






## Twin Deficit Hypothesis Validation: A case study of Pakistan

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### Abstract

*The core purpose of this paper is to empirically test the twin deficit hypothesis validation in context of Pakistan. To achieve this purpose, we used annual data on Pakistan's budget and the trade deficit in the period from 1976 until the end of 2017 and applied econometrics method: ARDL (Autoregressive Distributed Lag) bound test to analyze the short run and long run association between budget deficit and trade deficit. The study confirms both short run and long-run co-movements of trade deficit and budget deficit. The statistical value of the long run relationship estimate that 1% change in trade deficit causes positive change of 0.3% in budget deficit, while in short run 1% change in trade deficit causes negative change of 0.57% in budget deficit. The study results validates twin-deficit hypothesis and invalidates the Ricardian Equivalence proposition in context of Pakistan and conclude that trade deficit is one of the determinants of budget deficit and can cause it. The variables have significant relationship in both short run and long run. The policy makers should focus not only on reducing the deficit balance of budget, but also on improving the country external position though promotion of export.*

**Keywords:** Trade deficit, Budget deficit, Inflation, Foreign Direct Investment, Gross Domestic Products (GDP)

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## I. INTRODUCTION AND BACK GROUND

The co-movement of deficit balance of budget and deficit balance of trade generally known as twin deficit is extensively discussed in literature. It has attracted the attention of researchers and policy makers in the development economies because of large increase of these deficits across the lower competitive developed and developing countries. The twin deficit phenomenon was first emerged in the 1980s, when downturn in U.S trade account leads to rise up in the federal balance of budget. Economists were of the view that the large deficit in trade balance is because of record level deficit budget balance. Later, this mutual relation was given the name of twin deficit hypothesis.

In accordance with Mundell–Fleming model increase in deficit budget balance positively stresses interest rate, which directs increase of incoming capital and domestic currency appreciation and finally this up-gradation in domestic currency provides with the increase in the trade deficit.

According to the Keynesian absorption theory an increase in the budget deficit would increase in imports and this increase in imports leads to worsening condition of trade deficit.

According to the Ricardian Equivalence Hypothesis (REH), there is no association between the budget deficit and the trade deficit and that the trade deficit is not being caused by budget deficit. The perfect REH implies the rational behavior of taxpayers, who are forward-looking persons and will not respond to tax cuts by increasing their spending, but rather prepare to pay future tax liabilities by increasing their savings (Barro, 1989, p. 39; Hashemzadeh and Wilson, 2006).

Anyanwu (1993) states that budget policy (fiscal policy) indicates that government activity which is related to the increase in revenue by taxation and other variable means and also taking a decision on the degree and scheme of expenditure of that revenue to accomplish economic activities. It means this policy manages public disbursement, taxation, public borrowing and other types of incomes to affect the economic activities for attainment of certain considerable macro-economic targets. Budget is deficit when government's expenses overpass its revenues. Pakistan is facing a very massive budget deficit and the value of this deficit in 2018 was 37.58 billion US dollars. The cause behind this deficit is the sluggish export growth and the phenomenal increase in imports and meaningful increased reliance of country upon outside fund resources in the form of debt and other assisting aids.

In addition the subsidies provided by the government in different commodities, especially in the energy sector like in gas, petroleum and electricity also add up in the budget deficit. Other additional reasons of budget deficit are fluctuation in interest payments due to fluctuation in dollar exchange rate, increased aggregate demand, and increased investment in public sector.

A trade deficit occurs when a country's import exceeds what it exports. More over unstable exchange rate many times increases amount than actual we have to pay for

imports. The continuous trade deficit had an adverse effect on a country's interest rates. It devalues domestic currency and the prices of commodities rises, in other words, it leads to higher inflation level. Economic theory states that an insistent deficit of trade is adverse to the economic growth of a country by impacting hostile to employment rates, growth and value of currency.

It is the outcome of many empirical studies that budget deficit and trade deficit are not only directly linked with each other, but they both also adversely affect other macro-economic variables. Researchers such as Premchard (1984), Kawai (1985), Darrat (1988), Volcker (1987), Kearney and Monadjemi (1990), Ibrahim and Kumah (1996), Khalid & Guan (1999), Vamvoukas (1999), Anjum and Nishat (2000), Piersanti (2000), Rauf and Qayyum (2011), Fidrmuc (2003), Saleh et al. (2005), Neaime (2008), Siddiqui (2009), Kashif et al. (2014), Ali, A., & Kakar, A. (2017), Gebremariam, T. K. (2018), Murshed, M., & Nijhum, N. K. (2019), Mohanty, R. K. (2019), N. S. A. (2020) found and supported the concept that worsening of trade balance would ultimately lead to budget deficits.

## II. LITERATURE REVIEW

Researchers, social scientists and practitioners extensively tried to empirically investigate the relationship between the trade deficit and budget deficit. However, during periods 1960's, 1970's and 1980's the main focus of the researchers is to investigate only two prototypes of twin deficit, i.e. trade deficit is being caused by fiscal deficit (Keynesian view) and there is no impact of fiscal deficit on trade deficit (Ricardian view). Later on the focus is being shifted towards two other possible prepositions i.e. (Summer's view), there is reverse causality and (Darrat, 1988 and Monsouri, 1998), there is a bi-directional relationship between budget deficit and trade deficit.

Hutchison and Pigott (1984) utilized US economy data to investigate the link between budget deficit, exchange rates, interest rates and trade account by a theoretical macro model based on open economy under elastic exchange rates suggested that domestic interest rate increases due to the budget deficit and resulted interest rates would persuade an increase in real exchange rates and finally leads to trade deficit.

Ahmed et al, (1998) by study found that Pakistan is continuously having highest deficit in budget balance because of inefficacious and unproductive patterns and policies of revenue generation. More said the main reason behind deficit in budget balance is hereditary structural problems in the tax system of Pakistan.

Khalid & Guan (1999) utilized time series data of some developed and some developing countries to study twin deficit by using cointegration technique and found no evidence of twin deficit in advanced economies, but in developing countries strong evidence of twin deficit found in long run.

Egwaikhide and Piersanti (1999) & (2000) respectively by empirical studies found that deficit balances of budget and trade have a significant positive association

statistically with each other.

Aqeel and Nishat (2000) utilized annual data of Pakistan of period 1973-1998 to investigate the relation of budget deficit with trade deficit using ECM and cointegration technique. They found long run positive and short run negative association between variables.

Rauf & Qayyum (2001) studied time series data of Pakistan from era 1980-2009 and found that budget deficit is an aftereffect of trade deficit in short-run and sequel run from trade deficit to the budget deficit.

Kashif et al, (2004) by the study of time series data of Pakistan for the period 1980-2009 supported the twin deficit hypothesis.

Simon Neaime (2008) conducted study on Lebanon data for period 1970-2006 using time series analysis found positive association between budget deficit and trade deficit in the short run but no significant relation in the long run was observed between both deficits.

Hakro, (2009) using autoregressive model found a sequel relationship between twin deficit and the economy's other macroeconomic variables by utilizing time series data of Pakistan for the period of 1948-2005.

Saeed and Khan (2012) used time series data of Pakistan from the period 1972-2008 to study Ricardian Equivalence hypothesis by cointegration technique. The study supported the positive long run relationship between the current account deficit and budget deficit. More over study supported uni-directional causality between variables. According to author FDI and defense expenditure increases imports demand, which increase current account deficit and forwarded to budget deficit. Hence Pakistan is a non-Ricardian economy that faced twin deficits.

Jawaid and Raza (2013) studied relationship of deficit balance of budget and deficit balance of trade in the context of Pakistan. The study utilized data of period 1976-2010 and found that both variables possess positive significant relationship in the long run and short run. The study also observed unidirectional causality which runs from budget deficit to trade deficit in short run.

Tufail et al. (2014) studied twin deficit phenomenon using annual data of Pakistan for the period 1972-2011. The study found that both variables possess significant positive relationship and also there is bidirectional causality between variables.

Ali, A., & Kakar, A. (2017) conducted study on annual data of Pakistan for period 1980-2014. The study used ARDL bound test to verify the long run connection between deficit balance of budget and deficit balance of trade account. The results suggest that the variables are linearly correlated with each other in long run while causality moves from deficit balance of trade account to budget deficit.

Gebremariam, T. K. (2018), in context of Ethiopia tested the effect of budget

deficit on current account deficit for the period 1976-2015 using VEC (vector error Correction) model. The results suggested that deficit balance of budget and deficit balance of current account deficit have negative association. The Granger causality at 5% level suggests bi-directional causality between both variables.

Murshed, M., & Nijhum, N. K. (2019) analyzed twin deficit existing possibility in Bangladesh by utilizing annual data from 1980-2017. Vector Error-Correction (VEC) approach was used in paper to estimate long and short run relationship between variables and for long run causal connection pairwise Granger causality is employed. The results of the study reveal that budget and current account deficits are distant cousins rather than twins. In case of causality test, the causality runs from deficit balance of budget to deficit balance of current account.

Mohanty, R. K. (2019) conducted study to test the empirical relationship between fiscal and current account deficit in India. The study utilized data of period 1970-2014 and ARDL bound test. The study results validate the twin deficit hypothesis in case of India in both short and long run period.

Abu, N., & Gamal, A. A. M. (2020) investigated twin deficit hypothesis in context of Nigeria for the period 1981-2017. The study used Autoregressive Distributed Lag (ARDL) and Dynamic Ordinary Least Squares (DOLS) techniques to establish relationship between variables. The results revealed positive significant long run and short run association between deficit balance of budget and deficit balance of current account. The causality test shows one way causality which moves from current account to budget account.

Rehman, N. S. A. (2020) conducted study to test twin deficit and its impact on macroeconomics variables in Pakistan for the period 1992-2018. The results supported twin deficit hypothesis in Pakistan in both short and long run. More over twin deficit collectively put impact on other macroeconomic variables.

Dey, S. R., & Tareque, M. (2021) conducted study for twin deficit hypothesis validation in Bangladesh. The study used ARDL bound test in multivariate framework. The study findings fully supported the twin deficit hypothesis both in short as well as in long run. The causality test supported unidirectional causality in long run which runs from deficit balance of budget to deficit balance of current account.

## 2.1 Twin deficit analytical framework

The analytical framework of twin deficit hypothesis depends upon the national income identity. For an open small economy the individual sum of C (private consumption), I (private investment), G (government expenditure), and X-M (net export) is equal to Y (gross domestic product).

Mathematically will present the same:

$$Y = C + I + G + (X-M) - T$$

Whereas T indicates tax, while other are same as above identified.

$$Y - C = I + G + (X-M) - T$$

As,

$$Y - C = S$$

So, equation above becomes

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

It can also be written as,

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

According to equation above any change in balance of trade would be attributed with fiscal disturbance or saving investment gap of the country.

### III. METHODOLOGY

#### 3.1 Research Design & Data Source

The study is quantitative in nature and descriptive causal study based on secondary annual time series data of the Pakistan's economy for the period 1976-2017. The data of the said variables are collected from different published volumes of economic survey of Pakistan, Federal Bureau of Statistic, world data bank and Annual Reports State Bank of Pakistan Website. The data is selected in percentage of GDP.

#### 3.2 Methodology

The annual time series data is used for study rather than monthly or quarterly data because the annual data provides with more significant results. The data is selected in percentage of GDP.

For the annual time series data first stationarity of data is checked. For the purpose ADF unit root test is utilized. After unit root test descriptive statistics of variables in group is being tested. ARDL bound test is employed to predict the short run and long run association between deficit balance of budget and deficit balance of trade. For model stability and structural changes CUSUM and CUSUM square test is used.

#### 3.3 Model Specification

Using the existing literature, following specification is used to evaluate the twin deficit hypothesis for Pakistan.

$$BD = \beta_0 + \beta_1 TD + \mu$$

Whereas,

BD stands for budget deficit

TD stands for trade deficit

$\mu$  stands for error term

#### 3.4 Hypothesis

**H1:** There is a significant association between budget deficit and trade deficit.

**H2:** There is short-run association between budget deficit and trade deficit.

**H3:** There is long-run association between budget deficit and trade deficit.

## IV. DATA ANALYSIS

### 4.1 Unit Root Test

Results of Augmented Dickey-Fuller unit root test found budget deficit stationary at level and Trade deficit non stationary at level, but stationary at 1st difference. Our study contains mixed integration sequence I(0) and I(1). On mixed integration results, long run relationship between dependent and independent variables is proposed by the literature.

Table No. 01

Variables	Augmented Dickey-Fuller Test		Augmented Dickey-Fuller Test		Integration
	Statistic (At Level)		Statistic (At First Difference)		
	t- values	Probability	t- values	Probability	
BD	-3.085562	0.0355	---	---	I (0)
TD	-1.872130	0.3417	-7.338172	0.0000	I (1)

### 4.2 Descriptive Statistics

Using thumb rule the descriptive statistics test found that the probability is insignificant and data is normal, means residuals are normal. The outcomes of Jarque Bera of our study related variables are higher than 0.1 indicates the model's error term is distributed normally.

Table NO. 02

Table	No. of Obs.	Mean	Std. Dev.	Skewness	Kurtosis	Jarqu Bera	Prob.
BD	42	6.3333	1.8435	-0.2399	2.54367	0.7673	0.6814
TD	42	6.5888	3.7387	-0.1849	1.9155	2.2976	0.3170

### 4.3 ARDL Bound test

The Weighed value F statistics 8.155 found over the critical value 4.78 at 5% level of significance. The bound test of study confirms the existence of co-integration between deficit balance of budget and deficit balance of trade.

Table No. 03

Equation	F-Statistics Calculated	Upper Bound Critical value	Conclusion
Equation 1			
BD, TD	8.155434	4.78 (5%)	Co-integration exist

#### 4.4 Short Run Coefficient by ARDL Approach

The t-statistics value confirms the short run relationship between budget deficit and trade deficit. Trade deficit has negative significant relationship with budget deficit in short run. According to the result table a single unit change in trade deficit will decrease budget deficit by 0.57 units.

Moreover the coefficient of ECM (error correction term) is negative and significant at 5% level. The ECM coefficient of one period lagged suggest that speed of adjustment progression is 34 percent of the last year's disequilibrium in BD from its equilibrium path is recovered in the current year.

Table No. 04

Selected Model: ARDL(1, 3)				
Dependent variable: BD				
Including Observations: 41				
Regressors	Co-efficient	Standard Error	t-value	Prob.
TD	0.301959	0.104991	2.885469	(0.0068)

#### 4.5 Long Run Coefficient by ARDL Approach

The t-statistics value indicates that trade deficit has a positive significant long run relationship with budget deficit. The co-efficient values suggest that a single unit change in trade deficit will cause 0.3 units change in budget deficit.



**Table No. 05**

Selected Model: ARDL(1, 3)				
Dependent variable: BD				
Including Observations: 41				
Regressors	Co-efficient	Standard Error	t-value	Prob.
TD	0.301959	0.104991	2.885469	(0.0068)

#### 4.6 Model Stability Test

The structural changes in budget deficit and trade deficit are tested through CUSUM and CUSUM square statistics graph. The graph test proves the stability of model and long-run estimates.

The CUSUM and CUSUM square graphs show that model is stable and results are reliable because the estimated lines of both graphs are inside the critical limits at 5% significant level.

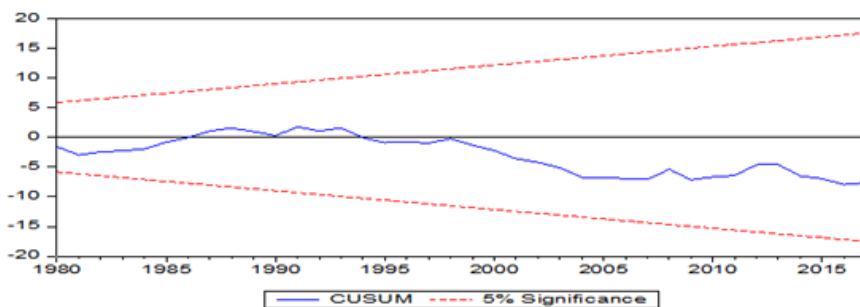


Figure 1: Results of CUSUM Test

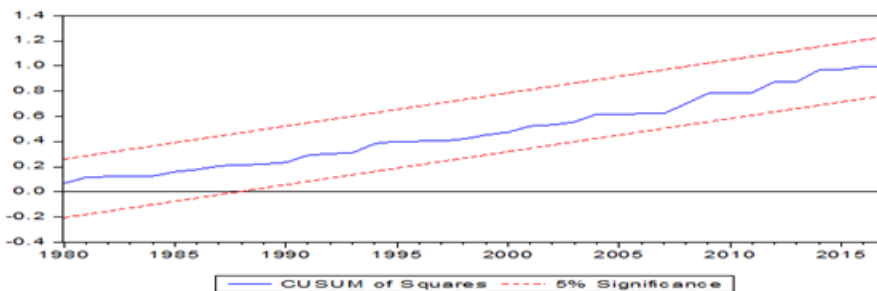


Figure 2: Results of CUSUM square Test

## V. CONCLUSION

The core aspect of study was to reveal out the relation between the deficit balance of trade and deficit balance of budget in context of underdeveloped economy like Pakistan. Upon inference of results obtained witness the strong positive long run association between deficit balance of budget and deficit balance of trade, while short run relationship is negative between the variables. Both deficits are certainly inter-linked in case of Pakistan. Our study results of both short term and long run are consistent with the studies of Siddiqui, M. M. (2011), Mudassar, K., Fakher, A., Ali, S., & Sarwar, F. (2013), Ali, A., & Kakar, A. (2017) and Rehman, N. S. A. (2020) in context of Pakistan.

## VI. RECOMMENDATION OF POLICY

The prior policy implication to cope with the problem of twin deficit is to increase the exports at more effective and competitive level in the relative concerned foreign markets. The government should pay more intense attention towards our export products and announce bail out and tax rebate packages for the export firms. Moreover Go local slogan should be practiced and heavily advertised to divert the mind set of population towards the usage of domestic goods instead of imported one. This will reduce the import burden and increased selling and profit margin of domestic firms, which will consequently increase the tax revenue of the country. On the other hand government also needs to find alternate sources to increase its revenue and reduce dependence on external finance. Budget balancing and effective monetary policies should be made and implemented efficiently.

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