Role of External Shocks in the Movements of Real Exchange Rate: A Dynamic Analysis for Pakistan

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Abstract

The study investigates the role of external occurred in Pakistan's economy during 1981 to 2012 with the following supporting variables (in literature known as fundamentals of exchange rate) including capital inflows (KI), trade openness (TOP) in the movements of Real Exchange Rate (RER) in Pakistan. In order to examine the role of external shocks, Error correction model (ECM), Johnson Cointeregation Technique and Impulse Response Function (IRF) have been applied to capture the short -run and long-run dynamics of the impact of external on the RER. Econometrics analysis supports the results of Cointegration, ECM and IRF analyses. Role of external shocks in the movements as well as determination of RER in Pakistan has also been analyzed. Exchange rate would be appreciated due to external shocks & improvement in the fundamentals like KI, whereas deviation of RER significantly from its equilibrium level require immediate measures to correct it in order to maintain the external competitiveness of the economy. The results also reveal that external shock (D_1) has lager influence on RER in short run as well as in the long run.

JEL:

Keywords: Co-integration, External Shocks, Error Correction Model, Real Exchange Rate, Capital Inflows (KI)**.**

1. Introduction

Pakistan's economy has faced number of autonomous shocks such as deterioration in TOT (Terms of trade) due to fluctuations in international oil prices and unexpected changes in "capital flows like other developing economies which was the big challenge for macroeconomics management

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and policy makers. External shocks such as sharp increase in remittances in 1983 and incident of 9/11 in 2001 had also destabilized the economy to the large extent require appropriate and suitable fiscal and monetary policies actions and also need to adopt floating exchange rate system (Also viewed in Khan (1987) merit in policy of some flexible exchange rates) to prevent unfavorable consequences of deficit in current account, expanding external debt burdens and also loss in external competitiveness of the economy.

Real exchange rate (RER) is an important economic indicator. Variations in RER cause fluctuations in the rest of the macroeconomic indicators of the economy. In order to find the factors and effects of variations in RER (real exchange rate), it is very important to first know the determinants of RER. In literature consensus regarding the determinants of RER are very few while important works of Montiel & Khan (1987), Edwards (1985/1988), Rodrigues (1989), and Soto & Elbadawi (1994/1997) provide an important guideline for the fundamentals (determinants) of RER. Practically, theory states that the determinants of RER can be categorised into structural variables like TOT (terms of trade), TOP (trade openness), public and private consumption and other variables like rate of interest and devaluation of currency usually used as a proxy of exchange rate as well, so no consensus available about the determinant of RER and literature remains unable to provide the theory as the best option.

In the literature Inflows of capital found as an important factor to determine the RER too (Given in Corden and Neary (1982) theory of Dutch Disease), higher inflows of capital may result an appreciation of the RER and may affect both tradable sector and non-tradable sector of the recipient economy as well. In most of the empirical studies inflows of capital considered as an aggregate (see in Opoku- Afari et al 2004) and the present study also used inflows of capital as sum of foreign aid received by government, net foreign direct investment and foreign remittances" as one of the determinants of RER movement in one study.

1.1: History of Exchange Rate Systems in Pakistan

In the perspective of exchange rate regimes; "Pakistan generally followed export led growth policy to attain viability in its BOP (balance of payments) and adopted different exchange rate systems. A fixed exchange rate system was practiced from 1947 to January 7th, 1982. In beginning of 1980s, dollar appreciated in term of major currencies that negatively affected the value of Pakistani goods in external markets because rupee was linked with dollar. Thus in order to maintain the external value of Pakistani goods in foreign

markets and sustainability between the country's current external expenses (payments) & Incomes (receipts) , Pakistan has made a decision to fallow managed floating exchange rate system on January 8th , 1982.Now the value of Pak-rupee was determined on the daily basis with respect to currencies of major trading partners of the country and also necessary and important adjustments were made as per requirements in value of rupee, while also considered the relative changes in exchange rate and prices of trading partners of the country and macroeconomics indicators as well. So managed floating system operated successfully up till July 21st, 1998.

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In the reaction of nuclear tests on May 28, 1998, many economic restrictions were imposed by main donors of Pakistan and the restraining stance of multiple financial institutions created number of challenges for Pakistan economy. As a result, on July 22nd, 1998, Pakistan central bank (SBP) replaced Managed Floating Exchange Rate System with New Exchange Rate Mechanism (NERM) in order to acquire the advantages of devaluation to exporters. The NERM creates differences among foreign traders (exporters & imports) and also causes inefficient allocation of country scare resources that adversely affected output as well as growth of the economy.

On 19 may, 1999, state bank of Pakistan (SBP) introduced another exchange rate system that is known as Unified Exchange Rate System. Under this system floating interbank rate followed for all international transactions (receipts & payments) in government and private sector respectively. Furthermore, SBP also interfered in forex market to buy and sale foreign exchange on its own account rates.

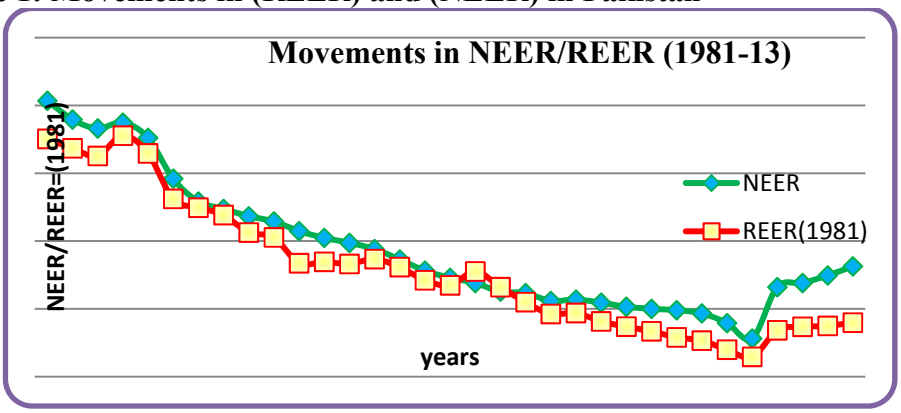
On July 20th, 2000, country followed Free Floating Exchange Rate System. In this system monetary policy actions played dominant role to stabilize exchange rate of the country because central bank of the country observed the speculative activities in foreign exchange market and regularized by taking proactive monetary policy actions. One of the tool of monetary policy used by central bank to overcome the undue pressure of exchange rate while increase CRR (Cash Reserve Requirements) to reduce excess liquidity in foreign exchange market.

The present study examines the reasons of external in real exchange rate (RER) movements in Pakistan by using Error correction model (ECM), Johnson Cointeregation Technique and Impulse Response Function. To analysis the short run and long run dynamics of external shocks impact on RER by considering; a sharp increase in remittances in 1983(D_1) and nine

eleven incident (D_2) as external shocks with following some other variables including inflows of capital (KI), trade openness (TOP), based on annually data for 1981 to 2012. As Montiel (1999) and Baffes and others (1999) used co-integration techniques to estimate the equilibrium exchange rate and viewed that co integration technique is superior method of estimating the real exchange rate over the purchasing power priority (PPP) methodology.We also apply the same technique in this study for empirical analysis as well.

Movements of RER due to external shocks in Pakistan may not well explore and limited work has been done. So one objective of the present study is to fill this gap and analysed the factors that result movements in RER empirically.

Figure 1: Movements in (REER) and (NEER) in Pakistan



Source: IFS (Various Issues)

a) REER = Real effective exchange rate
b) NEER = Nominal effective exchange rate

Real effective exchange rate (REER) uses as a proxy for RER. (Use in several studies.e.g Opoku-Afari et al 2004).
REER in Pakistan has passed several phases due to its liberalization in 2000. In figure 1 REER curve shows the fluctuations occur in REER over time. REER shows continuous negative trend from 1998 to 2010, reflects strong appreciation result to attract attention of the exporters those have argument, strengthen REER cause of reduction in their competitiveness while after 2010 REER curve has positive trend reflects depreciation in REER.

Figure 1 shows the overall trend of REER in Pakistan during particular period of 1981 to 2013".

In addition to movements in real exchange rates in Pakistan also because of changes in terms of trade, level of trade openness, remittances.

1.2. Objectives

1. To highlight the importance of external shocks in the determination the RER in Pakistan.
2. To implement the findings of the study for the choice of exchange rate system in Pakistan.
3. To find and provide estimated evidence on the linkages among internal external shocks and RER movements over the period of 1981 to 2012 in long run as well as in short run.
4. Determination of relevant policy recommendation based on our findings is also an important goal of this study.

1.3. Significance of the study

There is hardly any study incorporated given external shocks to see the fluctuations in RER in Pakistan. To capture the true picture of impact of such types of shocks on RER, we have conducted the present study which provides the overall glance of RER movements during 1981-2012. The importance of this study is quite lofty as it also contributes in the existing literature and helps in understanding the effects of external shocks in real exchange rate phenomena for common reader.

2. Literature Review

Literature about the movements in the exchange rate has been briefly presented in this chapter, which may be followed as:

"Swam (1981) and Straubhaar (1985) found that Remittances have resolved partially the problem of RER and helped in improving balance of payments problem in developing countries.

Khan (1986) analyzed effects of TOT (terms of trade), RGNP (real GNP) of developed countries, real interest rate in foreign financial markets and inflows of capital on RER over period of 1977-1984. He found that effects of above mentioned variables were often apposite to that mentioned in the

theory. This is may be due to exchange rate policies pursued by authorities that offsetting the effects of external factors or due to domestic factors that changed the direction of external factors. Thus author trying to show the importance of flexible exchange rate system by arguing that enhance the efficiency of the authorities to adjust variety of external shocks that play an effective role in the economy. Furthermore huge inverse effect of depreciation in RER on domestic demand reflects greater flexibility in exchange rate could also destabilize the overall demand.

Montiel & Haque (1992) used the period of 1982 to 1991 for estimation. They found higher correlation ship between changes in nominal exchange rate (NER) and RER with respect to cumulative depreciation in the NER that is 170 % over this period is being accompanied by a cumulative depreciation of 110% in RER as well. Thus due to depreciation of NER does not bring about an increase in prices and to deterrent RER to changing much.

Haque and Montiel (1992) also identified in their study, the role of remittances in REER (real effective exchange rate) movements. They considered the sample period of 1982-1991 and found that growth in workers' remittances causes an appreciation of REER, especially workers' remittances and official transfers result 80% variation in REER over this period. Khan's papers mentioned above also highlights role of remittances in the BOP (balance of payments) and movements in RER.

Ahmed (1992) analysed the determinants of NER since the advent period of managed floating in 1982, applying ECM (error correction model) technique and the analysis based on monthly data over the period of January 1983 to June 1987.The findings of the study showed monetary authorities react towards variations in rupee exchange rate with respect to dollar and SDR in short run while in the long run policy was offset the difference in Pakistan's inflation with respect to major trading partners in order to set exchange rate at constant level.

Hassan and Khan (1994), considered demand and supply of exports, imports demand and price function, used 3SLS methodology for analysis and sample of the study contained the period of 1972 to 1991.The study showed that Marshall-Lerner condition satisfied that means devaluation would successfully making the improvement in balance of payments.

Khan and Aftab (1995) made the same analysis with different sample period over 1983 to 1993 and found on aggregate Marshall-Lerner condition not satisfied.

Aftab and Aurangzeb (2004) estimated Marshal-Lerner conditions by using sample period of 1981-2004. They concluded Marshal-Lerner condition hold only in the long run. They also estimated ECM for short run analysis and the findings of the study support the existence of J-curve theory in SR (short run), but initially during two quarter trade balance deteriorate and then improve.

Nabvi (1997) studied the exchange rate management and revised the trade policy as a principle tool. He put more light on the issue of exchange rate system in his analysis and studied the interaction between prices and exchange rates in Pakistan.

Baffes and et al (1997) measured the degree of exchange rate misalignment, using Single Equation framework, using annual data for Faso 1980 – 1993. The results of the study reveal no major overvaluation of real exchange rate. Indeed Burkino Faso real exchange rate undervalued during 1980-86 by 1% on average and almost 14% during 1987 - 93. It is difficult to measure the degree of misalignment when the economy is out of its equilibrium with respect to internal and external balances.

Ahmed and Ali (1999) estimated pattern and speed of adjustment of nominal exchange rate and local prices with respect to response of internal and external shocks, applying simultaneous equations technique and the study contains the period of 1982-1986.Auther considered money supply (MS) and real production as internal shocks while foreign exchange and prices of imports as external shocks. The study revealed that MS, real production and import prices result larger variations in inflation than RER while on the other hand reverse is true about exports prices and foreign exchange reserve. If a 10% rise in foreign exchange reserve results on average 0.1% appreciation of real exchange rate within a quarter. By making the comparison between exchange rates and prices to different shocks, they concluded that response of price level to temporary shocks did not offset the direction of exchange rate in short run but it was in long run and PPP was not hold in short run.

Chand (2001) empirically estimated misalignment in Australian Real Exchange rate using quarterly date from 1981-2000.Ordirnary Least Square (OLS) and Error Correction (ECM) technique applied for empirical

estimation and find real exchange rate 7% below from its equilibrium value. Furthermore short run dynamics are accounted for even this anomaly disappears.

Broda (2002) examined the TOT and RER regime in under developing countries used descriptive statistics by considering Friedman (1953), that an advantage usually associated with flexible exchange rate system over fixed exchange rate system due to its ability to insulate the economy in response of real shocks more effectively. The study contained the sample over 1973-1996 and included seventy five under developing countries to analyzed the response of GDP, RER, prices to TOT shocks differ with respect to exchange rate systems or not. He concluded that responses are differing with respect to exchange rate regimes that supported Freidman hypothesis.
Afari and et al (2004) measured the response of RER to inflows of capital for African country Ghana. The paper concentrated the effects of inflows of capital (by categorized inflows of capital in the form of official, permanent and non permanent inflows) in the determination of ERER (equilibrium real exchange rate) and also misalignments. They used Vector Auto regressive Model (VAR) for estimation of ERER. The findings of the study stated that, inflows of capital appreciated RER while trade (exports), TOT and technological changes depreciate RER in the long run and also found variations in exports are main drivers of RER misalignment in Ghana.

Hyder & Mehboob (2005) empirically estimated EREER (Equilibrium real effective exchange rate) and misalignment for Pakistan, using annual data for 1978-2005. Applied Engle Granger Cointegration technique for empirical analysis and following independent variable ncluded in the model such as TOT, TOP (trade openness), net inflows of capital, relative productivity differential, GC (govt. consumption) and remittances (rm). The estimation of the study revealed that TOP, GC, inflows of capital depreciated RER while increase workers' remittances, improvement in TOT productivity differential appreciated REER. However results also show EREER gradually converge towards long run EREER which suggested that rupee has not deviated from EREER.

Ahmed and et al (2005) analyzed the effects of external shocks and exchange rate on economy of Pakistan, using Structural VAR model including foreign output & remittances as external shocks. The study shows depreciation of real exchange rate positively affects export while lager reduction in domestic demand offset the positive change in exports.

Janjua (2007) examined the EREER and exchange rate misalignment in Pakistan, using annual data during the period of 1978-2006. For empirical estimation Engle Granger Cointegration technique applied including exogenous variables such as TOT, TOP, net inflows of capital, relative productivity differential, GC, and remittances as well. The results of the study revealed that ERER gradually converge towards ERER level of long run. Moreover, foreign trade significantly depends on the behavior of economic fundamentals in the next period. Improvement in the economic fundamentals causes expansion in foreign trade.

Zakaria and Ghauri (2007) studied the effect of TOP on RER in Pakistan and using quarterly data over the period of 1972-2010. Results of the study stated that TOP positively affecting RER in Pakistan. The results again repeated with alternative model specifications including TOT, inflows of capital, GC, foreign direct investment and accumulation of capital to alternative trade openness measure and different model specification including terms of trade, inflows of capital, government consumption, foreign direct investment and capital accumulation. The findings of the study demonstrated that GC and foreign direct investment positively influenced RER while TOT, inflows of capital and accumulation of capital have negatively affected RER in Pakistan.

Kiptui & Kipyegon (2008) empirically estimated the impact of external shocks on REER, used Error Correction Model and Johnson's cointegration technique to capture the short run & long run dynamics of external shocks including TOT, TOP, net foreign inflows of capital and the sample based on monthly data over the period of 1996 to 2007. The model also incorporated the other domestic variables like growth of real GDP, Rd (interest rate differential) and GC. They found that external shocks such as TOT and TOP has a significant influenced by large extent on REER than domestic factors in Kenya.

Lartey (2008) analysed the effects of level as well as share of inflows of capital on reallocation of resources and RER movements in the context of Dutch diseases under small open economy. The study shows that there exist a tradeoff between resource reallocation and real exchange rate appreciation. The findings of the study stated, rise in inflows of capital results an expansion in demand that rise in relative price and supply of non-tradable goods respectively. Finally an increase in prices of non-tradable goods appreciated RER and loss of international competiveness of country and adversely affect external sector of the economy.

Kim and Yang (2008) studied effects of inflows of capital on domestic economy considering particularly assets prices, using Vector Auto Regressive (VAR) methodology. The study indicates that shocks of inflows of capital result increase stock prices in Korea while no effect on land prices but shocks to inflows of capital have minor effect on nominal and RER due to large increase in holding of foreign reserves.

Awan and et al (2012) established the sound and stable relation between variations in RER and balance of trade (BOT) indicators of Pakistan economy. The study based on quarterly data over 1980-2006.ARDL model has applied to see the long run relations and elasticities. They found existence of long run relationship between RER and BOT. Negative and statistically significant elasticities imply that depreciation will cause worsen BOT and the theory of J-curve not hold in Pakistan".

In short, almost all the studies analyzed REER as main variable along with inflows of capital, trade openness, government consumption, inflation rate, and interest rate differential; and draw different conclusions based on their analysis. There is hardly any study which provides the importance of **the role of external shocks in the movements of REER,** which is also needs to be done and quite interesting for the policy makers as well. We have tried to fill this gap.

3. Long Run Equilibrium Real Exchange Rate in: Theoretical Background

Real Exchange Rate (RER) existing in an economy is a short run phenomenon. It may response to variations in the economy due to changes in dynamic factors that changed equilibrium of RER in short run and cause disequilibrium in long run. Sustainable RER associates with sustainable long-run macroeconomic equilibrium. Equilibrium in RER in long run associates with steady-state equilibrium level of international creditor position of the economy and the conditions upon the variety of the values of permanent policies and exogenous variables. Defining the ERER (equilibrium RER) based on permanent variables that are known fundamentals of RER in literature. So the permanent changes in the fundamentals may result variation in long run ERER. Montiel (1987), Edwards (1985, 1988, 1988a), Rodriguez (1989), and Elbadawi and Soto (1994, 1997) provide helpful guidelines towards fundamentals (determinants) of RER.

For the derivation of long run ERER, we follow Montiel (1999), he utilized two-good structure consists on tradable and non tradable commodities. The RER is defined as the local currency price of foreign currency multiplied by prices of tradable and non tradable commodities:

$$RER = (e)(\frac{p_t}{p_n}) \qquad \text{……..…….. (1)}$$

Where "e" is exchange rate, p_t is price of world tradable commodities and p_n is the world price of non tradable commodities. Exchange rates are defined as, increase implies depreciation and vice versa. Thus increase in the prices of tradable commodities reduces index of RER that appreciation in RER and vice versa.

To examine the markets of tradable and non tradable commodities, Montiel (1999) defined IB (internal balance) where the demand for non tradable commodities equals to supply of non tradable commodities and also expected being in equilibrium in future period as well which is associated with Edwards 1989 as;

$$Yn(E) = Cn + Gn = (1-\zeta)\text{EC} + \text{Gn} \qquad \text{Gn; Yn}' < 0 \text{ …….} \quad (2)$$

Y_n is the production of non tradable commodities under the condition of full employment, E is RER, C_n is the individuals' consumption of non tradable commodities, G_n public consumption of non tradable commodities and C is the individuals (private) consumption of tradable commodities where as ζ represents the portion of tradable commodities in aggregate consumption.

If a rise in private spending result to create difference between demand and supply of non tradable commodities at given equilibrium RER, here demand exceed over supply of non tradable commodities. In order to determine the equality (equilibrium) between demand and supply of non tradable commodities then RER requires appreciation which ends up increasing the supply of non tradable commodities, while on the other hand increasing the demand for tradable commodities.

For external balance, Montiel (1999) said that external balance is the balance of current account that is associated with the sustainability of inflows of capital in long run.

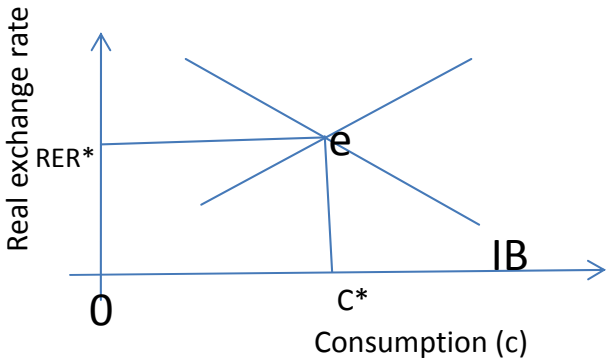
$$f^0 = Y_T(E) - G_T(\zeta + \tau)C + z + rf \text{ ……} \quad (3)$$

"Now f^0 reflects variation in total NFS (net foreign assets) over time, *f* shows aggregate of net foreign assets, z is the aggregate of external aid taken by the government and r is the actual reward on foreign assets (measured in term of tradable commodities), Y_T shows the local/ domestic supply of tradable commodities, G_T and *C* showing public and private spending on tradable commodities respectively, τ shows transportation costs of private consumption of tradable commodities and rf reflects foreign debt service.

In equilibrium situation $f^0 = 0$ producing EB (external balance) that also shows relationship between consumption of tradable commodities and RER. EB schedule has increasing trend that shows positive relationship between consumption of tradable commodities and RER. If private consumption of tradable commodities increases that creates a deficit in current account at given equilibrium RER. To establish equilibrium in tradable goods market, RER depreciated that increases the demand for non tradable commodities and supply of tradable commodities respectively. Under IB a rise in private consumption of non tradable commodities results appreciation in RER while stock in EB result reduction in RER that increase in the production of tradable commodities". The overall effect IB and EB markets generate equilibrium RER that associated along with fundamentals determining equilibrium RER. Expression has shown through graph as below;

Figure 2: IB (internal balance) & EB (external balance) and RER:

Equilibrium RER



Vertical axis measured *RER* and at horizontal axis consumption of tradable goods (*C*) of both private and government sector. *IB* stand for internal balance and *EB* stand for external balance.

"*e*" is the equilibrium point where *IB* and *EB* curves intersect to each other reflect that demand for tradable commodities equals to supply of tradable commodities which determine equilibrium consumption for tradable commodities "*C**" and equilibrium "*RER**"

The relationship between private consumption and RER can solve for EB by keeping *f* at its equilibrium level. Setting the right hand side of equation (3) into zero and substitute into equation 2 then we will get desired static (equilibrium) RER.

$$E^* = E^*(G_n, G_T, r^* f^* + z, \tau^*)$$

Now * superscript shows the equilibrium values of exogenous variables while z (transaction costs) treated as endogenous because its value determined by interest rate, ratio of money holding to private expenses, and the alternative cost of local /domestic money holding . At the end Montiel model gets the following form for equilibrium;

$$E^* = E^*(G_n, G_T, z, rw, \pi t) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4) \qquad E_1 < 0,\ E2 < 0,\ E3 < 0,\ E5 < 0$$

Where *rw* is the world real interest rate and πt is the inflation rate in term of domestic price of tradable commodities Equation (4^{th}) shows that policy variables and exogenous variables. Version of equation 4^{th} varies country to country. In African countries RER affected by (terms of trade), inflows of capital, productivity, GC (govt. consumption), differences in prices and real interest rate respectively and net foreign assets as well as M/p (real money

supply) are important determinants of RER. (See, Opoku-Afari, 2004; Mungule, 2004; Elbadawi and Sato, 2005).

3.1. Definitions of RER and REER

Before analyzing the model, it is very important to define RER and REER and reasons of using REER instead of RER.

Real exchange rate (RER):

It tells us how expensive commodities are in different countries and reflects the external competitiveness of the economy. e.g. A cup of coffee cost is 200 rupee in Pakistan and one dollar in USA while nominal exchange rate is 1 $ is equal to 100 rupee. If an American citizen visit in Pakistan can only purchase half a cup of coffee then RER is 0.50.

*Formula: RER= Exchange rate * oversees price level/domestic price)*

Real Effective Exchange Rate (REER):
It is a measure of how the currency has done on average against currencies of all trading partner rather than just one currency and REER is a measure of this average performance. It can be calculating on trade weight basis.
Formula: REER= nominal exchange rate * Trade weight whole sale price index of trading partners/domestic CPI.

Reason of using REER:

REER shows the average performance of domestic currency against currencies of major trading partners of the country instead of only one currency as RER shows. So this is the basic reason of utilize REER rather RER in this study.

4. Analytical Framework

4.1. Methodology

To empirically account the external shocks' effects on RER in Pakistan used Error correction model (ECM), Johnson Cointeregation Technique (1989), and Impulse Response Function, as the methodology adopted by Baffes et al (1997), Chand (2001) Opoku-Afari (2004).

Model specification for Pakistan:

In this study, we have used annual data from 1981 to 2012 for Pakistan for the purpose of estimation. Taking into account the variables mentioned above to adopt the following equations for analysis of this study

- **General form of the model:**

$$REER = f(TOP, KI, D_1, D_2).$$

In order to do separate analyses for the impact of external and internal shocks on real exchange rate (RER); we develop two econometrics models for the purpose of empirical estimations such as**;**

i). The econometrics model of EXTERNAL SHOCKS for the purpose of estimation would be;

$$REER = \alpha_0 + \beta_1 TOP + \beta_2 KI + \beta_3 D_1 + \beta_4 D_2 + \mu_t \text{.....(5)}$$

- *REER=Real Effective Exchange Rate (REER) use as a proxy for RER.*
- *TOP=Trade Openness*
- *KI=Inflows of capital*
- *D*1 *=Dummy for sharp fluctuations in remittances in 1983 shows the effects of this change on RER.*
- *D*2 *=dummy use to capture the effects of 9/11 incident on RER*
- μ*=Error Term*

4.2. Data and Variables Construction:

In this study we have used annual data to analyze the effects of external shocks in RER movements in Pakistan. It is time series data of last more than three decades [1981-1990, 1991-2000, 2001-2012] contains 32 years. The main sources of data are *State Bank of Pakistan (SBP), International Financial Statistics (IFS), World Development Indicators (WDI), Pakistan Economic Survey, and World Bank (WB).*

4.2.1. Variables Construction:

I. **REER** (real effective exchange rate) calculated as nominal effective exchange rate (NEER) multiplied by the ratio Pakistan's value of exports to value of imports. (See Opoku-Afari et al (2004)).

$$REER = NEER(\frac{P_x}{P_m})$$

II. **TOP** (Trade Openness) is the sum of unit value of exports and unit value of imports.

$$TOP = (\frac{(X+M}{GDP})$$

(See Albadawi and Soto (1994), Baffes et al (1999) and Tan (1998)

III. **GC (**Government Consumption) measured as a ratio of total government consumption to GDP (GC/GDP). We are not able to separate GC for tradable and non tradable commodities, so we used total GC as a proxy for GC for tradable and non tradable goods (see Baffes et al 1997, Adwards 1985 and Chishti and Hasan 1993).

IV. Most of the studies used **aggregate inflows of capital (KI),** this study also considers aggregate inflows of capital that contains foreign aid received by government (aid), foreign direct investment (fdi) and foreign remittances (rm as a percentage of GDP).

V.

$$KI = aid + fdi + rm$$

Note: 1=reflects the occurrence of event and zero (0) otherwise for all dummies.

Table 1: Variables and Sources

Codes	Variables	Formula	Source
REER	Real effective exchange rate	REER=NEER(P_x /P_m)	IFS/SBP/Eco. survey
TOP	Trade openness	TOP=X+M/GDP.	FBS
KI	Inflows of capital	KI=KI/GDP	SBP
D_1	Sharp increase in remittances in 1983	1=reflects the occurrence of event and zero(0) otherwise	…
D_2	Incident of 9/11,2001	1=reflects the occurrence of event and zero(0) otherwise	…

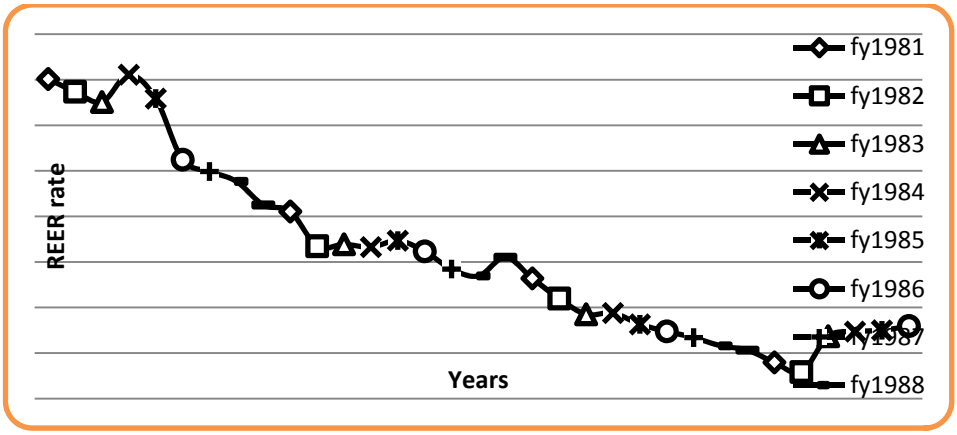
4.3. Trend of all Variables: A Graphical Analysis

I): Real Effective Exchange Rate (REER)

REER reflects competitiveness of the economy and has greater importance in the external sector perspective of the economy. We used REER as proxy for real exchange rate (RER) which is computed as nominal effective exchange rate (NEER) multiplied by the relative prices exports over imports.

Note defined RER in this way that a rise means depreciation and fall means appreciation.

Figure 3: Trend in Real Effective Exchange Rate in Pakistan during 1981-2013

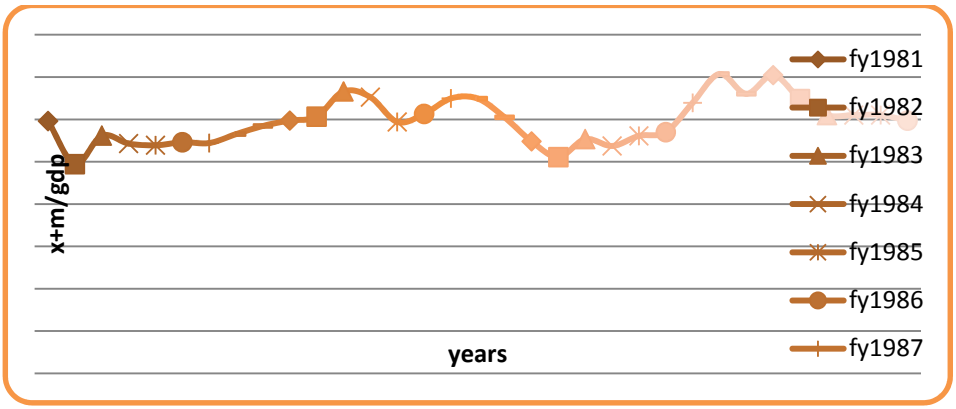


In figure3, REER calculated by using 1980-1981 as a base year. REER has passed through several stages due to its liberalization since 2000. In figure3, curve shows the fluctuations (appreciation/depreciation) in REER with respect to time. It shows continuous falling trend from 1981 to 2010 except few years, reflects strong appreciation that would be raised number of challenges for exporters because strengthening of REER reduces the competitiveness of exporters. After 2010 the curve shows gradual increase reflects depreciation in REER, such fluctuations in REER were created the serious challenges for policy makers for overall macroeconomics management.

ii): Trade Openness (TOP)

TOP depreciates REER because trade liberalization itself reduces trade barriers and lower tariffs. Reduction in tariffs also causes fall in imports prices, increase demand for imports and volume of trade, hence depreciation of domestic currency occurred. So we may expect a positive relationship between TOP and REER.

Figure 4: ***Trend in TOP in Pakistan***



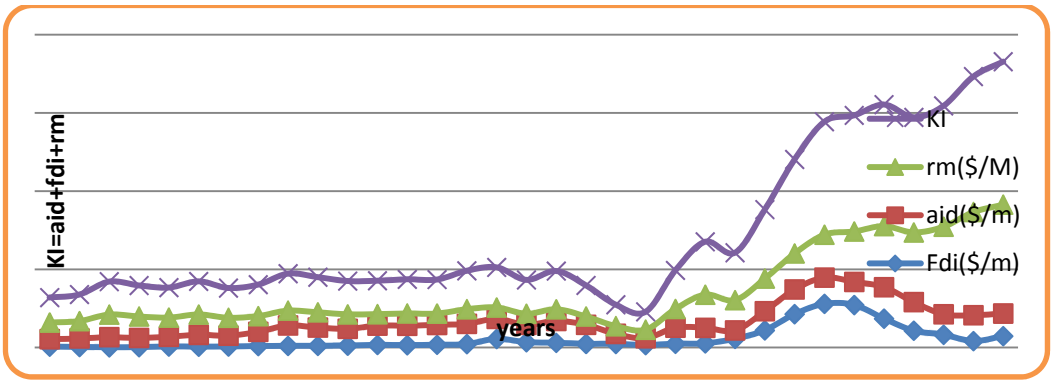
Source: Statistical Bureau of Pakistan

In Figure 4, Trade Openness (TOP) schedule initially shows negative trend during 1981-82 and then gradual increase in it till 1992 states that trade liberalization expands the volume of trade while huge fluctuations from 1993 to 2013 reveal the changes in volume of trade over time. Overall TOP was not attractive for the investors throughout 33 years and producers had to face different challenges to smooth it.

III): Inflows of Capital (KI) in Pakistan:

Inflows of capital (KI) as mentioned in the theory and also in almost all studies has an appreciating impact in most of the study period. KI leads to increase domestic income and consequently demand for non-tradable goods that results to rise in prices of non-tradable goods and hence an appreciation impact on RER.

Figure 5: Trend in Inflows Capital in Pakistan:



Source: IFS, Pakistan's eco. Affairs division, SBP

Figure 5, draws the Inflows of Capital (KI) individually factors involving to measure it and also on aggregate level. It may be defined as summation of Foreign Direct Investment (FD), Foreign Aid (Aid) received by government and Remittances (RM). KI schedule does not show much fluctuations during 1981 to 1998 and remain stable then show little fall in 2001, while in 2005 and onward rise till 2013 which implies huge capital inflow in Pakistan, indicates the positive sign for producers, businessmen and policy makers to enhance their investment projects.

5. Results and Discussion

The results and discussion are given in detail. For the purpose of illustration, the econometrics methodology contains three steps. *First*, we tested Augmented Dickey Fuller (ADF) test to establish the order of integration of all time series individually. In the s*econd* step, if all the time series are integrated at first order I(1), then we tested cointegration test to see the long run relationship among dependent and independent variables and ECM (error correction model) for short run analysis as well. *Finally*; we employed Impulse Response Function (VAR Model Technique) to capture the dynamics of the impact of external shocks and other supporting variables on REER in Pakistan.

5.1 Unit Root Analysis

In time-series analysis, first step is to determine the order of integration, we employed ADF test to determine the order of integration of all time series because ADF approach provides the evidence of cointegration between REER and all other independent variables.

Table 2: ADF Test Results /Unit Root Test

Variables	**Level/ Difference**	**Intercept/ Trend**	**t- Statistics. (1%, 5%, 10%)**
Log of REER	1st	No	**-5.226493** -2.644302 -1.952473 -1.610211
Log TOP	1st	No	**-6.971392** -2.644302 -1.952473 -1.610211
Log KI	1st	No	**-4.865254** -2.644302 -1.952473 -1.610211

Table 2 shows that all variables are in log form and they are stationary at first difference I (1) according to the ADF findings which shown in the last column of the above table where all calculated values of t-state are greater than critical values reveal the significance level of all variables at 1%, 5% & 10% respectively, reject null hypothesis means there is no unit root in all time series.

5.2 Co integration and Error Correction Analyses:

5.2.1 Long Run Analysis:

ADF test shows that all the time series variables are stationary at order I (1), following equations given below will be estimated in order to establish the LR (long run) relationship among the dependent and independent variables. For the sake of linearization we take the natural log of equation (5th) except dummies that would become the **cointegration equation 7th for external shocks**;

$$REER = \alpha_0 + \beta_1 \ln TOP + \beta_2 \ln KI + \beta_3 D_1 + \beta_4 D_2 + \mu_t \quad \text{.....(7)}$$

Take the natural log of equation (6th) except Rd and dummies that would become the **Cointegration equation (8th) for internal shocks;**

$$REER = \lambda_0 + \gamma_1 \ln INF + \gamma_2 \ln GC + \gamma_3 \ln Rd + \gamma_4 \ln D_3 + \gamma_5 \ln D_4 + \varepsilon_t \quad \text{.....(8)}$$

i): Estimation of eq.(7th) for external shocks effect:

$$REER = \alpha_0 + \beta_1 \ln TOP + \beta_2 \ln KI + \beta_3 D_1 + \beta_4 D_2 + \mu_t \quad \text{.....(7)}$$

Table 3. Regression Results

Dependent variable=REER			
Independent Variables	***Coefficients***	***Std. Errors***	***t-Statistics***
lnTOP	6.65825	1.43787	4.630631
lnKI	-2.13779	0.21212	-10.0782
D_1	-1.251389	0.48982	-2.55479
D_2	-1.671359	0.47109	-3.54785

In above table the coefficient of Trade Openness (TOP) is positive and statistically significant at 5% level of significance. Trade Openness (TOP) depreciates domestic currency because trade liberalization itself reduces trade restrictions and tariffs as well. Reduction in tariffs result fall in imports prices, rise in demand for imports, expend the volume of trade and hence depreciate domestic currency. So there would be a positive relationship between TOP and REER but inverse in term of domestic currency.

Table also shows that Inflows of Capital (KI) has a negative and significant effect on REER. KI have appreciating impact on RER / domestic currency in almost all of the empirically estimated studies Higher inflows of capital rises domestic income of the residents and demand for non-tradable commodities respectively, also increases the prices of non-tradable commodities and hence an appreciates REER.

The estimated result of External Shock (D_1) in above table reveals a negative and significant effect on REER. External Shock (D_1) appreciates domestic currency because of a sharp increase in remittances result a capital inflow that would strengthen domestic currency.

External Shock (D_2) also appreciates domestic currency because after 9/11 Pakistan played a front role in war against Afghanistan and received a huge amount of foreign aid in the form of military aid from America.

iii): Cointegration Augmented Dickey-Fuller (ADF) TESTS:

$$\mu_t = REER - \alpha_0 - \beta_1 \ln TOP - \beta_2 \ln KI - \beta_3 D_1 - \beta_4 D_2 \quad \text{.....(7)}$$

Table 04. Cointegration ADF Test For External Shocks

Null Hypothesis: μ_t has a unit root			
Exogenous: None			
Lag Length: 0 (Automatic based on SIC, MAXLAG=0)			
		t-Statistic	***Prob.****
Augmented Dickey-Fuller test statistic		**-5.41592**	**0.0000**
Test critical values:	1%	-2.644302	
	5%	-1.952473	
	10%	-1.610211	
*MacKinnon (1996) one-sided p-values.			

According to the ADF results in the above table, in absolute form calculated value of t-state is greater than critical values at 1%, 5% & 10% respectively, reject null hypothesis means μ_t is stationary at level I(0) which reveals that there exist a long run relationship between dependent variable (REER) and all other independent variables given in cointegration eq.(7^{th}).
Thus we can concluded that relationship established in eq. (7^{th}) is meaningful (e.g. not spurious).So in this case REER and others independent variables are cointegrated.

5.2.1. Short Run Analyses.

In short run analyses, we followed ECM (Error Correction Model) technique which is first used by Sargan and later by Engle and Granger. Under ECM analysis error terms ($\mu_{t,}$) mentioned in eq. 7^{th} is treated as

equilibrium error terms (μ_t) that they tie behaviour of REER in short run to long run.
After the estimation of cointegration equations 7th, the following **Error Correction Model** estimated;

i): Error Correction Model For External Shocks:

$$\Delta \ln REER = 0.229396\,\Delta \ln TOP_t - 0.101033\,\Delta \ln KI_t - 0.296943\,D1 - 0.076010D2 + 1.039419\,\mu_{t-1} \ldots\ldots\ldots (9th)$$

t - State: 1.269079 3.405079 4.90414 1.52814 25.6098

R-squared: 0.933535 **Durbin-Watson stat:** 1.5271

All variables mentioned in above are previously defined and Δ is first difference operator, β_i are impact multipliers, coefficient of μ_{t-1} is a adjustment parameter and ε_t error term, While

$$\mu_{t-1} = \Delta \ln REER - (\beta_1 \Delta \ln TOT + \beta_2 \Delta \ln TOP - \beta_3 \Delta \ln KI - \beta_4 D_1 - \beta_5 D_2)$$

,that shows one period lagged value from equation 7th error term (μ_t) "The value of adjustment parameter reflects that REER lying below equilibrium level in the short run which corrected in next period and positive sign shows that REER rises in next period and moves towards equilibrium.
The values of impact multipliers (βi) of TOP are positive which they state that Change TOP result rise in REER. Raise in exchange rate cause of depreciation of domestic currency while values of all others impact multipliers (β_i) are negative and statistically significant change in KI, D_1 and D_2 cause an appreciation of REER.
R-square shows 93% variation in dependent variable is explained by explanatory variables given in the regression. Rest of variation is from error term (omitted variables).
Durbin Watson value shows no auto correlation in above model.

5.3. Vector Auto Regressive Model (Var) Analyses:

To analysis the dynamic relationship between Real Effective Exchange Rate (REER) and other variables such as trade openness (TOP), Inflows of capital (KI) as well as sharp increase in remittances in 1983 (D_1) and nine eleven (D_2) as external shocks, a vector auto regressive (VAR)

model is employed. Standard references of VAR methodology are available; include Hamilton (1994), Enders (1995) and Mills (1990), among others. In the context of empirical research VAR methodology has two major advantages. First; in VAR model all the variables to be treated as endogenous variables and each endogenous variable explained by its own lagged values and lagged values of other endogenous variables of the model, no exogenous variable included in VAR model

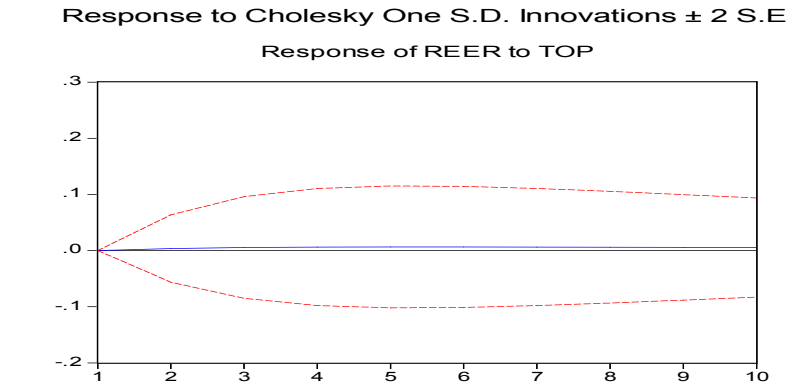
Secondly; VAR methodology applied to analyse the general dynamic relationship among economic variables because many relevant empirical analyses use a partial equilibrium framework and do not account fully for dynamic interrelation.

5.3.1. Impulse Response Function (IRF) Analysis

To capture the dynamics of the impact of external shocks and other supporting variables on the REER rate based on annual data for 1981 to 2012.
The IRF shows the dynamic responses of all the variables included in the system to a shock or innovation in each variable. For the sake of computation of IRF require that all the variables in the system should be ordered presented as moving average process".

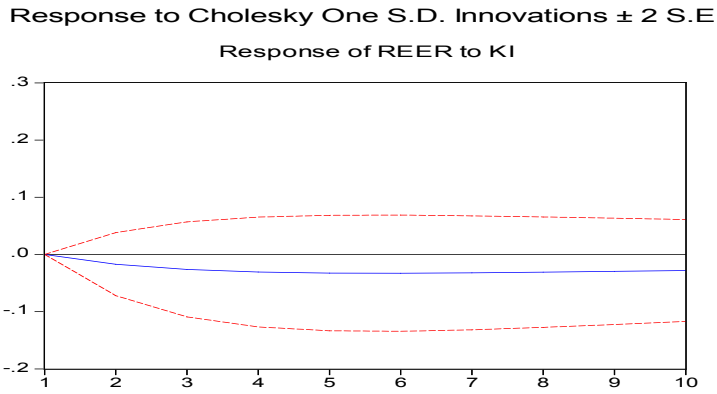
5.3.1.(IRFs):

Figure: 9 Response of REER to TOP



The central line in 2st graph shows that variation in REER due to lags of TOP. Panel shows the positive relationship between REER and TOP. Graph shows that as lags periods of TOP increase REER raises which depreciates domestic currency but no huge variation occurs. Once shock is given to TOP that would affect REER positively from 2nd to 4th period then 4th to 6th period after that curve become horizontal that reflects no change in REER due to increase in lag periods. Overall TOP may not attractive throughout 33 years and producers had to face different challenges to smooth it.

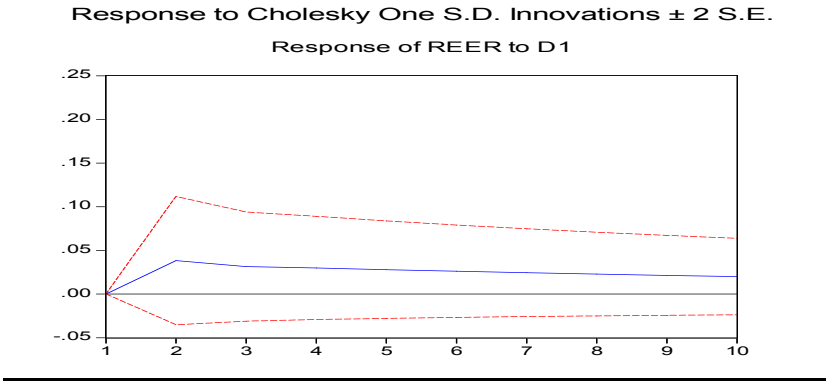
Figure. 10 Response of REER to KI



The central line in 2st graph shows that variation in REER due to lags of KI that shows the negative relationship between REER and KI. Graph shows that as lags periods of KI increase REER raises which appreciate domestic currency. Once shock is given to KI that would affect REER negatively

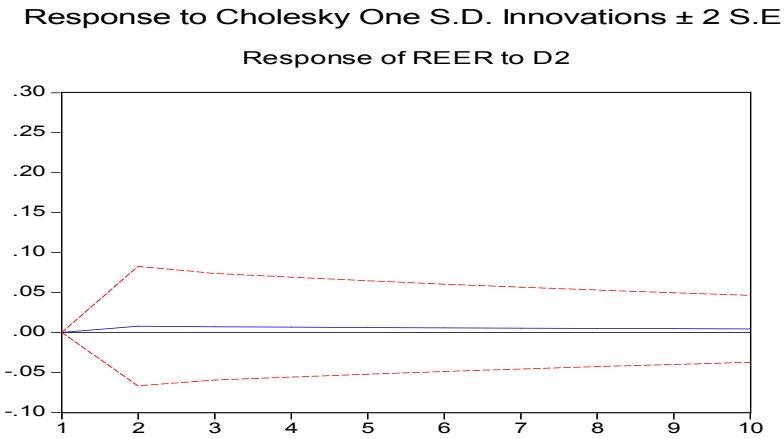
from 1st period to 4th period regularly while during 4th to 8th period curve become horizontal reflects no change in REER due to increase in lag periods of KI but after that lags in KI also negatively affect REER.

Figure: 14 Response of REER to D1 (Sharp increase in remittances in 1983)



The central line in 2st graph shows that variation in REER due to lags of external shock (D_1).Graph shows the positive relationship between REER and D_1 in the SR but negative in the LR. The central line in the 2nd graph reflected that as lags periods of D_1 increases, REER rising initially during 1st and 2nd period depreciating domestic currency during this short period of time. Graph also shows that as well as lags periods expended, curve shows negative trend reflects that means increase in lags periods of D_1 results decline in REER which depreciates REER while appreciates domestic currency

Figure. 15 Response of REER to D2 (incident of 9/11, 2001)



The central line in 2st graph reveals that variation in REER due to lags of external shock (D_2).Graph shows the positive relationship between REER and D_2 in the SR but negative in the LR, as lags periods extended, curve adopted negative trend reflects that increase in lags periods of D_2 results decline in REER which depreciates REER while appreciates domestic currency.

5.3.2. Variances Decomposition Analysis:

Table: 05 Variance Decomposition for external Shocks Model

Period	S.E.	LREER	LTOP	KI	D1	D2
1	*0.202495*	*100.0000*	*0.000000*	*0.000000*	*0.000000*	*0.000000*
2	*0.273075*	*96.81040*	*0.589992*	*0.557461*	*1.727212*	*0.314935*
3	*0.321460*	*96.11342*	*0.427033*	*0.729057*	*2.135208*	*0.595277*
4	*0.358580*	*95.66074*	*0.416898*	*0.898154*	*2.390646*	*0.633564*
5	*0.388538*	*95.25628*	*0.525897*	*1.020464*	*2.548154*	*0.649205*
6	*0.413348*	*94.89453*	*0.683026*	*1.118556*	*2.657612*	*0.646279*
7	*0.434233*	*94.57526*	*0.852754*	*1.196173*	*2.736688*	*0.639122*
8	*0.452003*	*94.29955*	*1.015072*	*1.258610*	*2.796181*	*0.630587*
9	*0.467241*	*94.06435*	*1.161961*	*1.309187*	*2.842160*	*0.622338*
10	*0.480383*	*93.86512*	*1.290993*	*1.350528*	*2.878501*	*0.614860*

Above table shows that D_1 has greater influence on REER in the SR and LR as well as compare to other variables.

6. Conclusion

The paper investigates the role of external shocks occurred in Pakistan's economy during 1981 to 2012 with following supporting variables (in literature known as fundamentals of exchange rate) including inflows of capital (KI), trade openness (TOP) in the movements of REER in Pakistan.
"In this study cointegration technique used to establish relationship between REER and external shocks as well as its fundamentals in long run. According to results of all the variables are being significant in the cointegration space including dummies of external. TOP, KI, external shocks (D_1 & D_2) have negative effect on REER that reflect appreciation of domestic currency /REER in the long run.

Results of Error Correction Model (ECM) of internal shocks model reveal that REER lies below its equilibrium level in the SR which corrected by increase in REER in coming periods and reach at equilibrium level.
The values of impact multipliers (βi) of KI, D_1 and D_2, are negative & shows that Change in these variables result decline in REER. Reduction in exchange rate causes appreciation of domestic currency and TOP also impact positively domestic currency in short run.

The results IRF supported the results of cointegration estimation
The findings of Variance of Decomposition analysis of the model suggest that external shock (D_1) has greater influence on REER in the SR & also in the LR as compare to all other variables.

Finally it is found that role of external and internal shocks are very important and they play an effective and significant role in the movements and also in the determination of REER in Pakistan.

The study indicates that causes of movements in REER are important for central bank to identify what kind of movements in REER result fall/improvement in the competitiveness of external sector of the economy.

Exchange rate would be appreciated due to external shocks (D_1 & D_2) & improvement in the fundamentals like KI, whereas deviation of REER significantly from its equilibrium level require immediate measures to correct it and strengthen the competitiveness of external sector of the economy. The results also reveal that external shock (D_1) has lager influence on REER in short run and in the long run under external shocks model. In literature inflows of capital are identified an important factor in the variation of REER".

Pakistan experienced persistent large deficit in her Balance of payments due to weak economic activity and huge fluctuations in exchange rate. So country needs to strengthen its currency by improving its fundamentals and properly availing positive external shocks while take immediately remedial measures to prevent effects of negative shocks through monetary and fiscal policy actions.

6.2. Policy Recommendations

I. It is the need of the hour now, move from traditional base exports to industrial base in order to strengthen the terms of trade.
II. We also encourage inflows of capital through exemptions in taxes and rise in interest rate domestically.
III. Positive external shocks improve external competitiveness of our economy but negative shocks reduce external competitiveness of the economy. So it is very important for government of Pakistan and central bank of Pakistan in the light of external and internal shocks, take suitable actions timely.
IV. Pakistan may follow floating exchange rate system where monetary policy actions play an effective role to strengthen Pak-rupee.

References

Ali, S. (2000), "*Pakistan's Real Exchange Rate*", First quarterly report of SBP for the year 2000-2001, pp. 41-52.

Afridi Usman, (1995), "*Determining Real Exchange Rates*", The Pakistan Development Review, Vol, 34, pp, 263-276.

Ahmed Shaghil,Ara Iffat and Hyder Kalim (2005). "How External Shocks and Exchange Rate depreciations effect Pakistan",*Social Policy and Development Center*,oct,2005.

Ahmed.E.and Ali,AS, (1999), "Exchange Rate and Inflation Dynamics" *The Pakistan Development Review*,38(3), 235-251.

Ahmed. S, Ara. I,and Hyder. K (2006), How External Shocks and Exchange Rate Depreciation Affects Pakistan's, Implication for Choice of an Exchange Rate Regim.*SBP Research Bulletin*, 1(2), PP.61-88.

Asif Muhammad (2011), "*An* Analysis of Exchange Rate Changes On Foreign Aid in Pakistan*", Economics and Finance Review* Vol. 1(5) pp. 83 – 89, July, 2011.

Awan Ullah Rehmat, sher Falak Shahbaz, and Javaid (2012), *"*Does J curve phenomenon exist in Paistan*"* , *Interdisciplinary Journal o Contemporary Research in Business*,Vol.3,No.9.

Baffes j,I Elbadawi and S.O'Connell (1997),Single equation estimation of the equilibrium real exchange rate.

Chand S. (2001), how misaligned is the Australian Real exchange rate, the Australian National University.

Chisti, S. and M, Hasan (1995), "*What Determines the Behaviour of Real Exchange Rate in Pakistan"* , Pakistan Development Review, 34: 1015-1029

Dr.Ali Saidatulakmal,Dr.Khan Tasnim and Riaz Madiha (2012), " Reinvestigation sources of Movements in Real Exchange Rate",*European Journal of Business* Dosse Toulaboe, Fort Hays State University, *Real Exchange Rate Misalignment and Economic Growth in Developing Countries and Management*, Vol.4, No.8,2012.

Ejaz Rana Ali, Sttar Rashid and Rahman Ur Hafeez (2012), *"*Effectiveness of Exchange Rate in Pakistan*", Pak. J. Commer. Soc*. Sci. 2012 Vol. 6 (1), 83-96.

Edwards,S. (1989), "*Real Exchange Rates, Devaluation and Adjustment: Exchange Rate Policy in Developing Countries*", MIT Press, Cambridge, Massachusetts.

Elbadawi, I. and R. Soto (1995), "Real Exchange Rate and Macroeconomic Adjustment in Sub-Saharan Africa and Other Developing Countries," (forthcoming) in Elbadawi and Soto eds, *Foreign Exchange Market and Exchange Rate Policies in Sub-Saharan Africa*, a special.

Government of Pakistan (1990-2012),"*Economic Survey"*, Economic Advisory Wing, Ministry of finance Islamabad.

Haque, N. and P. Montiel (1998), "*Long Run Real Exchange Rate Changes In Developing Countries: Simulations frome an Econometric Model*, Washington, D.c.World Bank.

Hyder,Zulfqar and Adil Mehboob ,2006, "Equilibrium Real Effective Exchange Rate and Exchange Rate Misalignment in Pakistan*,"SBP working paper 2006*.

Khan Arshad Muhammad and Abdul Qayyum (2008), "Long-Run and Short-Run Dynamics of the Exchange Rate in Pakistan", *The Lahore Journal of Economics*13:1 (Summer 2008): pp. 29-56.

Khan.M.S (1986), "Exchange Rate Policies for Developing Countries in the Context of External Shocks" *Pakistan Development Review*, 25, autumn, PP. 403-21

Khan, M.S. and J.S. Lizondo (1987), "Devaluation, Fiscal Deficits, and the Real Exchange Rate in Developing Countries", *World Bank Economic Review 1, 357-74.*

Montiel, P. J. (1999), "Determinants of the Long Run Equilibrium Real Exchange Rate:An Analytical Model" in Hinkle, L and Montiel, P, J (eds) *Exchange Rate Misalignment, Concepts and Measurements for Developing Countries*, A World Bank Research Publication, Oxford University Press.

Montiel, P. (1997), *" Exchange Rate Policy and Macroeconomic Management in ASAEN Countries"*, In J. Hicklin et al. (eds), Macroeconomic Issues Facing ASEAN Countries, Washington, D.C: IMF

Mustapha immurana, Abdul-Aziz & Ishaq Kyei-Brobbey (2013), "Determinants of real exchange rate in Ghana", *Africa Development and Resources Research Institution*, vol.3, pp 20-37

Moses Kiptui and Leonard Kipyegon (2008), "External Shocks and Real Exchange Rate

Movements in Kenya", *Central Bank of Kenya*.

Noman, O. (1991), The impact of migration on Pakistan's economy and society. Economy and culture in Pakistan: *Migrants and cities in a muslim society (eds) by Hasting Donnan and Pnina Verbner*.PP.77-96.

Rodriguez, C. A. (1994), "The External Effects of Public Sector Deficits", Chapter 2 in W.Easterly, C. A. Rodriguez, and K. Schmidt-Hebbel, eds, *Public Sector Deficits and Macroeconomic Performance*, Oxford: Oxford University Press.

Hamilton, J. (1994), *Time Series Analysis*, Princeton University Press, N.J.

Nabvi,I.(1997). "Outward Orientation of the Economy: A Review of Pakistan's Evolving Trade and Exchange Rate Policy," *Journal of Asian Economics, 8 (spring):143-63*.

Opoku Afari (2004), measuring the real effective exchange rate in Ghana, Credit Research Paper no.04/11: Center for Research in Economics and development and International Trade, university of Nottingham.

Zakria Muhammad and Amed Bilal Ghauri (2011*), "Trade Openness and Real Exchange Rate in Pakistan", The Romanian Economic Journa*l,No.29,March,2011.