that is, Czech Republic, Hungary, and Poland, cointegration and Granger causality analysis. The results rejected the existence of the twin deficit hypothesis.

2.2 Ricardian Equivalence Hypothesis

The Ricardian equivalence hypothesis (REH), on the other hand, claimed the absence of any direct relationship between the fiscal deficit and the trade deficit. The proponent of REH urges that the economic agents will perceive a current fiscal deficit financed through a tax cut and bond sale as incurring a future tax liability. Anticipating an increase in future taxes, the economic agents will respond by increasing current saving rather than consumption, see the study by Robert J. Barro (1989). Accordingly, when the demand for credit increases because of fiscal deficit spending, it will be matched by an increase in credit supply by the private sector. As a result, there will be no change in aggregate demand. Therefore, the fiscal deficit has no impact on the trade deficit. The tenet of REH is that the increase in the fiscal deficit will not affect total saving, interest rate, the price level, and national income.

The empirical literature on fiscal and trade deficit is replete with findings supporting REH. Chul-Hwan Kim and Donggeun Kim (2006) investigated the possible causal link between the fiscal and current account balance in Korea using Granger noncausality procedure (Hiro Y. Toda and Taku Yamamoto 1995) from 1970 to 2003. They found no evidence of a causal link. Similarly, Carlos Fonseca Marinherio (2008) evaluated whether Egypt's public deficit impacted the current account imbalance using cointegration and Granger causality analysis. The study rejects the twin-deficit hypothesis because it found reverse Granger causality running from the external trade deficit to budget deficit. In recent studies, Heba E. Helmy (2018) investigates the causal relationship between the fiscal balance, % of GDP, and trade deficit, % of Egypt's GDP by using the VAR model and VECM model. The estimated result revealed no

cointegration between fiscal and trade deficit. The VAR model used to explore causal relationships revealed unilateral causality running from trade deficit to the fiscal deficit.

2.3 Twin Divergence

Twin divergence is another strand of economic literature that urges that the budget deficit and the current account deficit, unlike twin deficit, can move in opposite directions. The proponents of twin divergence provide economic justification based on REH and adjustment of fiscal stimulus into savings. Soyoung Kim and Nouriel Roubini (2008) investigated the effect of government budget deficit shock on the USA's current account balance using vector auto-regression (VAR) models. The estimated result showed that the expansionary fiscal shock improved the USA's current account balance and termed it "twin divergence phenomena". They urge that an increase in private savings and declines in private investment contributes to the current account improvement. In contrast, a nominal exchange rate depreciation, instead of a relative price level change, is responsible for the real exchange rate depreciation. They also justify "twin divergence" based on the prevalence of fiscal expenditures' stimulated output shock. Similarly, Miguel Cardoso and Rafael Doménech (2010) explored the effect of different expansionary fiscal policies on Spain's trade deficit by constructing a dynamic general equilibrium model for Spain. The findings show that the expansionary fiscal policies negatively impact the trade deficit, validating the twin divergence hypothesis. They urge that it may be because of the massive output shock that compensates fiscal expansion policies and a significant change in consumption and saving pattern within the economy.

In more recent studies, Alka Obadić, Tomislav Globan, and Ozana Nadoveza (2014) provided an alternative explanation for the existence of twin divergence by investigating the relationship between the fiscal deficit and trade deficit in the selected four emerging European countries. In this case, indirect taxes determine tax revenue for Bulgaria, Croatia, Poland, and Romania, from 1999(Q1) to 2011(Q4). The findings confirmed the existence of twin divergence in selected countries. They stress that the countries with the indirect tax-tax oriented system, an improvement in the external trade balance, resulting in the reduction in after-tax revenue and consequently, increase the budget deficit.

2.4 Literature in Pakistan

In Pakistan, some notable attempts are observed that have investigated the causal relationship between the fiscal deficit and the current account balance, which are not enough to justify any stable long-run relationships. Anjum Aqeel and Mohammad Nishat (2000) scrutinized Pakistan's twin deficit hypothesis by using the annual time series data from 1973 to 1998. The result of the cointegration analysis confirms the existence of a long-run relationship. In contrast, a significant negative relationship is observed in the short-run, validating twin divergence in the short-run. Tahir Mukhtar, Muhammad Zakaria, and Mehboob Ahmed (2007) reinvestigated the causal relationship between the current account deficit and fiscal deficit. They validated the twin

deficit hypothesis with bidirectional causality. In more recent studies, Navaratnam Ravinthirakumarana, Saroja Selvanathan, and Eliyathamby A. Selvanathan (2016) investigated the causal relationship between the fiscal deficit and the trade deficit in selected SAARC countries. They found unidirectional causality running from fiscal deficit to trade deficit in Pakistan and Sri Lanka, whereas inverse causality is observed in India and Bangladesh.

This study attempts to explore the behavior of the external trade deficit of Pakistan from 1980 to 2018 by constructing eclectic models that incorporate fiscal deficit as significant explanatory variables along with other regressors suggested by the theoretical and empirical literature discussed above. The next section discusses the relationship between the fiscal deficit and the trade deficit in a theoretical framework.

3. Theoretical Framework

To explain the nature of the relationship between the fiscal deficit and the trade deficit in a small open economy, the national income accounting identities provide the basic structure required to trace relationships among macroeconomic aggregates. The Keynesian aggregate demand identity takes the following mathematical form:

$$Y_{AD} = C + I + G + (X - M), \tag{1}$$

where Y_{AD} is the gross domestic product (GDP) measured by using components of aggregate demand, C is consumption, I is investment, G represents government expenditures, X is exports of goods and services, M represents imports of goods and services. Similarly, the main components of GDP measured using aggregate supply components in a small open economy are presented as follows:

$$Y_{AS} = C + S + T + FTR, \tag{2}$$

where Y_{AS} measures GDP measured using components of aggregate supply, C is consumption, S is national savings (private plus public), T is total taxes, and FTR is the net foreign transfers. At equilibrium, $Y = Y_{AD} = Y_{AS}$. By combining Equations (1) and (2):

$$(X - M) = (T - G) + (S - I) + FTR.$$

Rearranging:

$$TB = FB + SI + FTR, \tag{3}$$

where TB represents trade balance, FB is the fiscal budget, SI is the saving-investment gap. Foreign transfers take various forms, such as remittances, foreign investment, borrowing, and official development assistance. The FTR thus measures the overall net international investment position. The considerable increase in the public debt in recent years to a unsustainably high level indicates the adjustments of shortage in aggregate supply through FTR components.

The identity 3 shows that the trade deficit in a small open economy is equal to its fiscal deficit and the saving-investment gap and net unilateral transfers, including remittances. If the saving-investment gap and net unilateral transfers remain stable, then the change in government policies that worsen budget deficit will induce a trade

deficit. This identity provides a basis for the long-run relationship between the fiscal balance and external trade balance. However, this identity does not provide any clue about the behavior of temporal relationship and the direction of causality between fiscal and trade balances. It cannot be expected that the adjustment in identity 3 will come to trade balance. An increase in fiscal deficit because of the tax cut equivalently adjusts by the increase in public savings or unilateral transfers. However, it does not adjust to the external trade balance and the Ricardian argument. If an increase in fiscal expenditure results in a shock on domestic productivity growth or output level, according to Kim and Roubini (2008), in that case, the trade balance will improve, and the twin divergence mechanism will hold.

4. Methodological Framework

This section specifies the data issues, model specification, and estimation strategies used to establish robust short-term and long-term relationships between Pakistan's fiscal deficit and trade deficit from 1980 to 2018.

The annual data of the trade deficit and fiscal deficit of Pakistan from 1980 to 2018 are taken from the State Bank of Pakistan (2015) and Government of Pakistan - Finance Division (2015), whereas other variables are collected from the World Development Indicators published by the World Bank (2019). The definition and descriptive statistics of selected variables are presented in the Appendix (Table A1). The random variables with the normal distributions are considered for econometric analysis.

4.1 Model Specification

Given, the disagreements among reviewed theoretical and empirical literature regarding the nature and direction of causal relationships, Aqeel and Nishat 2000; Mukhtar, Zakaria, and Ahmed 2007; Kim and Roubini 2008; Šuliková, Siničáková, and Horváth 2014; Helmy 2018 urge the use of Granger causality analysis to explore the direction of the relationship between the fiscal deficit and the trade deficits. In recent studies, Ravinthirakumarana, Selvanathan, and Selvanathan (2016) have concluded unidirectional causality running from fiscal debt to the trade deficit in Pakistan's case. This study examined the direction of the causal relationship between selected random variables with normal distribution for the fiscal (FBGDP) and trade deficit (TBGDP). The mathematical representation of vector autoregression (VAR)-based stochastic analysis used (to explore the linear interdependencies) is presented in Equations (4) and (5):

$$TBGDP_t = c_1 + \sum_{i=1}^{n} \gamma_1 \, TBGDP_{t-i} + \sum_{i=0}^{n} d_1 \, FBGDP_{t-i} + \ \mu_t, \tag{4}$$

$$FBGDP_t = c_2 + \sum_{i=1}^{n} \gamma_2 \, FBGDP_{t-i} + \sum_{i=0}^{n} d_2 \, TBGDP_{t-i} + \varepsilon_t, \tag{5}$$

where $TBGDP_t$ is the trade balance as a percentage of GDP at the time (t), $FBGDP_t$ is the fiscal balance as a percentage of GDP at the time (t), the subscription i represents selected lag length of the VAR, γ is the coefficients of auto-regression, and d is the distributed lag coefficient.

Table 2 Granger Causality Analysis

Null hypothesis	Chi-sq	Prob.	Null hypothesis	Chi-sq	Prob.
TBGDP does not cause FBGDP	1.287	0.301	FBGDP does not cause TBGDP	2.908*	0.020

Notes: On Chi-square statistics reveal a rejection of the null hypothesis, of no causality, at a 5 % significance level.

Source: Authors' estimation.

The VAR model considers selected variables as endogenous. The estimated result of Granger causality analysis in Table 2 reveals unidirectional causality running from FBGDP towards TBGDP at a lag length of 4. The direction of causality analysis corresponds with the findings of Ravinthirakumarana, Selvanathan, and Selvanathan (2016). After establishing a functional relationship, the next step is to reduce omitted variables bias by incorporating other explanatory variables suggested by economic theory and empirical literature. The mathematical presentation of estimated models is presented in Equation (6):

$$TBGDP_t = a_0 + a_1 FBGDP_t + \sum_{i=2}^{n} a_i Z_t + \mu_t, \quad (6)$$

where Z_t is a composite variable, which contains the effect of other explanatory variables, the subscription i shows selected n explanatory variables, the theoretical and empirical economic literature suggests three approaches to explain trade balance behavior, that is, elasticity approach, Keynesian approach, and monetarist approach. Among these, the elasticity approach identifies the exchange rate as significant determinants of the trade balance. Keynesian income approach identifies the level of economic activities, that is, gross domestic product, whereas the monetarist approach considers excess of money supply and price level as significant determinants of the balance of payment deficit, (Mohsen Bahmani-Oskooee 1992).

This study constructed two eclectic models for the trade deficit to reduce serial correlation and other econometric complications. The first model, following the elasticity and Keynesian approach, used official exchange rate (LOER)[1] and *per capita* gross domestic product (LPCGDP) as explanatory variables. The second model, following elasticity approach and monetarist approach, incorporated LOER, domestic price level (LCPI), and trade openness (TOPN) as other control variables. The Extreme Bound Analysis (EBA) approach was introduced by Edward Leamer (1985) and modified by Rose Levine and David Renelt (1992). This approach claims that if changes in other explanatory variables (as suggested by the literature) do not change the sign and significance of established relationships, the relationships are said to be robust, otherwise fragile. The modeled variables are then subjected to stochastic VECM to trace response of TBGDP to Cholesky one standard deviation innovation in selected explanatory variables. The optimal lag length is selected on a minimum of Scheward criteria, with a maximum 4 lags. The findings of sensitivity analysis and the impulse response function will reveal the reliability of established relationships.

The elasticity approach to trade balance suggests that the exchange rate is an important determinant. Moreover, Anoruo and Ramchander (1998) argue in favor of

[1] The asymmetric behavior of real effective exchange rate (REER) in both absolute and logarithmic form forced to use official exchange rate.

LOER in the trade deficit model. The increase in LOER (depreciation of Pakistani Rupee) of Pakistan makes exports cheaper and imports expensively, reducing the external trade deficit. The short-run and long-run effects of exchange rate depreciation should be different and generate a J-curve effect. Accordingly, the initial trade balance should deteriorate and then starts to improve in the long-run.

The Keynesian income views consider economic activities and income level as significant determinants of the trade balance. The increase in *per capita* gross domestic product (PCGDP) would affect the trade balance through its relative effects on export and import behavior. Keynesian believes that the increase in domestic income will induce demand for imported goods resulting in deterioration in the trade balance. The monetary approach to the trade balance considers the domestic money supply and price/inflation rate as a determinant of the trade balance. The plethora of literature has modeled the domestic price level as an explanatory variable of trade/current account balance (L. E. Winner 1993; Anoruo and Ramchander 1998; Olubenga A. Onafowora and and Oluwole Owoye 2006). Trade openness (TOPN) proxies the effect of globalization on the trade balance and its effect on relative growth in imports and exports. If trade openness leads to the expansion of exports, it would positively affect economic growth. Empirical studies on the economic effect of trade openness revealed a mixed effect on economic growth. The finding of Abbas (2014) has reported a significant negative economic effect of trade openness on selected developing and least developed economies, including Pakistan.

4.2 Estimation Strategy

The stationarity of selected variables is tested using the Augmented Dickey fuller unit root test, proposed by the David A. Dickey and Wayne A. Fuller (1979), and Phillips-Perron unit root test, proposed by the Peter C. B. Phillips and Pierre Perron (1988). The selected series are then subjected to autoregressive distributed lag (ARDL) bounds testing approach to cointegration test proposed by the M. Hashem Pesaran, Yongcheol Shin, and Richard J. Smith (2001). This approach has several advantages over the alternatives, that is, JJ cointegration analysis proposed by the Søren Johansen (1988) and Johansen and Katarina Juselius (1990). First, it provides relatively efficient estimates for the small sample size. Second, it is applicable even when variables are integrated at level *I*(0). Third, it also shows both short-run and long-run relationships along with the adjustment of short-term shocks in a year. The lag length is automatically selected based on the minimum value of Schwarz criteria. The unconstrained ARDL error correction models used are presented in Equations (7) and (8) as follows:

$$\begin{aligned}\Delta TBGDP_{it} = a_0 + \vartheta_1 TBGDP_{t-1} + \vartheta_2 FBGDP_{t-1} + \vartheta_3 LOER_{t-1} + \\ + \vartheta_4 LPCGDP_{t-1} + \sum_{i=1}^{n} \gamma_1 \Delta TBGDP_{t-i} + \sum_{i=0}^{n} \gamma_2 FBGDP_{t-1} + \\ + \sum_{i=0}^{n} \gamma_3 \Delta LOER_{t-i} + \sum_{i=0}^{n} \gamma_4 \Delta LPCGDP_{t-i} + \varepsilon_t,\end{aligned} \tag{7}$$

$$\begin{aligned}\Delta TBGDP_{it} = a_0 + \vartheta_1 TBGDP_{t-1} + \vartheta_2 FBGDP_{t-1} + \vartheta_3 LOER_{t-1} + \vartheta_4 LCPI_{t-1} + \\ + \vartheta_5 TOPN_{t-1} + \sum_{i=1}^{n} \gamma_1 \Delta TBGDP_{t-i} + \sum_{i=0}^{n} \gamma_2 FBGDP_{t-1} + \sum_{i=0}^{n} \gamma_3 LOER_{t-i} + \\ + \sum_{i=0}^{n} \gamma_4 \Delta LCPI_{t-i} + \sum_{i=0}^{n} \gamma_5 \Delta TOPN_{t-i} + \varepsilon_t.\end{aligned} \tag{8}$$

The ARDL bounds testing approach to cointegration analysis involves estimation of the above equations and conducting tests to check the joint significance of all long-term estimates ϑ_i. Pesaran and Shin (1999) and Shin, and Smith (2001) introduced two critical values for the lower bounds I(0) and the upper bounds I(1). The value of *F*-statistics greater than the upper bound's value will reject the null hypothesis of no cointegration. After establishing cointegration, the next stage is an exploration of short-run and long-run relationships. The ARDL bounds approach also provides both short-term and long-term estimates and the adjustment of short-term shocks into equilibrium.

5. Analysis of Results

This section discusses the estimated results and establishes the long-run and the short-run dynamic relationships between the trade deficit (TBGDP) and the fiscal deficit (FBGDP) of Pakistan from 1980 to 2018.

The time series variables tend to change over time and do not have any fixed or stationary mean and variance. The presence of non-stationary variables can lead to spurious regression. The estimated result of the unit root analysis explored using Dickey and Fuller (1979) and Phillips and Perron (1988), presented in the Appendix (Table A2), reveals the existence of unit root at the level that becomes stationary at first difference. The time series with the same order of integration I(1) is then subjected to the ARDL bounds approach test to examine the existence of a cointegration relationship and explore the dynamic short-run and long-run relationships. The estimated results of the ARDL Bounds testing approach presented in Table 3 reveal cointegration among the variables at 5% significance level. The estimated ARDL model is then used to explore dynamic short-run and long-run relationships. The coefficient of error correction terms (ECT) in Table 4 shows a significant negative effect, which implies adjustments of 0.747% of short-run equilibrium shocks of the model 1 converge to equilibrium in a year, whereas model 2 converges 0.631% of short-term disequilibrium shocks. The higher convergence of disturbances validates the established cointegration relationships, as reported in Table 3.

Table 3 Result of Cointegration Analysis

Model 1	ARDL: 1, 3, 1, 3		Significance level	Critical value	
	Value	DF		I (0)	I (1)
F-stat.	8.827	3	10 percent	2.26	3.35
			5 percent	2.62	3.79
			2.50 percent	2.96	4.18
			1 percent	3.41	4.68*
Model 2	ARDL : 1, 3, 2, 0, 1		Significance level	Critical value	
	Value	DF		I (0)	I (1)
F-stat.	7.401	4	10 percent	2.26	3.35
			5 percent	2.62	3.79
			2.50 percent	2.96	4.18
			1 percent	3.41	4.68*

Notes: The critical values of the ARDL bounds test reveal both lower bound and upper bound values at varying levels of significance with k = 4. * and ** shows significance at the 1 percent level.

Source: Authors' estimation.

After confirming the existence of cointegration in both the models, the next stage is to explore the dynamic short-term and long-term relationships. The ARDL bounds testing approach also provide efficient short-term dynamics and long-run relationships. Estimated results in the upper panel of Table 4 reveal long-run effects, whereas the lower panel shows error correction and the short-term estimates. The estimated short-run estimates of fiscal balance as a percentage of GDP (FBGDP) revealed a significant positive effect at the second and third lag differences, indicating the Twin deficit's prevalence. It implies that an increase in fiscal deficit would increase the trade deficit in the short-run because of the induced imports of raw materials, intermediate goods, and capital goods. The selected variable's long-run economic effects would be different from short-run estimates because of the dynamic adjustment and change over time. The estimated long-run fiscal deficit results revealed a significant and robust negative effect, implying the prevalence of twin divergence phenomena. Moreover, the sensitivity analysis explored by using the unrestricted VECM-based impulse response function validated the established negative relationship, see the Appendix (Figures A3 and A4). It implies that the increase in fiscal deficit would reduce the external trade deficit in the long-run.

Table 4 Estimated Result of ARDL Model

Variable	ARDL: 1, 3, 1, 1, 1		ARDL: 1, 3, 3, 1, 1, 1	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Constant.	43.387	6.315*	-37.08	-5.987*
FBGDP	-1.08	-4.332*	-1.342	-3.169*
LOER	8.8	9.276*	23.586	6.353*
LPCGDP	-13.898	-10.103*	-	-
LCPI	-	-	-19.08	-5.16*
TOPN	-	-	0.185	1.642
	Coefficients	*t*-statistics	Coefficients	*t*-statistics
Δ FBGDP	-0.216	-1.095	0.246	1.737***
Δ FBGDP(-1)	0.025	0.13	-0.3	-1.328
Δ FBGDP(-2)	0.574	3.443*	0.071	0.337
Δ FBGDP(-3)	-	-	0.74	3.671*
Δ LOER	-5.255	-2.163**	-1.906	-0.627
Δ LPCGDP	-0.897	-0.358	-	-
Δ LCPI		-	-12.137	-5.386*
ΔTOPN	-	-	-0.184	-1.760***
ECT(-1)	-0.747	-5.864*	-0.631	-4.755*
		Model 1		Model 2
Adjusted R^2		0.918		0.902
SE of regression.		0.897		0.984
Durbin-Watson statistics		2.388		2.392
F-statistics, [probability]		44.716[0.000]		30.201[0.000]
Jarque-Bera statistic, [probability]		2.482[0.289]		1.272[0.529]
LM. test: *F*-statistic, [probability]		2.443[0.108]		2.283[0.126]
ARCH: *F*-statistic, [probability]		0.003[0.957]		1.445[0.237]
RESET test: *F*-stat. [probability]		0.427[0.673]		0.290[0.774]

Notes: *, **, and *** show significance at the 1 percent level, 5 percent level, and 10 percent level, respectively. Jarque-Bera statistics test the normality of distribution. The LM test is Breusch-Godfrey serial correlation Lagrange multiplier (LM). The ARCH is an autoregressive conditional heteroscedasticity test. The RESET is Ramsey Regression Equation Specification Error Test (*RESET*) test. Wald coefficient restriction tests can be used to explore the significance of the asymmetric relationship.

Source: Authors' estimation.

An increasing volume of imported goods can explain the prevalence of twin deficit in the short-run because of an increase in fiscal expenditures. In the long-run, the imported raw material and other inputs start to participate in the production process. The private sector investment is mostly confined to urban industries, stock market, deposits, real estate, and so on. The massive infrastructure and market development that requires substantial investment is dependent on public sector investment. In this regard, the fiscal policy instruments play an essential role in explaining economic and trade performance behavior. The official exchange rate reveals a significant negative effect on the trade deficit of Pakistan in the short-run, whereas a significant positive effect is observed in the long-run. It implies that an increase in official exchange rates (depreciation of Pakistani Rupee) distorts the external trade balance only in the short-run, whereas it considerably improves the trade deficit in the long-run. The time path of the short-run and the long-run effect on the trade deficit validates the J-curve effect of the official exchange rate.

The increase in *per capita* gross domestic product shows a significant negative effect in the long-run, which is consistent with the Keynesian views that are an increased income, inducing demand for imported goods and distorting the trade balance in the long-run. The findings are consistent with the argument established by Abbas (2019), that is, increasing in domestic income is inducing import demand of consumer durables and non-durables in Pakistan. The increase in the domestic price level, consistent with the monetarist approach, shows a significant negative effect of higher intensity on Pakistan's trade deficit in both the short-run and long-run. It implies that the monetary policies leading to a higher price level would increase production cost and distort the trade balance. The increase in trade openness revealed a significant adverse effect with an insignificant effect in the short-run.

The estimated coefficients of FBGDP and LOER estimated in model 1 are consistent with results in model 2, which, according to Leamer (1985) and Levine and Renelt (1992), validates the robustness of established relationships. Moreover, the estimated models are also subjected to stochastic impulse response function generated using a VECM. The result of the impulse response function in the Appendix (Figures A3 and A4) is consistent with the established relationships. The lower panel of Table 4 reveals the predictive efficiency of the estimated models and tested various test statistics and diagnostics tests. The adjusted coefficient of determination (Adj. R^2) reveals that estimated models explain more than 90% variation in the dependent variable. The standard errors of both the models are low, and *F*-statistic validates the goodness of fit. The findings of Jarque Bera statistic and corresponding probability value reveal the normality of distribution in both models; the result of Durbin-Watson statistic and Lagrange multiplier test for serial correlation reveals no serial correlation in the estimated models. The ARCH test findings and the RESET test validate that models are free from heteroscedasticity and are correctly specified, respectively.

6. Conclusion

Pakistan is facing a persistent and large trade deficit and the fiscal deficit that has considerably increased public debt to an unsustainably high level. This study investigates the short-run and the long-run determinants of fiscal deficit and other macroeconomic policy variables on Pakistan's external trade deficit by constructing eclectic models that incorporate *per capita* GDP, the official exchange rate, domestic price level, and trade openness as explanatory variables. With the same order of integration, the selected time series variables are first subjected to Granger causality analysis to explore the functional relationships.

The result of the ARDL bounds testing approach revealed the existence of cointegration relationships among selected variables. The error correction term's findings revealed significant negative effects of higher intensity, validating established cointegration relationships. The estimated short-run and long-run ARDL model estimates revealed a significant positive effect of fiscal deficit on the trade deficit of Pakistan in the short-run, whereas a significant negative relationship is observed in the long-run. Thus, the findings validate the twin deficit hypothesis in the short-run and twin divergence proposition in the long-run. Similarly, the long-run estimates of *per capita* GDP revealed a significant negative effect. It implies that the increase in domestic income is inducing import demand and distorts trade deficit in the long-run. The increase in official exchange rates reveals a significant negative effect on the trade deficit in the short-run, whereas a significant positive effect in the long-run. An increase in the domestic price level revealed that an increase in domestic prices would induce domestic cost of production and distort domestic competitiveness. The concerned authorities should control the increasing domestic prices and make macroeconomic conditions favorable for domestic tradable sectors.

This study urges Pakistan to develop its internal economic structure and encourage economic activities through favorable and consistent policies. In this regard, the expansionary fiscal policy would have a favorable effect on Pakistan's trade deficit in the long-run. The expansionary fiscal policy financed through higher indirect taxes, and public borrowing would not be beneficial. Instead, the government should finance deficit through direct tax collection. The major problem with the domestic production sector is unfavorable and inconsistent with fiscal and monetary policies. The austerity measures taken in fiscal front, along with a contractionary monetary policy with a high-interest rate and domestic price level, can distort trade balance in both the short-run and long-run. The monetary authorities should stabilize the increasing domestic price level.

Future research can model the asymmetric effect of fiscal deficit and other explanatory variables on trade balance of Pakistan. Moreover, the inclusion of other macroeconomic variables would also expand the scope.

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Appendix

Table A1 Data Definition and Descriptive Statistics

Variable	Definition	Mean	Skewness	Jarque-Bera
TB	Trade balance, million US$	-8613.533	-1.308	11.939*
TBGDP	Trade balance, % of GDP	-6.745	0.110	2.342
FB	Fiscal balance, million US$	-5929.159	-1.136	8.526**
FBGDP	Fiscal balance, % of GDP	-5.665	0.266	0.664
PCGDP	*Per capita* gross domestic product, constant 2010 US$	678.402	0.890	5.972***
LPCGDP	Natural logarithm of PCGDP	6.384	0.529	4.233
	Real effective exchange rate, the base year 2010	126.897	1.521	16.491*
LREER	Natural logarithm of REER	4.807	1.255	10.407*
LOER	Natural logarithm of OER	3.726	-0.316	2.684
CPI	Consumer price index, the base year 2010	56.925	0.971	6.434*
LCPI	Natural logarithm of CPI	3.664	0.059	2.445
TOPN	Trade openness	33.399	-0.619	2.494

Notes: This study's data are taken from open data sources such as the World Bank, International Monetary Fund and State Bank of Pakistan. *, **, *** revealed asymmetric distribution at varying confidence levels, such as 1 percent, 5 percent, and 10 percent.

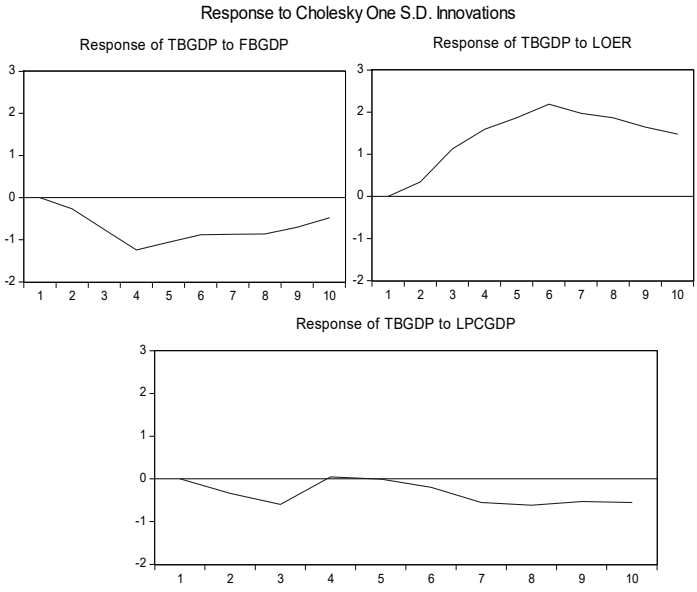
Source: Authors' calculation.

Table A2 The Result of Unit Root Analysis

Variables	ADF test statistic				Remarks
	I(0)		**I(1)**		
	C	*C and T*	*C*	*C and T*	
TBGDP	-0.644	-1.674	-6.690*	-6.836*	I(1)
FBGDP	0.034	-1.374	-6.620*	-6.821*	I(1)
LOER	-2.085	-0.477	-5.480*	-8.852*	I(1)
LPCGDP	2.137	-0.631	-4.626*	-5.657*	I(1)
LCPI	0.771	-2.119	-5.581*	-4.270*	I(1)
TOPN	-1.094	-3.448	-5.018*	-4.956*	I (1)
Variables	PP test statistic				Remarks
	I(0)		**I(1)**		
	C	*C and T*	*C*	*C and T*	
TBGDP	-0.408	-1.568	-6.774*	-8.022*	I (1)
FBGDP	0.053	-1.41	-6.565*	-6.806*	I (1)
LOER	-2.085	-0.477	-5.480*	-8.852*	I (1)
LPCGDP	2.087	-0.562	-4.606*	-5.661*	I (1)
LCPI	0.849	-2.138	-5.576*	-5.665*	I (1)
TOPN	-1.011	-2.776	-6.160*	-6.123*	I (1)

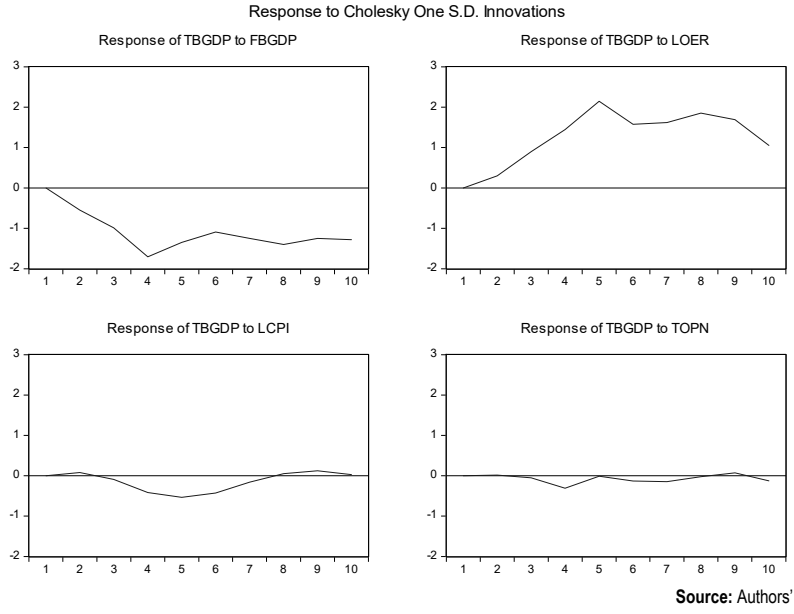
Notes: The critical values for PP and ADF test with constant and constant & trend at 1, 5, and 10 % level of significance are -3.63, -2.95, -2.61, and -4.24, -3.54, and -3.20, respectively. * and ** show significance at 1 and 5 percent level, respectively.

Source: Authors' estimation.



Source: Authors' estimation.

Figure A3 Impulse Response of Variables at Model 1



Source: Authors' estimation.

Figure A4 Impulse Response of Variables at Model 2

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