

# Determinants of Real Exchange Rate Volatility: A Case Study of Pakistan

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**Abstract :** Exchange rate is an important macroeconomic policy instrument which effects all macroeconomics variables. Thus fluctuations in real exchange rate have strong influence on the economic activities. The foremost purpose of this study is to investigate the major determinants of real exchange rate volatility for the Pakistan economy over the period 1976 to 2013. Different econometric techniques, including GARCH model, Cointegration approach and Vector Error Correction Mechanism applied for analysis and time series annual data used in this study. The results reveals that trade openness and government expenditures are the major source of volatility while remittances does not play significant role in mitigating the real exchange rate volatility as they are stable flow of foreign exchange reserves for emerging economies. The result of VECM shows that these variables converge toward equilibrium in the long run. External and internal factors both have significant importance in alleviating the volatility.

**Keywords:** Real exchange rate volatility, Trade Openness, Government expenditures, Remittances, GARCH.

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## 1-INTRODUCTION

Exchange rate is a conversion factor and one of the significant and ample policy variable in an open economy which links an economy with other economies in both assets and goods markets, it also indicates international competitiveness of an economy (Tariq, 2012). Fluctuations in both real and nominal exchange rate accompanied volatility and may have a momentous impact on capital movements, international trade and economic growth (Caporale and Pittis 1995; Insah and Chiaraah, 2013).

Volatility in real exchange rate is associated with irregular and erratic fluctuations in relative prices of the economy (Parikh and Williams, 1998). Real exchange rate volatility has real economic cost for instance it might negatively affect the price stability, financial stability, firms profitability and overall macroeconomic equilibrium. Government of every nation seeks to stable the exchange rate because it attempts to provide the opportunity to economic agents for investment without any fear of erratic fluctuating in prices (Benita and Lauterbach, 2007).

Recent stand of New Open Economy Macroeconomics contend that non-monetary factors such as government spending and trade openness are more prominent in intensification of exchange rate volatility. In amplifying or smoothing out the influence of shocks in real exchange rate the openness of an economy to international market of goods and assets might play a role (Calderon and Kubota, 2009).

Most of the economies in the world either developed or developing suffer with higher real exchange rate volatility but real exchange rate are more volatile in emerging economies (Calderon, 2004).

There are several factors that can become source of volatility in real exchange rate (Stancik, 2007). The factors that cause the volatility in exchange rate can be economic, political and psychological (Saeed et al., 2012). The external as well as internal factors are both significantly link with exchange rate (Tariq, 2012). Thus being an open economy there is domestic as well as foreign factors that cause the volatility in exchange rate like government expenditures, trade openness, remittances, inflation and external debt.

As volatile exchange rate is the main hurdles in the successful implication of any macroeconomic policy therefore policy makers are highly interested to know about the major factors that cause volatility in the exchange rate and how feasibly limit the variability in the exchange rate. Hence, the foremost purpose of

this study is to investigate the major determinants of real exchange rate volatility in Pakistan's economy under the selective period and to examine either external or internal factors cause more fluctuations in real exchange rate. This study also formulates the suitable suggestions for policy implementations according to the findings of study.

Over the years real exchange rate volatility has been under much scrutiny by the economists after the collapse of Bretton Woods's system, due to its deep foundations in economic performance and amplification, and being an imperative gateway to international transactions. In order to study the impacts of volatile real exchange rate, an abundance of literature has been existed but a dearth of literature is found regarding the determinants or sources of real exchange rate volatility in Pakistan economy, as not sufficient attention paid to bring into being the reason behindhand the volatility to overcome the famous quotation that identification of the problem is half of the cure. Identification of the problem is essential to overwhelmed. It's evident that if determinants will identify then volatility in real exchange rate can be easily controlled and eliminate or at least be minimalize to forward economy towards sustainable development.

1) This study is different in the sense its main concern to analyze the role of remittances, government expenditures, external debt, inflation and trade openness in mitigating the volatility in real exchange rate. On determinants of exchange rate volatility this study will supplement novel as empirical evidence and explores new dimensions to the existing literature. 2) The study examines either internal or external factors are the main source of fluctuations in real exchange rate with a distinctive cluster of variables. 3) The study conducts analysis in a detail over a larger period of time. 4) The study applies the sophisticated econometric techniques i.e. GARCH model to measure the volatility in real exchange rate, whereas Cointegration and Vector Error Correction Model to examine the relation Real Exchange Rate Volatility with its determinants.

The layout of this study is as following. Section 2 briefly reviews the relevant literature on determining factors of real exchange rate volatility. Section 3 based on theoretical and empirical justification of the model. Section 4 discusses the data and outlines the econometric methodology. The empirical findings and concluding remarks are presents in section 5. Whereas section 6 contains on policy implications regarding how volatility should be reduced.

## 2-REVIEW OF LITERATURE

In recent times increase in uncertainty of exchange rate markets there have been made several considerable developments in this area with significant contributions in the theory and empirical understanding of exchange rate determination. However, both theoretical and empirical studies produced contradictory results. Related literature is as following.

The factors that cause volatility in the Syrian economy was investigated Samara(2009) from 1980 to 2008. For this purpose two estimation techniques was used which is ARCH Model and Vector Error Correction Model (VECM). This study found positive relationship of exchange rate volatility with relative productivity, total investment, oil prices and negative relationship with government expenditures.

The determining factors of exchange rate in Pakistan within the framework of monetary approach, investigated by Saeed et al., (2012) for the period 1982 to 2010. ARDL approach and ECM was applied. Empirical results proved that political instability has a substantial negative influence on the domestic currency value but foreign exchange reserve balance, stock of money and debt are major determinants of exchange rate of Pakistan.

The factors affecting exchange rate variability in Pakistan was investigated by Parveen et al., (2012). Ordinary least Square method (OLS) is used for this purpose. The results exposed that inflation is the major cause of the volatility in exchange rate while economic growth lies at second position and import and export have third and fourth positions.

With respect to the currencies of the major trading partners of Zambia the factors that became source of volatility in exchange rate has been studied by Chipili(2012). GARCH method used to measure the volatility in exchange rate from 1964 to 2006. It was exposed that monetary factors gain relative importance then real factors in account for volatile exchange rate as money supply found main source of volatility in short term. While in the medium to long run among other real factors openness have strong positive affect.

The relationship of exchange rate volatility and inflation examined by Danjuma et al., (2013) using time series data. Volatility measured through ARCH GARCH model, for further analysis vector error correction mechanism, impulse response function and variance decomposition method was applied. This study found negative association between volatile exchange rate and inflation as inflation increases, volatility decreases in the exchange rate.

Factors that cause the real exchange rate to volatile over the period 1980-2010 for Pakistan Zardad et al., (2013) made a study through co-integration and error correction models. Volatility in real exchange rate measured through ARCH and GARCH by using a distinctive set of variables that is terms of trade, trade openness, government expenditures and productivity differential. This study reveals that real effective exchange rate has been volatile around its equilibrium level and endorses long run convergence toward equilibrium.

A study has been conducted by Mayowa and Olushola(2013) to inspect the determining factors of real exchange rate volatility in Nigeria over the period 1981-2008. GARCH model used to measure volatility ECM applied for further analysis. Results demonstrate that to influence the real exchange rate volatility the main significant variables was openness of the economy, interest rate movements, government expenditures and the lagged exchange rate during that period.

In the Ghanaian economy the sources of real exchange rate volatility was analyzed by Baba and Anthony(2013) by covering annual data period from 1980 to 2012. Volatility of real exchange rate was measured through GARCH (1, 1) and Autoregressive Distributed Lag (ARDL) Model uses for estimation purpose. This study chose the other variables which is Money supply, Government expenditures, Domestic debt and External debt and find out that government expenditures are the major source of volatility in the exchange rate and both have positive relationship. While real exchange rate volatility negatively relates with external and domestic debt. Money supply also negatively but this relation found no significant in this study.

The impact of remittances inflows on exchange rate volatility analyzed by Keefe (2014) through conducted a panel analysis of developing countries. The study found that remittances mitigate volatility in exchange rate for those countries which have high levels of partial dollarization are more vulnerable to drastic fluctuations in exchange rate. The effect of remittances on real exchange rate was studied by Lopez et al., (2007). This study found that remittances lead loss of competitiveness in tradable sector and significant real exchange rate appreciation.

The impact of economic openness on real exchange rate volatility from the period 1980 to 1998 investigated by Hau (2002) and found that with more liberalized financial markets real exchange rate was less volatile in the more open countries. But Calderon (2003) used the quarterly data of industrialized

countries and found that trade liberalization is likely to mitigate volatility in real exchange rate. In order to tests the hypothesis that real exchange rate are less volatile in more open economies Calderon(2004) conducted a study. This study found weak negative correlation between real exchange rate volatility and financial openness and also reveals that real exchange rate is more volatile in emerging economies than developed countries. Jorge and Romain, (2008) found that trade openness cause more volatility in real exchange rate hence there exists positive link between them.

All the above studies show that government expenditures, remittances, inflation, money supply, external debt, interest rate, imports, exports, gross domestic product, trade openness and inflation are major determinants of real exchange rate volatility under different eras for different economies(Samara,2009; Saeed et al.,2012;Parveen et al., 2012; Chipili,2012; Baba and Anthony,2013;Mayowa and Olushola,2013; Zardad et al.,2013). This study selected a distinctive cluster of variables (trade openness, government expenditures, external debt, inflation and remittances)to investigate the sources of real exchange rate volatility due to their theoretical and empirical importance and also in their standing the Pakistan economy.

#### 4- THEORETICAL AND EMPIRICAL JUSTIFICATION

This section sheds light on the theoretical and empirical relationship of the key variables included in this study. There are several possible factors that



But if government spends more for non-tradable commodities in domestic economy, it can cause lower markups in domestic economy then in the foreign market. It makes those goods cheaper domestically and as a result real exchange rate

might cause volatility in real exchange rate. Countries which are in renovating process are more vulnerable to being prompted by exchange rate volatility. Particularly they are dependent more on the real shocks and the magnitude of these factors to affect the exchange rate determined by the country specific factors.

#### 4.1 Government Expenditures and Real exchange Rate Volatility

Empirical literature exposes that government expenditure is one of the major determinantsof real volatile exchange rate. The Balassa Samuelson hypothesis (1976) states that the supply sides of the economy determine the real exchange rates. In long term the enduring increase in government expenditures causes real exchange rate appreciation from their equilibrium (Frenkel and Mussa, 1985).

Due to the distribution of government expenditures between tradable and non-tradable goods, government expenditures lead variations in real exchange rate. Non tradable which forms a large proportion of government spending, increase in government expenditures associates with an upsurge in relative price of non-tradable goods (Froot and Rogoff ,1991; Samara ,2009).

High government expenditure leads low money demand but higher demand for goods and services that results increase in price level and consequently a low real exchange rate (Eslamloueyan and Kia, 2014). As appreciation of real exchange rate, are linked with increase in government consumptions (De Gregorio et al.,1994).

If government expenditures increases for tradable goods

depreciated. Hence, this depreciation can be occurred by an unanticipated exogenous increase in government expenditure (Corsetti and Muller, 2006; Enders et al., 2011; Zardad. Et al., 2013)



Hence, theoretically and empirically states that rise in government expenditures leads an increase in real exchange rate volatility and literature are consistent with this theory.

#### 4.2 REMITTANCES AND REAL EXCHANGE RATE VOLATILITY

Remittances are one of the largest sources to developing countries of financial flows. It contributes to consumption smoothness, financial and macro-economic stability in recipients' countries (Ahmed. et al., 2011). Remittances increased to make financial support to economies during the time of economic recessions, financial crisis, or political conflicts (Orozco, 2003; World Bank, 2005; Ratha, 2007).

For many small developing open economies remittances are larger form of foreign currency inflows than foreign direct investment or portfolio investment (Keefe,2014). Remittances go to individuals and households, it might improve a creditworthiness of nations and there by enhance its access to international capital markets for development projects and to finance the infrastructure (Yang, 2004; Woodruff and Zenteno, 2004; Ratha, 2005; Kapur, 2005).

Whether by representing a steady foreign currency inflow, remittances are able to create volatility in the exchange rate as when other forms of capital inflow become diminishing (Keefe, 2014). Significant increase in such flows may lead financial system to be more fragile and causes to appreciation in real exchange rate of an economy (Combes et al.,2011). As many small open economies are more susceptible to fluctuations in capital flows that might cause volatility in nominal and real exchange rate (Keefe, 2014). Volatility in exchange rate had adverse effect on growth by decreasing investment spending, trade volume, and profitability (Jorge and Habermeier, 2004). Volatility of inflows can also leads to balance sheet risks and bank failures (IMF, 2010). Besides, if remittances are used for consumption purpose but not for investment then these can produce harmful effects (Ahmad et al., 2013).

As remittance inflows are denominated in foreign currency that may wield a strong influence on exchange rate and price movements because household can choose to save or consume in either foreign or local currency. Like all capital flows, remittances have the potential to increase exchange rate volatility (Keefe,2014).



Generally, the inflow of capital is escorted by appreciation in real exchange rate in the economy (Corden, 1994; Li,2003). An increase in consumption demand for both traded and non-traded goods is caused by inward flows of capital, which in turn leads to an upsurge the price of non-traded goods to recover the market equilibrium. The rise in merchandized consumptions leads balance in trade. Hence, it is difficult to draw a clear cut conclusion, about the effect of capital flexibility on the fluctuations of real exchange rate (Li, 2003).

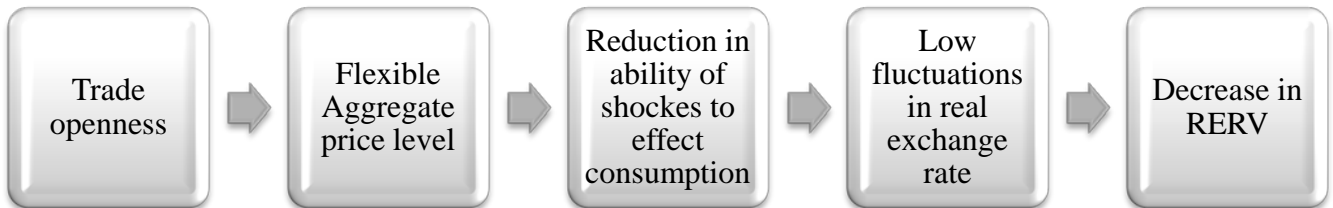
#### 4.3 TRADE OPENNESS AND REAL EXCHANGE RATE VOLATILITY

Trade openness is a measure to determine how open an economy is to world trade and income growth benefits those results from trade (Wilson, 2006). New open macroeconomics theory emphasizes that non-monetary factors are more important in the amplification of exchange rate volatility as compare to monetary factors. Hau, (2000) examined the negative association between real exchange rate

volatility and trade integration, with more liberalized financial markets real exchange rate was lesser volatile in the more open countries. Furthermore, Calderon, (2004) found negative relation between liberalization and real exchange rate volatility.

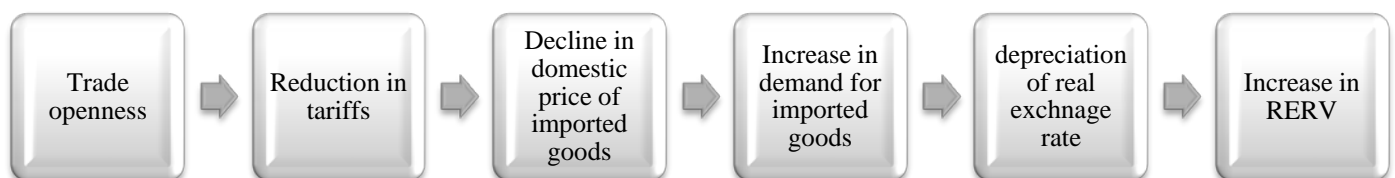
The work by Obstfeld and Rogoff (1995, 1996, 2000) and Hau, (2000) related general equilibrium

models states that higher open economies have lower volatility in real exchange rate and trade openness assist to decrease the effect of instable shocks on real exchange rate fluctuations. Obstfeld-Rogoff, (2000) and Hau, (2002) states that openness of the economy has negative relation with real exchange rate volatility.



An unanticipated shock (real or monetary) has only transitory or temporary influence on real prices of non-tradable goods, though the real price of tradable is constant. As more open economies have more receptive and elastic aggregate price level therefore it lessens the ability of shocks on short term consumption and thus low changes in real exchange rate. Consequently higher flexible aggregate price system implies lower volatility in real exchange rate. Monetary as well as real shocks both generate the negative relationship between economic openness and real exchange rate volatility (Hau, 2002).

But Calderon (2003) found that trade liberalization is likely to mitigate volatility in real exchange rate. Besides, Calderon (2004) found that that real exchange rate is more volatile in emerging countries than developed economies and also found weak negative correlation between real exchange rate volatility and financial liberalization. Jorge and Romain (2008) found positive relation and develop a channel through which trade openness positively affects the real exchange rate volatility.



Thus trade openness has both positive and negative effect on real exchange rate volatility.

### 5- DATA ND METHODOLOGY

Although a number of variables is used to study the determining factor of exchange rate volatility but the cluster of variables that is used in this study is selected due to their relative importance in the economic performance. Government expenditures, remittances, trade openness are main variables while inflation and external debt added as control variables. These variables empirically and theoretically play vital role in illumination the fluctuations in the

exchange rate. The measure the determining factor of exchange rate volatility the following equation is specified.

$$RERV = \beta_0 + \beta_1 GOVE + \beta_2 TOPEN + \beta_3 EDT + \beta_4 INF + \beta_5 REM + \epsilon \tag{5.1}$$

In equation (5.1) the following notations described as RERV is the Real Exchange Rate Volatility, GOVE is Government Expenditures, TOPEN is trade openness, EDT is external debt, INF is inflation and REM denoted Remittances whereas  $\epsilon$  is the error term. Theoretically and empirically these following variables are found to play a significant role in mitigating the volatility for real exchange rate.

This study conduct regression analysis on secondary data and data set is collected from the data base of World Bank (i.e. world development indicators, 2013). Frequency of data set retained annually and the time scope of data is occupied from 1976 to 2013. All data are taken in local currency unit at constant prices. In this study real exchange rate is the relative inflation adjusted exchange rate, and it is constructed by multiplying the nominal exchange rate by the ratio of consumer price indexes. Trade openness is the summation of imports and exports by the ratio of GDP.

### 5.1 METHODOLOGY AND ESTIMATION TECHNIQUE

At the first stage cointegration order of variables is checked through Unit root test. In the next step GARCH model applied to measure the real exchange rate volatility and then employs Cointegration analysis to check the existence of cointegrated equations in long run and Vector Error Connection Model (VECM) employ to assess the relationship of dependent and independent variables and the movement of variables toward equilibrium in the long run.

#### UNIT ROOT TEST

Since this study uses a time series data set therefore indispensable to check the stationary properties of the series. At the outset of co-integration test, it's required to check the level of stationarity as it can only be applied if all variables are stationary at same level. For instance, the Augmented Dickey Fuller Test (ADF) test is a standard measure of unit root test, and it is the wider form of Dickey Fuller Test as it counters the problem of the serial correlation of error terms. This test is performed by augmenting the lagged values in the above three equations.

This test is applied to determine the cointegration order for a time series. If a time series becomes stationarity after being differentiated of d. times denoted by  $X_t \sim I(d)$  (Engle and Granger, 1987).

The Dickey-Fuller (DF) can expressed as

$$\Delta Y_t = \mu + \delta Y_{t-1} - \varphi \Delta Y_{t-1} + \varepsilon_t \quad (5.2)$$

Where  $\delta$  and  $\varphi$  can be defined as

$$\delta = \Theta_1 + \Theta_2 - 1$$

$$\varphi = \Theta_2$$

To perform a generic AR (p) process the same reasoning can be extended for a unit root test, the regression should be estimated as

$$\Delta Y_t = \mu + \delta Y_{t-1} - \sum_{j=1}^p \varphi_j \Delta Y_{t-j} + \varepsilon_t \quad (5.3)$$

The augmentation of Dickey and Fuller is  $\sum_{j=1}^p \varphi_j \Delta Y_{t-j}$ , therefore it is regarded as Augmented Dickey-Fuller (ADF) and in this situation regression model and t test denoted as ADF tests.

### MEASUREMENT OF VOLATILITY

Volatility is not simple phenomenon for prediction or forecasting. To catch this variance the most prominent tool are ARCH GARCH family models. This class of models is proved to be effective in predicting the volatility in several conditions.

In this study the real exchange rate volatility is derived through the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model in its place of applying outdated methods to measure the volatility that are unconditional and simple approaches for measurement such as coefficient of variation and standard deviation. However, GARCH family is corrective developments in this regard therefore this study focuses on the conditional volatility and the application of GARCH model provides variable of interest i.e. the real exchange rate volatility.

### GENERALIZED AUTOREGRESSIVE CONDITIONAL HETEROSCEDASTICITY (GARCH) MODEL

The Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model was developed by and Bollerslev (1986).

The GARCH (1, 1) model can be expressed as

$$\sigma_t^2 = \beta_0 + \beta_1 \mu_{t-1}^2 + \beta_2 \sigma_{t-1}^2 \quad (5.4)$$

In the above model,  $\sigma_t^2$  is the conditional variance of error term, t is the time period and  $\mu_{t-1}^2$  is the squared error term in the previous time period. This model shows that the conditional variance of error term at time t depends not only on squared error term in the previous time period but also on the conditional variance ( $\sigma_{t-1}^2$ ) in the previous time period.

#### Johansen Cointegration Approach

The Augmented Dickey Fuller decisively conform that each variable become stationary after taking first difference and depicts similar order of integration that is I(1). Thus, to study the long term relationship among variables we can use Johansen Cointegration Approach.

In order to find the numbers of cointegrated vectors this technique makes use of two tests: Trace Test and Maximum Eigen Value Test.

As part of the empirical design the basic estimating equation is specified as follows:

$$RERV = \beta_0 + \beta_1 GOVE + \beta_2 TOPEN + \beta_3 EDT + \beta_4 INF + \beta_5 REM + \varepsilon_t \quad (5.5)$$

To check for co-integration, in order to know the disequilibrium error, equation (5.5) is rewritten as:

$$\varepsilon_t = RERV - \beta_0 - \beta_1 GOVE - \beta_2 TOPEN - \beta_3 EDT - \beta_4 INF - \beta_5 REM \quad (5.6)$$

The number of cointegrating relations is checked on the basis of trace statistics and maximum Eigen statistics in Johansen (1988) approach. Instance, if co-integration found between the series it indicates the long run relationship between them and then Vector Error Correction Mechanism (VECM) applied to assess the short term dynamics of the series. This includes both long run and short run dynamics.

### VECTOR ERROR CORRECTION MECHANISM

$$\Delta RERV = \beta_0 + \beta_1 \sum_{t=1}^n GOVE + \beta_2 \sum_{t=1}^n TOPEN + \beta_3 \sum_{t=1}^n EDT + \beta_4 \sum_{t=1}^n INF + \beta_5 \sum_{t=1}^n REM + \delta ECT_{(-1)} + \varepsilon_t \quad (5.7)$$

Here  $\Delta$  is the first difference operator and  $\varepsilon_t$  is the stochastic error term. The term  $ECT_{(-1)}$  is the error correction term that captures the long run effect. If  $\delta$  is non-zero, indicates the disequilibrium of model. But in case,  $\delta$  when it is have negative sign and also statistically significant it means that the model is

The long term static changes and short term dynamic changes relationship is examined by Vector Error Correction Model, as it indicates the speed of adjustment from short run equilibrium to the long run equilibrium. Statistical significance and magnitude of the coefficient measures the degree or tendency of a variable to return its equilibrium (Engle and Granger, 1987).

In the study Vector Error Correction Model is used to measure the relationship between real exchange rate volatility and its various determinants.

converging towards the equilibrium. As statistically significant coefficient indicates that past equilibrium errors influence the present outcomes. While the short run influence is captured by specific coefficients  $\beta$ .

## 6- RESULTS AND DISCUSSION

The result of the Augmented Dickey Fuller Test specifies the acceptance of null hypothesis that it has unit root and indicates that all the variables were non-

stationary at their level which make the coefficients inconsistent and empirically produce spurious regression

**TABLE 01: Augmented Dickey Fuller Test**

Variables	Level		First Difference		Integrated Order
	Test Statistics	Probability	Test Statistics	Probability	
<b>IRER</b>	0.629298	0.9886	-3.223628	0.0267	I(1)
<b>IGGE</b>	-0.726896	0.8275	-7.410169	0.0000	I(1)
<b>IREMT</b>	-2.132154	0.2338	-8.916422	0.0000	I(1)
<b>ICPI</b>	0.209920	0.9687	-4.132131	0.0036	I(1)
<b>ITOPEN</b>	-2.125447	0.2363	-6.074292	0.0000	I(1)
<b>IDEBT</b>	-0.994583	0.7451	-4.155885	0.0025	I(1)

As the above table shows that all variables achieve stationary at I(1), or integrated at order 1. Henceforth there will be no chance of spurious regression or inconsistent parameters.

The series of volatility is constructed by applying GARCH (1, 1) model, selected on the bases of

minimum Akaike information criterion and Schwarz criterion. Main output from GARCH (1,1) model is allocated into two parts; upper part presents the mean equation whereas the lower part labeled with variance equation.



**TABLE 02: GARCH Model**

<b>GARCH ( 1, 1)</b>		
	<b>Coefficients</b>	<b>p –Value</b>
<b>Mean Equation</b>		
C	0.078247	0.0000
ER(-)	1.013897	0.0000
<b>Variance Equation</b>		
C	0.007007	0.0003
RESID(-1)^2	0.586106	0.0000
GARCH(-1)	-1.065643	0.0000
Akaike Info Criterion	-2.514434	
Schwartz Criterion	-2.296742	

The results show that volatility is persistent in the real exchange rate of Pakistan. Hence, next step is the application of Cointegration test used to check that how many cointegration vectors exist in the concerned model. Both the Trace test and Max-Eigen

statistics confirms the presence of two cointegrating equations at 5% level of significance.

The results are presented below in the table.

**Table 03: Trace Test**

<b>Null Hypothesis</b>	<b>r=0</b>	<b>r=1</b>	<b>r=2</b>	<b>r=3</b>	<b>r=4</b>	<b>r=5</b>
<b>Alternative Hypothesis</b>	<b>r≥1</b>	<b>r≥2</b>	<b>r≥3</b>	<b>r≥4</b>	<b>r≥5</b>	<b>r≥6</b>
<b>Eigen Value</b>	0.7747620	0.6675770	0.4914810	0.3347260	0.2082470	0.000592
<b>Trace Statistics</b>	132.935082	2.2546544	8.8088221	1.816217	9.9593140	0.020122
<b>Critical Value at 5% significance level</b>	95.7536669	8.188947	8.8561329	7.7970715	4.494713	8.841466
<b>Probability</b>	0.00000	0.00370	0.09400	0.30880	0.46980	0.8871

Table of Trace test presents that at 1 percent significance level null hypothesis r=0 and r=1 both are rejected 0.0000 and 0.0037 respective probability.

The critical values are also less than the trace statistics.

**Table 04: Eigen Value Test**

Null Hypothesis Alternative Hypothesis	r=0 r≥1	r=1 r≥2	r=2 r≥3	r=3 r≥4	r=4 r≥5	r=5 r≥6
<b>Eigen Value</b>	0.7747620	0.6675770	0.4914810	0.3347260	0.2082470	0.000592
<b>Max-Eigen Statistics</b>	50.6803537	44.58322	99.26113	85.6897	93.91910	0.20122
<b>Critical Value at 5% significance level</b>	40.0775733	87.68727	58.43421	131.6214	264.603	841.466
<b>Probability</b>	0.00230	0.01790	0.17380	0.37690	0.38490	0.8871

Table presents that Eigen Value test also confirms the existents of two cointegrating equations at one percent level of significance.

The results of VECM confirmed that long run parameters are statistically significant and consistent with the previous literatures.

**Table: 05**

Variables	Coefficients	t-statistics	Standard errors
Constant	-0.042216		
Government Expenditures	0.006718	-2.83407	0.00237
Trade openness	0.012832	-2.46665	0.00520
External debt	- 0.004976	3.49333	0.00142
Inflation	-0.000636	0.42231	0.00151
Remittances	0.0000716	-0.10052	0.00071
ECT	-0.789110	-2.17656	0.36255

Above equation of Vector Error Correction Model (VECM) indicates the long term relationship of explanatory variables with dependent variables. In this model  $ECT_{-1}$  is error correction term that have negative sign and significant value, which confirms that variables in the model have tendency to move the equilibrium in long run. The value of  $ECT_{-1}$  is equal to -0.789110 for the short run.

The value of intercept shows that if all other variables become constant or zero the change will come in the real exchange rate volatility will be 4.2 percent. The value of trade openness is positive and statistically significant. Thus 1 percentage increase in trade openness leads 1.28 percent volatility in real exchange rate. Trade openness may increase or decrease the imports and exports of a country and thus mitigate volatility in the real exchange rate. Trade openness may reduce the trade barriers such as

reduction in tariffs which leads to a decrease in domestic price of imported goods, consequently demand for imported goods raise which leads fluctuations(depreciation) in real exchange rate and thus volatility increases in the real exchange rate. This positive relationship is consistent with the findings of Calderon (2003) and Jorge and Romain(2008).

Government expenditures have positive relation with real exchange rate volatility. One percent increases in government expenditures causes 0.67percent higher volatility in real exchange rate. According to Balassa Samuelson hypotheses real exchange rate determines by the supply side of the economy. The division of government spending between tradable and non-tradable good implies variations in the real exchange rate. If government spends more on tradable goods, it reduces the fiscal balance and weakens the position

of current account, that leads a depreciation of real exchange rate consequently creates volatility in the real exchange rate. Volatility will also be increased if government is biased toward non-tradable sector, which put pressure on relative prices of non-tradable pro as a result of rise in domestic demand, implies real exchange rate appreciation and hence volatility in real exchange rate. The result of this study has uniformity with (Frenkel and Mussa, 1985; Froot and Rogoff, 1991; De Gregorio et al., 1994; Alsamara, 2009; Corsetti and Muller, 2006; Enders et al., 2011; Monacelli and Perotti, 2010; Zardad. Et al., 2013).

In this model inflation and external debt are taken as control variables. External debt possesses negative and significant value which indicates negative association of real exchange rate volatility with external debt as confirmed this relationship by Insah and Chiaraah (2013). Inflation also has negative relation with real exchange rate volatility but the coefficient of inflation is insignificant, as one percent increase in inflation alleviates only 0.0636 percentage decrease in real exchange rate volatility. The New Open Economy Macroeconomics in the literature states that non-monetary factors are more important in explaining the real exchange rate volatility as compare to monetary factors. Countries which adopt inflation targeting policies, inflation does not play significant role in mitigating the volatility in real exchange rate. Central bank has its aim to attain the single digit inflation through liquidity tightening; by way of rising the cash reserve requirements and liquidity ratio for the banks to reduce the ability of landers to create money. This negative relation is consistent with (Pontines, 2011; Danjuma et al., 2013), as real exchange rate volatility is lower in inflation targeting countries but this relation is not strong in case of Pakistan under selecting period.

Remittances have positive but insignificant value, as one percent increase in remittances implies only 0.0072 percent volatility in real exchange rate. For instance remittances are stable flow of foreign currency for developing economies relative to foreign direct investment and portfolio investment. This result is consistent with the study of Keefe (2014), his study found that in case of Pakistan remittances does not play significant role in mitigating the volatility in real exchange rate.

## **7- CONCLUSION AND POLICY RECOMMENDATIONS**

The foremost purpose of this study is to find out the major determinants of real exchange rate volatility in Pakistan economy over the period 1976 to 2013.

Trade openness, government expenditures, remittances, inflation and external debt selected as independent variables due to their relative importance in the theory and literature. Different econometric techniques used for analysis such as Augmented Dickey Fuller test used to check the order of cointegration and GARCH model used to measure the volatility in real exchange rate. Johensons Cointegration test applied to confirm the long run relationship between the real exchange rate and its various determinants whereas Vector Error Correction Mechanism used to investigate the major determinant of real exchange rate volatility and the movement of these determinants toward equilibrium in the long run. The results of this study reveals that all the variables were stationary at first difference, hence they are integrated of order one. GARCH model exposed the presence of volatility in real exchange rate of Pakistan under the selective period of time. Cointegration analysis confirms the existence of long run relationship between the real exchange rate and its various determinants. Vector error Correction mechanism shows that the determinants of real exchange rate are convergent to their equilibrium in the long run. All the results were consistent with the theory and literature. Trade openness and government expenditure are the major determinants of real exchange rate, remittances does not significantly influence the volatility of real exchange rate. Whereas control variables in this study inflation and external debt do not play role in mitigating the real exchange rate volatility. Results also reveal that both internal and external factors play role in mitigating the volatility in the real exchange rate.

Under the light of the empirical results, this study suggests the following recommendations that are proposed to encourage and improve the stability in real exchange rate of Pakistan. The monetary authority of Pakistan should be cautious in making appropriate policies and strategies and their implementation the exchange rate policy to ensure the minimum uncertainty relating to the future course of the equilibrium real exchange rate. The central monetary authority should ensure the stability and a limit with in which exchange rate can fluctuate in a given period of time and consistently should adopt the inflation targeting policies. The government of Pakistan should direct its expenditures to the productive sectors such as agriculture and manufacturing sector of the economy because this will go a long way in increasing the production of goods and services thereby domestic production meet the demands of the economy and therefore imports can be reduced, prices should be stabilized and provide pathway toward stabilization of exchange

rate. The budget of the economy should be adequately addressed as more of the country's budget is recurrent which is not healthy for the economy. Government should spend more on investment side than in consumption expenditures to boost up the productive activities and thus a step toward the stabilization of exchange rate.

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