



Correlation of Macroeconomic Variables with Twin Deficit in Pakistan

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Abstract

The macroeconomic term Twin deficit is intensive of the study, which refers to a situation when in an economy both current account and the budget deficits are running at the correspondent period. The core objective of the paper to investigate the relationship between the twin deficit hypothesis and major macroeconomic variables (Gross domestic product, Foreign Direct Investment, money supply, and interest rate). The results of the study were found through the secondary time series quarterly data from 1992-2018 of Pakistan's economy. In the study to examine the stationary of data, applied Augmented Dickey-Fuller test and then used Vector Error Correction and Johansen co-integration Model to examine the short and long-term relationship among observed variables. The core finding of the study was that in a short period along with a long-run period Pakistan faced a twin deficit situation due to the positive association of current account deficit and Budget deficit. The outcomes of the study also indicate that GDP and FDI have a positive long-run association while money supply and rate of interest have a negatively long-run association with twin deficit. These results of the study are very helpful for the decision-making and implementation of fiscal, monetary, and export policies in Pakistan

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1) INTRODUCTION

The budget deficit in less developed Asian economies especially has been a continuous phenomenon ([Anoruo & Ramchander, 1998](#)), similarly, the current account deficit mostly caused by an imbalance in trade deficit. Therefore, the developing economy of Pakistan has been facing both the phenomenon since 1972 (Aqeel, Nishat & Qayyum, 2000). The main aspect of this problem communicates to the twin deficit since the positive correlation of budget deficit (BD) and current account deficit (CAD) cause the twin deficit situation in economy.

Numerous researchers (Abell, 1990, Rosenweing & Tallman, 1993, Mann, 1999, Vyshnyak, 2000, Mann, 2002, Corsetti & Muller, 2006, Onafowora & Owoye, 2006) evidenced the association between CAD and BD which formed the situation of twin deficit in diverse developed economies, furthermore researchers (Kulkarni & Erickson, 2001, Rauf & Khan, 2011, Bagheri, Pirae, & Keshtkaran, 2012, Perera & Liyanage, 2012, Iyidogan, 2013, Van Bog, 2014, Ahmad, Aworinde, & Martin, 2015, and Coban & Balikcioglu, 2016) worked and proved twin deficit in developing economies.

Theoretical exertion on Twin Deficit (TD) expressed by model of Mundell–Fleming (Mundell, 1963 and Fleming, 1962), that explained that raised in BD convince on interest rates (Intr) that will be upward, which prompts an increment in capital entries and the valuation for internal money as well as a final point this appreciation responsive to raise in CAD. Keynesian thoughts in theory of absorption also argued that raised in BD would increase imports in the economy and this increase in imports leads to a worsening condition of CAD (Volcker, 1987).

Budget deficit and current account deficit (twin deficit) may cause other macroeconomic variables to affect because of the multiple effect of the two. This may cause both demand and supply shocks in the economy, causing low GDP growth, unemployment, inflation, trade balance, high exchange rate etc. The works of numerous researchers such as (Hall & Taylor, 1993, Shabbir, Ahmed & Ali 1994, Vyshnyak, 2000, Fidrmuc, 2003, Chaudhary & Shabbir, 2005, Hakro, 2009, Litsios & Pilbeam, 2017) and some other researchers proved that the presence of Twin deficit (TD) affected on the macroeconomic indicators as saving, GDP, interest rate, rate of exchange, investment, and inflation of the observed economies.

The current economic situation of Pakistan favored the presence of CAD and BD at similar time which form the TD. As well as during the condition of TD, the Pakistan economy faced the problems of the low rate of GDP, high tax rate, low saving, high price level, rise in the interest rate and currency depreciation (Hakro, 2009). On this basis, the existing study not only investigates the presence of TD which caused by the relationship of CAD and BD in Pakistan but also examined the short and long term association of TD with major macroeconomic indicators, GDP, Foreign direct Investment (FDI), Money supply (M2), and Interest Rate (Intr) during the period of 1992 to 2018.

1.2) THEORETICAL FRAMEWORK

The concept of TD first time introduced in 1980, when US economy faced collected deficit (BD and CAD) on similar time period. Essentially, hypothetical framework of TD initiates with examining correlation of CAD & BD, these conceptions can be found as of the characteristics of the national income accounting (N.I). In an open economy NI can be specified, as

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

Wherever

Y = Economy N.I or GDP

C = Government Consumption

I = Investment

G = Government expenses

X = exports in economy

and M = Import in economy

Subsequently the import (M) and export(X) difference is capital account CA, then equation (1) transforms to:

$$CA = Y - (C + I + G) \quad \text{----- (2)}$$

In this equation, national absorption expressed through the C + I + G. In the frame work of closed economy both Saving (S) and Investment (I) are equal then it turns into,

$$Y - C = S \quad \text{----- (3)}$$

and

$$S = I + CA \quad \text{----- (4)}$$

The equation (4) indicates that NI improves through the Investment in open economy.

$$S = S_{pvt} + S_{govt} \quad \text{----- (5)}$$

Economy Saving is accumulation of Private and Public saving although Private saving Spvt deliberate through the measure of disposable income Yd, which is reserved as a replacement for consumed.

Then

$$S_{pvt} = Y^d - C = (Y - T) - C \quad \text{----- (6)}$$

In economy the difference of Government taxes (Revenue) T, government Transfers Rt and Government Expenses G, deliberate the Government Saving Sgovt. We have,

$$S_{govt} = T - G - R_t \quad \text{----- (7)}$$

Concluded through equations (5), (6) and (7)

$$S = (Y - T - C) + (T - G - R_t) = I + CA \quad \text{----- (8)}$$

$$S_{pvt} = I + CA - S_{govt} = I + CA - (T - G - T_r) \quad \text{----- (9)}$$

Equation (9), effectually stated the three portions of saving: economy investment, current account CA and saving of the government. then

$$CA = S_{pvt} - I + (T - G - T_r) \quad \text{----- (10)}$$

or

$$CA = S_{pvt} - I + BB \quad \text{----- (11)}$$

In equation (11) BB indicates the budget balance or Government Finance. Through this equation two options may arise.

If after some time period the transformation of Spvt and I is recognized, then in this condition variation in BB directly affected on CA.

Another probability is that if BB rise so that will also increase the economy's saving, in this condition BB does not affect the CA (Thomas and Abderrezak, 1988).

3) REVIEW OF LITERATURE

3.1) Evidence of Twin Deficit

From 1980 to till now, the "twin deficits" have been unusually high especially in developing countries (Khalid & Guan, 1999). Enders, & Lee, (1990), argued that in particular, BD caused by the raised in consumer spending may even depend on the rise of government consumption, without some funding basis, that form a CAD in economy. According to (Hall & Tailor, 1993), a raised in the BD predicted a future rise in taxes, which could cause a reduction in current household spending and damage stock prices

Lau & Baharumshah, (2006), initiated the positive relationship of CAD and BD in nine SEACEN economies. They observed the yearly data of nine (9) SEACEN economies during time period of 1980 toward 2001. They used panel data unit root test, Granger Causality and test of Johansen Cointegration for data analysis.

Corsetti & Muller, (2006) claimed that during the BD, raised the Government expenses instead of revenue, that also increased the import of country, so this situation creates the TD. The work of Chowdhury & Saleh, (2007) favored this claimed; they used the model of ARDL and found positive effective evidence of TD in Sri Lanka. Similarly, work of Mukhtar, Zakaria, & Ahmed, (2007), recognized the bidirectional relationship with CAD & BD in Pakistan from 1975 towards 2005. They applied the test of the co-integration and Granger causality on observed period

and established this relation.

Furthermore, TD found in Pakistan during 1972 to 2008 through models of ARDL and ECM Iram, Shadid, Mahpara, & Fazli, (2011). Similarly, the work of Jawaid and Raza, (2013) during the period of 1976 to 2010 and study of Hassan., Wajid, Mahmood, & Shahbaz, (2015) tested the annual data from 1972 toward 2012 of Pakistan economy established the confirmatory association among CAD & BD that formed TD in Pakistan in these perceived periods.

3.2) TWIN DEFICIT AND GDP

Barro (1989) described that raised in BD affected the growth rate and saving of economy which decreases during this situation, further BD also initiated to raise the CAD in the country. He proved this through the data of the US-developed economy. Similarly, Miller & Russek, (1989), claimed and proved the direct link of BD, CAD, GDP and other macroeconomic indicators by used the annual economic data of US economy since 1980s.

In Pakistan BD and GDP found negatively relation and that situation produced TD, Rauf, & Khan, (2011) claimed and proved this in Pakistan during 1980 and 2009. In this study they used the Granger causality test and the OLS model. Furthermore, Fatima, Ahmed & Rehman., (2012) also claimed similar outcomes that found through the economic information of Pakistan in the period 1978-2009. According toward their claimed BD and GDP had a negative relation found by applying the technique of regression. Another researcher Yasmin, (2015) claimed similar results in Pakistan from 1990-2010. She proved the presence of TD situation through positive link of CAD and BD. The outcomes of study found through the Granger causality and test of Johansen co-integration.

Tufail, Anwar, Raza, & Abbas, (2014), claimed and proved the short and long term association of CAD, BD, GDP, exchange rate, trade openers and financial development in Pakistan during the period 1972-2011. They established this relation through the test of Johansen co-integration.

Ghaderi, Samadi & Ghaderi, (2016) also used the VAR technique on the economic data of Iran between the period 1990:1- 2011:4. The outcomes of study proved the occurrence of the TD situation as well as proved the negative link of GDP with CAD and BD during presence of TD in Iran.

3.3) TWIN DEFICIT AND FDI

Bidirectional relationship of CAD and BD have directly correlated to the Investment. Since during BD in economy, decreased in investment level caused low saving and low productivity and that situation formed the CAD in economy (Bagnai, (2006); Kim & Roubini, (2008). Similarly, study of Corsetti and Muller, (2006) also favored this argument, they found the relation among the BD, CAD and Investment. These outcomes found through VAR model that applied on the annual economical records of US, Australia, UK & Canadian economies. Another claimed of Gaber, (2010),

confirmed the correlation of BD, CAD, Investment & Saving in Turkey during 1974 to 2010. Tulumce (2013) found similar results in Turkey during 1984 toward 2010 by VAR model.

Cerovic (2015), investigated economic data of 25 transition countries from 1989 to 2013. He found that, in this observed time period low production and investment level produced BD and this situation of economy lead to raise the level of aggregate demand, which initiated CAD.

Litsios & Pilbeam (2017), tested the quarterly data of three countries Greece, Portugal and Spain through data by using ARDL model. They confirmed the negatively link of TD and Investment in these perceived countries.

3.4) Twin deficit and M2

In Pakistan, CAD and BD had a positive long-term period association as well as economic growth, exchange rates, and M2 affect CAD as long as the interest rate did not significantly affect CAD, Aqeel et al., (2000). This result claimed by used Granger causality test and VECM model on yearly economic records of Pakistan from the 1973-1998.

According to Chaudhary and Shabbir, (2005), increase in BD of the country directly affected the supply of money, Government reserves as well as on price level, which also affected CAD.

The work of Hassan, Wajid, Mahmood, & Shahbaz (2015), established the existence of TD in economy of Pakistan from 1972 toward 2012. They also described the unidirectional association among the CAD and unemployment in short-term, as well as long-term interactions, confirmed among the macroeconomic variables M2, FDI, and unemployment during TD situation. For these results, they used tests of VECM and ARDL techniques

3.5) TWIN DEFICIT AND RATE OF INTEREST

In an economy fluctuated exchange rate, comprehensive external loans, and flexibility of capital boosts the import and disparaging exports. Correspondingly, the fixed interest rate increased the import that caused the CAD situation in country. This condition expressed all those developed and developing economies that have inadequate external loans, at that time increased in their government expenses formed BD and this condition appreciated the exchange rate and formed CAD in the country (Vyshnyak, 2000).

Burney and Yasmeen, (1989) tested Pakistan's data from the period of 1970-71 toward 1988-89 and found a positive relationship between the rate of interest and BD. They established this result through the OLS techniques to apply on the data of Pakistan.

Furthermore, (Rosenweing & Tallman, 1993) also favored the statement that value of dollar raised due to increasing the BD of economy and further in presence of this

situation TD occurred in the economy. They found these results through the VAR model applied to the economic time series data of US between 1961: I to 1989: IV. Salvatore, (2006), has shown that the increase of the rate of interest has occurred as a result of BD, this is based on foreign capital and the imports with respect to the currency promoted by the CAD. Baharumshah and Lau, (2007), found similar results in their study, they examined the TD effect on the emerging economies. Due to this reasoning, they tested the economic data of Thailand and confirmed the long-term association among CAD, BD, rate of interest and exchange.

Correspondingly, Payesteh, (2008) investigated the US economy and proved that BD caused inflows of capital, trade deficit, as well as also raised the interest rate. Hakro, (2009) showed the relation of CAD, BD and other macroeconomic variables in his study since BD effected on price level that is concerned to rate of interest and this rate is associated with flow of capital that related to the rate of exchange and this rate directly associated to trading deficits.

4) METHODOLOGY

The present research has based on quantitative approach to analyze the outcomes of data and achieve the objectives of the study. The positivism is the pattern of this research; it is a significant element for the research philosophy since it provides a considerate to the investigator about social issues henceforth it also expresses real situation and natural surroundings of investigation (Hughes and Sharrock, 2016). Further deductive approach is used in this research to investigate the existence of TD as well as also initiate the relation among TD, GDP, FDI, M2 and Intr. For this purpose, used the data from the quarterly period of the Pakistani economy during 1992 - 2018, (Bengaliwala, 1995 and Kemal & Arby, 2004). World Data Bank, IFS statistics and Pakistan's State Bank are helped as the source of data collection for the macroeconomic indicators such as BD, CAD, FDI, GDP, M2, and Intr.

4.1) HYPOTHESIS

- H1: In Pakistan CAD and BD have found a significant association.
- H2: In Pakistan Twin deficit and GDP have found a significant association.
- H3: In Pakistan Twin deficit and FDI have found a significant association.
- H4: In Pakistan Twin deficit and M2 have found a significant association.
- H5: In Pakistan Twin deficit and Intr have found a significant association.

4.2) MODEL OF STUDY

In open economy correlation of CAD, BD, Investment & Saving explained through the work of Thomas & Abderrezak (1988), in the context of the equation (11) the multivariable model of the study is,

$$CAD = f(BD, GDP, FDI, M_2, Intr) \text{----- (ii)}$$

Where,
CAD = quarterly % of the Current account deficit.

BD = quarterly % of the Budget deficit.
 GDP = quarterly % of Gross Domestic Product.
 FDI = quarterly % of Foreign Direct Investment.
 M2 = quarterly % of the Money supply.
 Intr = quarterly % of Real Interest rate.

The model of the study is,

$$CAD = \beta_0 + \beta_1 BD + \beta_2 GDP + \beta_3 FDI + \beta_4 M2 + \beta_5 Int + u_t \text{-----(iii)}$$

4.3) UNIT ROOT TEST

This technique is used on the time-series data to verify the stability of data. Stationarity (stability) described mean, variance and autocorrelation are constant in time series data. Further tests of data analysis depend on this test, so the test of Augmented Dickey-Fuller (ADF) has been used for checking of stationarity of the data. The mathematical equation of this test is,

$$\Delta Y_t = \alpha + \beta_t + \gamma Y_{t-1} + \delta_1 \Delta Y_{t-1} + \dots + \delta_{p-1} \Delta Y_{t-p+1} + \epsilon_t$$

4.4) JOHANSEN TEST FOR COINTEGRATION

When stationarity on the same order exists on all the variables then the test of Johansen co-integration is used to analyze the LR period association of the variables (Rao, 2007). Maximum Eigenvalues and Rank tests are applied in this technique.

4.5) VECTOR ERROR CORRECTION MODEL (VECM)

When there is Cointegration between variables, the VECM technique is used to measure the behavior of the short term and long period of the study's variables. The mathematical equation in the VECM technique is,

$$\Delta Y_t = \beta_0 + \beta_1 \Delta X_t + \pi \mu_{t-1} + e_t$$

Where

π = Error correction term Coefficient

5) ANALYSIS OF FINDINGS

5.1) RESULTS OF UNIT ROOT TEST

ADF approach applied to check the stability of data. ADF results present in table1 that show macroeconomics indicators CAD, BD, FDI, GDP, money supply and interest rate indicated first difference stationarity, this result specifies the integration order of observed variables are similar.

Table 1. Unit Root Test

Variables	Augmented Dickey-Fuller test statistic (At Level)		Augmented Dickey-Fuller test statistic (At First Difference)		Integration
	t- values	Probability at 5%	t- values	Probability at 5%	
	CAD	-2.62	0.0920	-3.98	
BD	-2.07	0.2580	-3.75	0.0048	I(1)
GDP	-2.69	0.0788	-5.30	0.0000	I(1)
FDI	-2.79	0.0633	-2.95	0.0430	I(1)
M2	-1.53	0.5167	-3.79	0.0041	I(1)
Intr	-1.36	0.5943	-8.24	0.0000	I(1)

5.2) RESULTS OF JOHANSEN CO INTEGRATION TEST

In Table 2 presents the trace test results of the study. The values 715.1943 and 95.75366 are the trace statistics and 5% critical values respectively that reject none* hypothesis i.e. no co-integration equation exists. At most 1* null hypothesis rejects at the values 362.6581 and 69.81889 which are the trace statistics and 5% critical values respectively. Values of trace statistics and critical values 5% reject all other null hypotheses at most 2*, at most 3* and at most 4*. The null hypothesis at most 5* does not reject at 5% critical value 3.841466 and 2.191137 trace value. This result indicates the existence of long term relation of CAD and BD through five Cointegration equations. The long term association of GDP, money supply, FDI and interest rate also found in Pakistan during the observed period.

Table 2. Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistics	0.05 Critical Value	Prob.**
None *	0.999005	715.1943	95.75366	0.0001
At most 1 *	0.913648	362.6581	69.81889	0.0001
At most 2 *	0.872725	237.7423	47.85613	0.0001
At most 3 *	0.851639	132.6106	29.79707	0.0000
At most 4 *	0.477505	35.29726	15.49471	0.0000
At most 5	0.042054	2.191137	3.841466	0.1388

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The results of the maximum Eigenvalue for the study present in Table 3. In this table, the values 352.5362 and 40.07757 are maximum Eigen result and critical value respectively at 5% that reject the none* hypothesis that indicates that no co-integration equation is found. The results are clearly indicated that null hypothesis at most 1* does not accept at 5% critical value 33.87687 and maximum Eigenvalue 124.915. Similarly, all others null hypothesis at most 2*, 3* and 4* are rejected through the 5% critical value and maximum Eigenvalue excluding the null hypothesis at most 5* which does not reject through at 5% critical value and maximum Eigenvalue. The results of Tables 2 and 3 clearly indicate the existence

Table 3. Unrestricted Cointegration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigen value	Max- Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.999005	352.5362	40.07757	0.0001
At most 1 *	0.913648	124.9158	33.87687	0.0000
At most 2 *	0.872725	105.1317	27.58434	0.0000
At most 3 *	0.851639	97.31334	21.13162	0.0000
At most 4 *	0.477505	33.10612	14.26460	0.0000
At most 5	0.042054	2.191137	3.841466	0.1388

Max-Eigen value test indicates 5 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The coefficient values of the study are presented in Table 4. The results confirmed the positive relation of CAD and BD in the long term period, a 1% rise in the BD has a tendency to 38.78% rise CAD, it means that in this time hypothesis of twin

Table 4. Normalized cointegrating coefficients

Variables	Coefficients	Standard Error	t - Statistics
BD	0.3878	0.0339	11.4396
GDP	-0.1807	0.0736	2.4546
FDI	-3.2077	0.1099	-29.1874
M2	-1.2433	0.0276	45.0471
Intr	0.1903	0.0247	7.7045

The term of error correction (π) shows a short period deviance from the earlier period used for long-term stability. The value is limited to how many times of convergence arise for side of short and long term changes in the budget deficit, GDP, M2, FDI, and the interest rate in Pakistan's economy.

From Table 5, -0.6804 is the value of the error correction model, the negative sign of the value confirms a steady long-term relationship, further result shows that in Pakistan the short and long period convergence found 68.04%.

Table 5. Error Correction Model

Variables	Coefficients	t - Statistics
ECM(-1)	-0.6804	-5.4271

Table 6, expressed the summary of the research through the VECM results. This table shows that all hypothesis of the study accepted in the perceived time period of Pakistan economy. The acceptance of H1 indicates that from 1992 to 2018 Pakistan economy faced the TD in short term and long term period since outcomes of study initiated positive association of CAD & BD. Acceptance of H2 found that during TD, GDP has negative significant relation. The results of study also found the negative substantial association of FDI, M2 and TD; it shows that hypothesis of study H3 and H4 also accepted through the results. Acceptance of H5 indicates that TD and Intr have found positively significant association.

Table 6 Hypothesis Testing

Hypothesis	Coefficient Value	t- Value	Relation	Remarks
H ₁	0.3878	11.4396	Positive Significant	Accepted
H ₂	-0.1807	2.4546	Negative Significant	Accepted
H ₃	-3.2077	-29.1874	Negative Significant	Accepted
H ₄	-1.2433	45.0471	Negative Significant	Accepted
H ₅	0.1903	7.7045	Positive Significant	Accepted

6) CONCLUSION

TD is vile of the study, then not only to examined and tested the association among CAD and BD but also to explored the short and long-term relationships of TD with GDP, FDI, M2, & the Intr. Time series quarterly data through 1992 toward 2018 of Pakistan is used in this study. For the investigation of the short and long period association of the variables, initially examined the stability of data by applying ADF test. The results of the test revealed that not all variables in the study were stationary at the level, but in the first difference, they were integrated at the significance level of 5%. Secondly, by applying test of Johansen co-integration to detect the co-integration between variables. The outcomes of this test found CAD and BD have positive significant association in long run it means that TD occurs in this time period and also found that Intr has positively relationship while negatively long-run relation of GDP, FDI, & M2 with TD. The short-term period association among the variables indicated through ECM that proved appearance of this relationship among the variables.

7) RECOMMENDATIONS

The existence of BD and CAD at the similar time is actual reason of TD, thus for the resolution of twin deficit lie in a clear platform of monetary and fiscal policies. Raise of import formed the CAD, consequently the Pakistan's government should create the strategies that sustenance control on imports and improved the demand of export goods. TD and FDI have found negative significant effect subsequently government would sustenance that strategy which increases the FDI of the country. State Banks should develop the strategies to control the money supply according to necessity and increase the capital capability ratio for economic constancy. The tax structure must be examined and urgently contain improvements in tax policies that to reduce the load of tax and also regulator and streamline its organizational salvage processes for homegrown and external investors. The government should implement better accomplish the political constancy through the state that is the important factor to fascinate the homegrown and foreign investors.

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