Does Currency Depreciation Certainly Result in Positive Trade Balance? Evidence from Pakistan

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ABSTRACT

The study attempts to examine the volatility of the exchange rate and the effect of depreciation of the domestic currency against the foreign currency on the trade balance of Pakistan. For that purpose, the time series data from 1976 to 2017 is extracted that is used to check the relation between exchange rate and trade balance. Moreover, this study applies Augmented Dickey Fuller (ADF) and Phillip Perron (PP) unit root tests to check the stationary element in the data. In order to find the cointegrated relationship among the selected variables an Autoregression Distributed Lag (ARDL) model is employed. Besides, the CUSUM test is executed to check the stability over time of the studied variables coefficients. The results of the unit root tests explain that the studied variables are integrated. Subsequently, the ARDL bound test specifies the long run association between trade balance and exchange rate. Finally, the CUSUM test confirms that all the studied variables are stable over the investigated time period. This study will be beneficial for the policy makers to make appropriate decision concerning trade balance of Pakistan and make better monetary policy.

Keywords: Unit root, ARDL cointegration test, CUSUM test, Exchange rate, Trade balance

INTRODUCTION

Exchange rate is one of the tools of macroeconomic which indicates the stability of domestic currency against foreign currency. Basically, exchange rate is the price of one currency into another currency which fluctuates due to market forces and especially it is used for the purpose of international trade in the world. Many economists and financial expert state that if the exchange rates easily transfer, it may arise to be the fastest moving price in the economy which gets all in one basket of foreign goods with it. Therefore, many countries in subcontinent use their own exchange rate system for the stability of their domestic currency.

In this recent study the focus will be on volatility of exchange rate which also influences over the rest of parameter of the economy. In fact volatility means instability or uncertainty in economy which become the cause of business and financial risk whether in option pricing, asset pricing, financial dealing, risk management and it indicates to be rational about the risk management, which may be very careful action and input for making economic decision. Many studies (Adeyemi and Oseni, 2021; Longe et al., 2019; Ahmed & Khan, 2018) have shown that exchange rate have significant relationship with trade balance of the country. Hence, exchange rate volatility can bring change in overall economy of the country. So, appreciation and depreciation of the domestic currency against the foreign currency leave its impact on overall economy of a country (Azid, Jamil, and Kousar 2005).

Undoubtedly, Globalization's concept has changed the practice of trades of the world where investors enter into the internationalization of markets of commodities and physical assets which enhance the significance of currency exchange rate among the inter-trading countries in the World. Hence, exchange rate plays a core role in the trade performance of any country. Likewise, the devaluation of exchange rate can eliminate the problem of trade deficit nearly in long-run. Technically, the impact of depreciation of exchange rate on trade balance is normally observed by the price and volume effects and at the end of results exports of the domestic country would be cheaper and imports would be more expensive (Halicioglu, 2007).

Furthermore, it has been observed that developed and emerging countries have potential to increase their export-related goods and services and they can manage short-run volatility of exchange rate within the short time period. Though on the other hand it has been noticed that developing countries depend on import and reveal decreasing growth in export which do not directly manage the volatility of exchange rate in short run period. Therefore, it is generally believed that appreciation in exchange rate may result in decrease of the trade balance, however, depreciation of exchange rate may increase the trade balance of those countries which are involved in export (Danzan, 2017). By considering the above discussion it is clear that floating exchange rate can affect overall economy of a country and exchange rate volatility is a big challenge for developed and developing countries. For instance, currency deprecation is an important issue for Pakistan which produces severe problems for Pakistani economy.

Pakistan is one of the developing countries which is also enmeshing in problem of instability of exchange rate. From the historical background of Pakistan, depreciation of local currency worsens the balance of payment of the country and the effect of devaluation of currency with trading partner weakens the trade balance of the country due to which negative balance payment have been seen in economy (Akhtar and Malik, 2000). Manifestly, Pakistan is suffering trade deficit because of meager and weak economic policies in the country (Shahbaz, Awan and Ahmed, 2011). Visibly, the exchange rate for the Pakistani currency i.e Pakistani rupee (PKR) has been continuously depreciating. Therefore, by seeing Pakistani context, the aim of this study is to find the effect of exchange rate on trade balance and examine the volatility of exchange rate over trade balance of Pakistan. Notably, this study attempts to use new model and technique for testing the long run relation using Time series Multivariate Forecasting technique. The main reason of this study is to analyze the vehicle currency effect on stock prices of

Pakistan. Therefore, we assume that all sectors of Pakistan Stock Exchange are heterogeneous in nature and these are considered as individual units. The findings may help the policy makers to make better policy for the improvement of economic growth of the country.

The rest of this empirical study is arranged as follows. Literature review is given in Section 2. After that, the Section 3 clarifies about data and methodology. Then, section 4 explains and deliberates the empirical results. Lastly, section 5 provides conclusions.

Literature Review

In last few decades, numerous empirical investigations have been conducted to explore the impact of exchange rate appreciation and depreciation on the trade balance of the nations. However, they provide dissimilar findings. For instance, Dzanan & Mansur (2017) explored and provided empirical evidences that currency depreciation had positive impact on trade balance of Norway. For this purpose, trade balance and gross domestic product are selected as an exogenous variable and other variables such as consumer price index, lending interest rate, exchange rate and degree of openness are used as endogenous variables. By applying ARDL co-integration technique on quarterly time series data from 1980 to 2009, this study evaluates the relationship of currency depreciation and its impact on trade balances. The results indicate that there is low effect of exchange rate on trade balance of Norway. Besides, this study concluded that due to long run trade surplus there is low tendency of currency exchange on trade balance in Norway. Evidently, the findings obtained from Dzanan & Mansure (2017) are not in line with earlier findings of various scholars. Previously, Nusrate (2008) examined the effect of exchange rate on the trade balance of Bangladesh. This study selected nominal effective exchange rate and real effective exchange rate of Bangladesh and applied the Engle-Granger and Johansen techniques for finding the association between these variables. Statistically, this study used 34 annual observations which are collected from 1972 to 2005. Moreover, the Augmented dickey Fuller and KPSS tests are hired to check unit root of the data and then cointegration to find the association among the variables. The results indicate that devaluation of currency exchange rate has significant relationship with the enhancement of balance of trade in Bangladesh. Furthermore, this study concluded that depreciation in currency entirely bring positive growth in Bangladeshi exports.

Accordingly, Waliullah et al. (2010) examined the determinants of Pakistan's trade balance by using the ARDL Cointegration Approach. This study used the macroeconomic variables on data from 1970s to 2005 to find short and long run relationship among the money supply, income, trade balance and real exchange rate in Pakistan. Additionally, the money supply and income are used to evaluate monetary and absorption method to the trade balance of payment and use real exchange rate to examine the conventional method of elasticity. Also, the natural logarithm was applied on all variables for examining of their elasticities. The results have shown that there is strong effect of income and money supply, both indicate significant role for determining the long run and short run relationship with trade balance in Pakistan. After that, Ahmed & Khan (2018) examined the effect of exchange rate on trade balance. This study used the time series data from 1976 to 2017. Applying two different models i.e. Autoregressive distributed lag (ARDL) approach and Granger co-integration the results from the analysis indicates that there is a strong association between the trade balance and exchange rate. Clearly,

the result shows that there is a positive relationship of trade balance with exchange rate which clearly depict that devaluation of exchange rate worsens the trade balance in long and short run.

Subsequently, Shahbaz et al. (2011) evaluated the correlation between exchange rate and trade balance in Pakistan. Analytically, this study used ARDL bound testing approach for finding the relationship between the trade balance and currency exchange rate in Pakistan. The macroeconomic variables such as real effective exchange rate, income, money supply and trade balance were selected for investigation. By using data from 1984 to 2006, this study concluded that improvements in polices of government brought lower trade deficit in future but depreciation in exchange rate worsened the trade balance. On the other hand, decreasing the money supply boosts up the trade balance in Pakistan rather than income. Similarly, Azid et al. (2005) investigated the impact of the exchange rate volatility on growth and economic performance of Pakistan. The data was extracted from International Financial statistics from first quarter of 1973 to the fourth quarter of 2003. Furthermore, this investigation used the Autoregressive Conditional Heteroskedasticity (ARCH) and Generalized ARCH models. The results indicate that there is positive relationship among the studied variable. However, the insignificant effect of exchange rate on manufacturing production is also reported.

In international context, Bahmani-Oskooee Hajilee (2010) inspected the relationship between the currency depreciation and domestic investment by considering 50 countries. This study applied absorption approach to the trade balance and two economic model which Tobin's Q and model of Jorgenson for better analysis. Notably, the core purpose of this study was to examine the effect of currency depreciation on domestic investment including the exchange rate in a standard investment function. By employing time series data of 50 countries from 1975 to 2006, this study employed Error correction model (ECM) to find the effect of dependent variable over lag dependent variable. Moreover, real investment was used as dependent variable and nominal interest rate, real income and real exchange rate were selected as independent variables to test the relationship among the selected variables. In conclusion, the results indicate short run relationship among currency devaluation and investment. Additionally, the results further explained that there is squared coherency and estimate of coherence in variables. Recently, Adeyemi and Oseni (2021) investigated the relationship among trade balance, currency depreciation and money demand in Nigeria. For analytical purpose, this study adopted ARDL cointegration method and time series data from 1986 to 2018 is extracted from Nigerian central bank portal. The results clearly specify that currency depreciation leaves positive and significant impact on money demand and trade balance. Moreover, this study concluded that depreciation of domestic currency and money demand have enhance Nigerian trade balance.

Yusoff and Febrina (2014) examined the connection between real exchange rate, growth of economic, domestic investment and trade openness for Indonesia. This empirical study used time series data from 1970 to 2009 and employ Johansen test of cointegration and Granger causality test. This study infers a long run relation between the studied variables. Likewise, Longe et al. (2019) explore the connection among oil price, exchange rate, current account balance, consumer price index and trade openness in Nigeria. By using

data from 1980 to 2016 and nonlinear ARDL model the results indicated long and short run association among the investigated variables.

In south Asian context, Rehman & Hossain (2003) examined the relationship between exchange rate and private investment in Bangladeshi manufacturing sectors. By applying the yearly time series data from 1981 to 2000 and considering macroeconomic variables, this study checks robust relation among the exchange rate and investment in private manufacturing firms. For this, Cointegration technique and Error Correction Model (ECM) was selected. The empirical results show that there is positive relation of depreciation of exchange rate with private investment in manufacturing sectors for long and short run. It further explained that there is no effect of interest rate on private investment for short and long run. Consequently, Islam (2013) examined the effect of income terms of trade and trade balance in Bangladesh. This study uses the time series data from 1985 to 2011 that is collected from the World Development Indicator (WDI) portal. The Augmented Dickey Fuller (ADF), Phillip Perron (PP) and KPSS unit root tests are applied to check the integration level of each selected variable in the series. In conclusion, the results confirm the existence of short run and long run relations among the investigated variables.

Additionally, Jawaid & Haq (2012) attempted to evaluate the effect of interest rate, exchange rate and their volatilities on stock prices in Pakistan by using Banking industry data from 2004 to December 2010. Analytically, the GARCH model is run on monthly basis data. Besides, the Augmented Ducky Fuller and Phillips Perron tests are used to check the stationary and non-stationary elemenst in time series data. Clearly, the results suggest significant negative and long run relationship between the conversation rate and short-term interest with stock prices. Furthermore, bidirectional relation among the stock prices and exchange rate was also observed and reported by this investigation.

Evidently, the above discussed studies show that depreciation of exchange rate results in positive trade balances in various contexts (see for example, Adeyemi and Oseni, 2021; Longe et al., 2019; Dzanan & Mansure, 2017; Yusoff and Febrina, 2014; Islam, 2013; Nusrate, 2008; Rehman & Hossain, 2003). However, in Pakistani context, the obtained findings delivered conflicting and inconsistent results (see for example, Ahmed & Khan, 2018; Waliullah et al., 2010; Jawaid & Haq, 2012; Shahbaz et al., 2011). Therefore, the absence of conclusive and consistent evidences in this case for Pakistan has been the prime motivation for this study.

Data and Methodology

This study uses the correlational research design to examine the impact and relation between the exchange rate and trade balance of Pakistan. Moreover, the implemented secondary data for all the selected variables is mined from the World Bank data portal, International Monetary Fund and Economic Survey of Pakistan from 1976 to 2017, with exemption of degree of openness (OP), and derived by dividing total trade by GDP. The descriptions of all the preferred variables are as given below in Table 1.

Table 1: Nominated Variables

S#	Variables	Acronyms	Source	Literature
1	Trade Balance	TB	World Development Indicator, International Monetary Fund and Economic Survey of Pakistan.	Adeyemi and Oseni, 2021; Islam et al., 2013; Nusrate, 2008; Waliullah et al., 2010
2	Exchange Rate	XR		Adeyemi and Oseni, 2021; Shahbaz et al., 2011; Ahmed & Khan, 2018; Longe et al., 2019; Dzanan & Mansure, 2017; Yusoff and Febrina, 2014.
3	Gross Domestic Product	GDPD		
4	Degree of Trade Openness	OP		Dzanan & Mansure, 2017; Yusoff and Febrina, 2014.
5	Consumer Price Index	CPI		Longe et al., 2019; Dzanan & Mansure, 2017.

Practically, this study adopts the positivism research paradigm which epistemologically expresess the knowledge through the empiricism that can be proven through the theoretical and empirical testing of theories. Technically, the positivism paradigm explains existing theoretical framework which tests and evaluates earlier theory. Also, this study applies deductive approach for explaining the relationship among the studied variables. Deductive approach is used to draw the conclusion on the basis of the premises.

Notably, this study is a correlational type of research which attempts to find the causal relationship between trade balance and exchange rate in Pakistan. Hence, time series multivariate forecasting technique and dynamic model are adopted for this purpose. Thus, by adopting econometric model which is previously implemented by Shahbaz, Awan & Ahmed (2011) and Mohsen and Wing Ng (2002) the effect of trade balance on currency depreciation takes the following forms

$$LTB = \alpha_1 + \alpha_2 LXR + \alpha_3 LGDPD + \alpha_4 LOP + \alpha_5 LCPI + \mu_t \qquad (1)$$

Where LTB = log of trade balance, LXR= log of exchange rate, GDPD = log of gross domestic products, LOP= degree of trade openness and LCPI= log of degree of trade openness.

Besides, in order to check stationary element in the mined time series data, the unit root tests are conducted. Exactly, unit root tests are the tools to check stationary properties in the time series data (Nkoro and Uko, 2016). Hence, by adopting earlier scholars practices (see Islam, 2013; Adebola, 2011; Apergis and Payne, 2011; Georgantopoulos, 2012) this study performed Augmented Dickey Fuller (ADF) and Phillip Perron (PP) unit root tests. Notably, the ADF test is constructed by considering first difference regression function (Hill, Griffiths and Lim, 2012). In addition, this study also considers Phillip-Perron (1988) test to check the consistency level among both tests outcomes. Thus, the econometric model for ADF test is as mentioned below

$$\Delta X_t = \alpha_1 X_{it-1} + \sum_{j=1}^{pi} \beta_{ij} \Delta X_{it-j} + \chi_{it} \delta + \varepsilon_t \qquad (2)$$

Remarkably, the selected variables (see Table 1) are created on the basis of literature and have solid theories-based foundation, however, only theories are not sufficient to make final conclusions. Hence, after conducting unit root tests Autoregressive Distributed Lag (ARDL) cointegration technique is used that is presented by Pesaran et al. (1996) to drive the conclusive findings. Technically, cointegrations tests are used to judge the long run stationary connection among selected non-stationary variables (Brooks, 1999). This study adopts Autoregressive Distributed Lag (ARDL) cointegration technique which is considered more suitable than other cointegration methods due to its various benefits for instance, ARDL can easily cope up with small size sample set (Pesaran and Shin 1999). Likewise, ARDL estimator can check relationship level among selected variables either they are at I(0) or I(I) or mixture of these two (Nkoro and Uko, 2016; Adom et al. 2012).

Notably, the ARDL estimator consists of two stages. First, the variables are investigating for long run relationship by computing F-statistics bound test. Here, if the calculated value of F-Statistics is greater than the upper bound critical value, then the null hypothesis of no cointegration can be rejected. However, if it lies below the lower bound critical value then the null hypothesis can be accepted. Finally, after establishment of long run relationship, the ARDL model can be reparametrized into ECM model by using estimates of the long run model (Nkoro and Uko, 2016).

As mentioned, first it is required to check the existence of long run association among the investigated variables. For this, the method of ordinary least square in which all selected variables are taken as a separate dependent variable and then F-test is conducted for each model of regression. The F-test is conducted to check the presence of long run association among the studied variables (Dzanan and Mansur, 2017).

Subsequently, by following the inquiries of former scholars (see Mohsen and Wing Ng, 2002; Brooks, 1999; Brown et al., 1975) this study executed the method of cumulative sum of recursive residuals (CUSUM). The CUSUM analysis is used to check the stability of the long run cointegrated vectors (Brooks, 1999). Hence, first it is required to check the presence of long run association among the selected variables. For this purpose, this study used the method of ordinary least square by turning each selected variable as a dependent variable and then ARDL F-test is used to explore the existence of long run association (Dzanan & Mansur, 2017). Hence, the proposed models to find long run relationship for this study are as given below

$$\Delta TB_t = \beta_0 + \Sigma \beta_i \Delta TB_{t-i} + \Sigma \gamma_j \Delta XR_{1t-j} + \Sigma \delta_k \Delta CPI_{2t-k} + \Sigma \delta_m \Delta GDPD_{3t-k} + \theta_0 TB_{t-1} + \theta_1 XR_{1t-1} + \theta_2 CPI_{2t-1} + \theta_3 GDPG_{3t-1} + e_t \; ;$$

$$(3)$$

$$\Delta XR_t = \beta_0 + \Sigma \beta_i \Delta TB_{t-i} + \Sigma \gamma_j \Delta XR_{1t-j} + \Sigma \delta_k \Delta CPI_{2t-k} + \Sigma \delta_m \Delta GDPD_{3t-k} + \theta_0 TB_{t-1} + \theta_1 XR_{1t-1} + \theta_2 CPI_{2t-1} + \theta_3 GDPG_{3t-1} + e_t \; ;$$

$$(4)$$

$$\Delta CPI_t = \beta_0 + \Sigma \beta_i \Delta TB_{t-i} + \Sigma \gamma_j \Delta XR_{1t-j} + \Sigma \delta_k \Delta CPI_{2t-k} + \Sigma \delta_m \Delta GDPD_{3t-k} + \theta_0 TB_{t-1} + \theta_1 XR_{1t-1} + \theta_2 CPI_{2t-1} + \theta_3 GDPG_{3t-1} + e_t \; ; \quad (5)$$

$$\Delta GDPG_t = \beta_0 + \Sigma\ \beta_i\Delta TB_{t-i} + \Sigma\gamma_j\Delta XR_{1t-j} + \Sigma\delta_k\Delta CPI_{2t-k} + \Sigma\delta_m\Delta GDPD_{3t-k} + \theta_0 TB_{t-1} +$$

$$\theta_1 XR_{1t-1} \qquad + \qquad \theta_2 \qquad CPI_{2t-1} \qquad + \qquad \theta_3 \qquad GDPG_{3t-1} \qquad +$$

$$e_t \eqno(6)$$

Data Analysis

The data analysis section explains the overall results obtained by various nominated tests to inspect the relationship between trade balance and exchange rate.

Unit Root tests

From the test of unit root, it is presupposed that the variables fall into stationary series. Thus, the ADF unit root test is applied first to check the series of variables that whether they are integrated at level I (0). Technically, if variables are integrated at level then the OLS method is adopted (Dzanan & Mansur, 2017). Otherwise, the variables are further checked for first difference I (1). Furthermore, the results of the variables are selected on the basis of Akaike Information Criteria (AIC) and Schwarz Bayesian Criteria (SBC).

Table 2: ADF Unit Root Test Results

Variable	Compound t-statistics I (0)	Critical value of t at 5%	Decision of Ho	Computed t-statistics I (1)	Decision of Ho
TB	-1.54	-2.94	Non-Stationary	-6.22	Stationary
XR	4.24	-2.94	Non-Stationary	-5.30	Non-Stationary
GDP	-4.10	-2.94	Stationary	-10.21	Stationary
CPI	-2.93	-2.94	Non-Stationary	-7.90	Stationary
OP	-5.01	-2.94	Stationary	-7.20	Stationary

Table 2 presents the results of ADF test at level and first difference. Evidently, the ADF test shows that all the variables are not stationary at level except trade balance, gross domestic product and trade openness. However, the remaining two variables are found stationary at first difference i.e. exchange rate and consumer price index (inflation) which are stationary at first difference. Besides, for further check the stationary of variables the study also executed PP unit root test.

Table 3. PP Unit Root Test Results

Variable	Compound t-statistics I (0)	Critical value of t at 5%	Decision of Ho	Computed t-statistics I (1)	Decision of Ho
TB	-1.54	-2.94	Non-Stationary	-6.22	Stationary
XR	3.08	-2.94	Stationary	3.59	Stationary
GDP	-4.10	-2.94	Stationary	-10.21	Stationary
CPI	-2.93	-2.94	Stationary	-7.90	Stationary
OP	-5.01	-2.94	Stationary	-9.93	Stationary

Table 3 displays the results of PP unit root test which indicates that all variables are stationary at level except the trade balance. Clearly, the ADF and PP unit root test do not show adequate relevance and consistency to consider all investigated variables to be I(1) at level and Stationary at first difference, this specifies that findings of the forecasting are doubtful (Dzanan & Mansur, 2017). Based on these findings this study moves for ARDL long run estimation.

4.2 Examining the presence of long run relationship

Table 4. The Long Run Relationship Test

Model	F-Statistics	CV Lower (95%)	CV Upper (95%)
FTB(TB/ XR CPI GDP OP)	7.573546	2.37	3.2
FXR(XR/ TB CPI GDP OP)	7.573546	2.37	3.2
FCPI(CPI/ XR TB GDP OP)	7.573546	2.37	3.2
FGDP(GDP/ XR CPI TBOP)	7.573546	2.37	3.2
FOP(OP/ XR CPI GDP TB)	7.573546	2.37	3.2

Table 5 shows the results of bound test which explain the relationship between the dependent and explanatory variables. Clearly, the value of ARDL bound test which shows FTB (TB/ XR CPI GDP OP) = 7.574 is greater than upper bound of critical value, reveals the existence of long run relationship among the variables. Evidently, the results indicate that Trade balance has co-integrated relationship with its investigated determinants for Pakistan.

Subsequently, below given long run coefficient estimation table is used to represent ARDL model outcomes that explain the long run relationship among the variables.

Table 5. Lon-Run Coefficient Estimation

Variables	Model 1 TB	Model 2 XR	Model 3 CPI	Model 5 GDP	Model 5 OP
TB	/	-5.940067 (6.59543)	3.913397 (6.67850)	10.25282 (3.84718)	-26.62708 (12.9662)
XR	0.000101 (0.00623**)	/	-0.205572 (0.22430)	-0.178128 (0.12921)	1.000335 (0.43548)
CPI	-0.003031 (0.00539**)	0.306322 (0.19166)	/	0.246990 (0.11180)	-0.973648 (0.37680)
GDP	-0.018151 (0.01069**)	-0.342822 (0.37976)	-0.453189 (0.38454)	/	1.079846 (0.74658)
OP	0.003280 (0.00440**)	-0.365435 (0.15638)	-0.015801 (0.15835)	-0.278301 (0.09122**)	/

***, **, * Significant at 1%, 5% and 10% level

Table 5 presents the results of coefficient for the long run relationship among the variables. Clearly, the results display the existence of long run equilibrium relationship among all variables for model 1 of trade balance (TB). Notably, the findings are according to the prior findings that specify the existence of long run equilibrium relationship among the investigated variables (see Shahbaz, Awan & Ahmed, 2011;

Mohsen and Wing Ng, 2002; Waliullah et al., 2010). Hence, there are some effective steps which are required to be taken by the government and policy makers for controlling the monetary, fiscal and exchange rate stabilization. Furthermore, the results postulate that depreciation of currency may increase the demand of goods and increase the export of the country. After conducting F-Statistics and confirming the long-run association among trade balance with investigated variables, this study performed ARDL ECM test to check the causality.
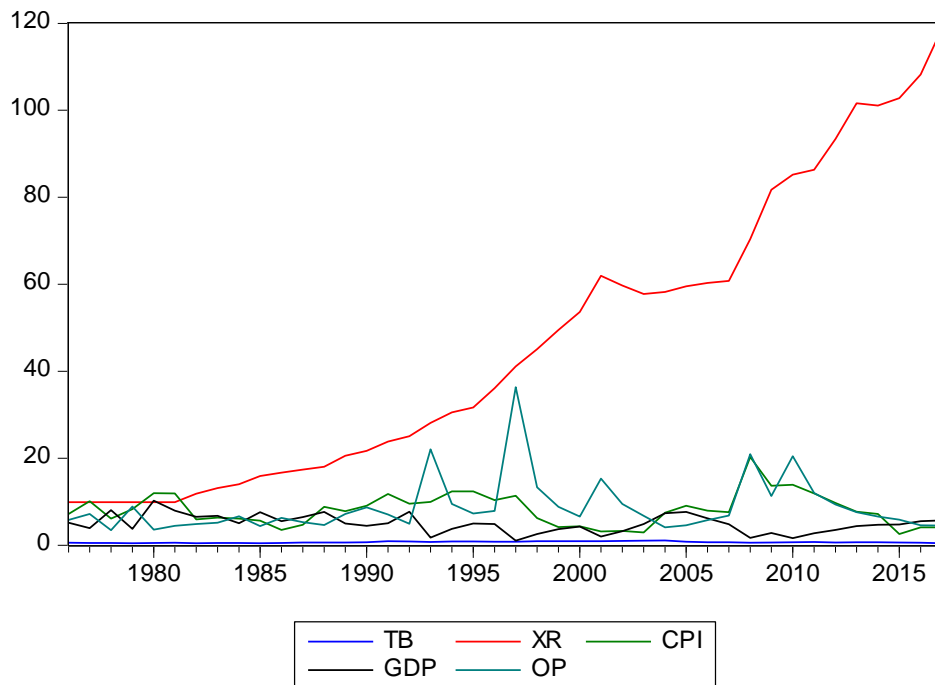

Figure 1. Graph of Yearly Data of Investigated Variables (1976 to 2017)

The Figure 1 above demonstrates the graph of selected variables that is constructed by using yearly extracted data of last 41 Years (1976 to 2017) for the selected variables. Interestingly, the figure supports the results obtained from ARDL bound test (see Table 5) that explain the long run relationship of trade balance with other variables. Similarly, the graphical demonstration of variables confirms that all of selected variables fluctuate, however, the trade balance is constant and maintains long run association with other variables.

4.3 CUSUM Test
Next, to check the stability of coefficient the CUSUM test is applied. The below graph depicts the stability of coefficients and also explains about the structure break of the data. The below graph is used to check that the variables are falling around the circle and they are within their limit. Thus, this graph confirms that there is no need to apply error correction   model.
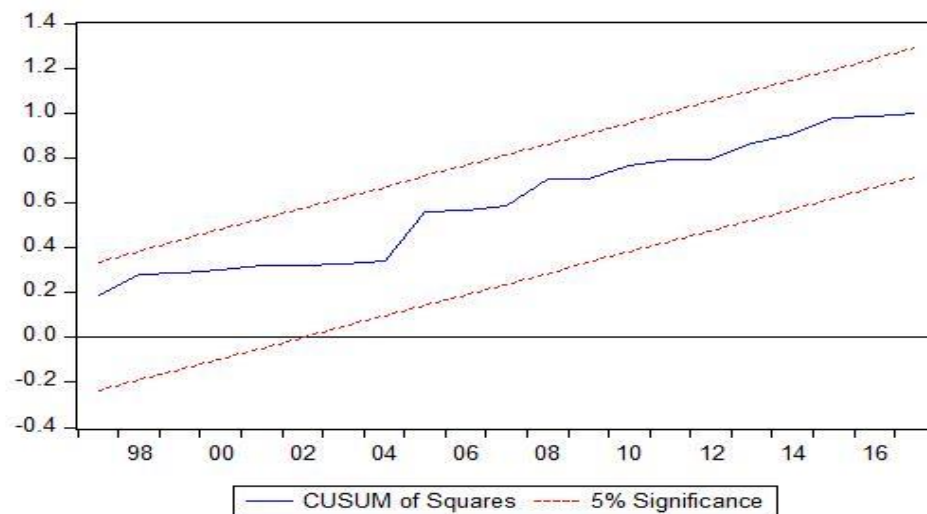
Figure 2. Graph of CUSUM of Square

From the Cusum square graph (see Figure 2) it is mined that there is stability among the coefficient because they are within the unit circle and there is no structure break observed among the data. Similarly, the value of parameters are also less than one and greater than zero. This graph further indicates that all the parameters are stable and they are within the boundaries. Technically, after the application of this graph it is clear that there is no need for error correction model because all the parameters are already stable and within their limit. Notably, the CUSUM square explain the overall scenario of parameters. In this case, the graph confirms that all parameters are falling within the unit circle and there is no problem of any error which can disturb the parameter of unit circle.

Conclusion

This study attempts to explain the relationship between the trade balance and exchange rate in case of Pakistan by using the time series data from 1976 to 2017. Methodologically, the ADF and PP unit root tests are used to check the stationary element, however, both delivered inconsistent outcomes. Nevertheless, ARDL bound test indicates the presence of long-term association between the trade balance and other studied variables in Pakistan. Clearly, this indicates that the exchange rate volatility has a long run and equilibrium association with the trade balance. In short, the results postulate that in long run the fluctuation does exist between exchange rate and the trade balance. Likewise, the CUSUM square explains the stability among the coefficient of the variables. By observing the outcomes of this study, the policy makers should make appropriate decision regarding trade balance of Pakistan and develop appropriate monetary and fiscal policy which enhances the investment opportunities in country. The future researchers should consider and add other variables i.e. interest rate and money supply in the model.

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