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Determinants of the Real Exchange Rate: Evidence from Pakistan Economy

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ABSTRACT

Previous studies for Pakistan focused on the domestic drivers of exchange rate (nominal or real) fluctuations. This paper extends the analysis to the role of foreign factors in the determination of Pak-rupee real exchange rate (RER) by using a two variant backward looking modeling approach. For this purpose a large span of data over the period 1973-2008, consist on the two regime shifts (i.e. occurred during 1982 and 2000) is used. Our results show that exchange rate fluctuations during the sample period have historically been accounted for both domestic and foreign variables i.e. domestic inflation, domestic interest rate, US interest rate and US inflation. Exchange rate regime policies are also showed to be relevant.

KEYWORDS: *Real exchange rate, Regime shifts, Two variant approach, Purchasing power parity, Newy-West test*

1.1. INTRODUCTION

Movement of the world major economies towards the floating exchange rate system in 1973 increased the variability in both the nominal[1] and real exchange rate. This is also true for those countries which even preferred to keep fixed regime (Mussa, 1986). With this development exchange rate become the central focus of the monetary authorities in both developed and developing countries. Exchange rate in nominal form measures the strength of a country's currency in the foreign exchange market. However, it does not take into consideration the role of the price differential between the two countries. In contrast, the real exchange rate measures the proportionality between the purchasing power of two countries' currencies by taking into account also the price levels. Real exchange rate helps a country in the judgment of its trade competitiveness in the international market. It plays a key role in an economy and instability in it hinder investment ,trade flow and economic growth (Frankel and Rose, 2002; Broada and Romalis, 2003). Similarly, Cottani et al. (1990) and Sekkat and Varoudakis (2000) mentioned that real exchange rate instability is a major factor responsible for the weak economic performance of developing countries.

For understanding the variability of real exchange rate (RER) one of the appropriate approach is to find out the factors[2] that causes fluctuations in it. Although identification of the factors of RER can be useful for the monetary authorities to maintain economic stability and solving the monetary ills. However, it is still a debatable issue and there is no agreed consensus exists in the literature over its specific determinants. Stancik and Prague (2007), mentioned that inflation, exchange rate regimes, interest rates, output level and domestic and foreign money supply are the general factors affecting the real exchange rate. Kumar (2010) found out that productivity differential, trade openness and terms of trade influence the real exchange rate. Similarly, Orlowski (2004) referred that domestic inflation and interest rate, Medeiros, et al (1997) and Agenor, et al (2002) foreign interest rate, and Hsing (2007) foreign interest rate and domestic inflation are the main determinants of real exchange rate. Balassa-Samuelson (1964), Jakab and Kovacs (1999), Alexius (2001) and Aleisa and Dibooglu (2002) stated that supply side factors (productivity shocks) are the important determinants of real exchange rate. Hau (2000) and Lee and Lin (2003) found out that both monetary and supply side factors affects the real exchange rate. In contrast, Clarida and Gali (1994) and Rogers (1999) mentioned that real exchange rate is mostly affected by monetary and demand side factors and the role of supply side factors is minimum. Similarly, Chen (2004), Inoue and Shigeyuki (2009) and Juvenal (2010) found out that real exchange rate is affected by demand side factors and the role of monetary factors is less important. Edwards (1988) stated that in the short run both monetary and real and in the long run only real factors determine the real exchange rate. However, Enders, et al. (1997) and Wang (2004) stated that only the real (demand and supply) factors bring variation in real exchange rate. Conversely, Grilliand Kaminsky (1991), argued that real and monetary factors are the main determinants of real exchange rate variability.

[1]. The nominal exchange rate is defined here is the domestic currency price of foreign currency i.e. PKRvs USD. Whereas, the real exchange is defined the nominal exchange rate between domestic (PAK) and foreign(USA) countries adjusted for the relative prices of goods. A rise in both nominal and real exchange rate shows a depreciation/devaluation of the domestic currency (rupee) against foreign currency (dollar) and vice versa.

[2]There is no specific theory or model which helps in successful determination of real exchange rate. Although Mark (1995), Richard and Rogoff (1983) and Chinn and Meese (1995), claimed some success in prediction of behavior of real exchange rate, however there studies are limited to particular countries and currencies and cannot be generalized.

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Similarly, the evidences whether regime shifts have any influence on RER are also mixed and contradictory in the literature. Liang (1998) and Harbinger and Wijeweera (2010) concluded that regime shifts does not influence the real exchange rate. In contrast, Stockman (1983), Kocenda (1998) and Kocenda and Valachy (2006) found out that regime shifts are not neutral and the behavior of RER is different under different regimes i.e. its variability[3] increased under a flexible exchange rate system[4].

Like, other developing countries Pakistani rupee also showed a downward fluctuated pattern during the last four decades. In 1971, the rupee is delinked from pound sterling and attached with US dollar. After a devaluation[5] of 130% in nominal terms of rupee during 1972, the nominal exchange rate appreciated from 11.03 to 9.9 i.e. 10.24% in nominal terms and 13.70% in real terms. After that the exchange rate of rupee is kept fixed against US dollar for almost 9 year i.e. 1973 to 1981. However, at the beginning of 1980s the US economy faced a large budget deficit, which forced the government to raise the interest rate. This increase in the US interest resulted in a massive inflow of capital from abroad and leads to appreciation of dollar against rupee. Since rupee is attached with dollar, it is also overvalued because of the market pressure. This made Pakistan's exports expensive and imports cheaper in the international market and resulted in the deterioration in the trade balance. Hence, for maintaining exports competitiveness in the international market and improving trade balance the State Bank of Pakistan (SBP) delinked the rupee from US dollar and moved to a managed float system in 1982. With this move, the nominal exchange rate of rupee increased from 9.9 to 12.84 i.e. it is devalued 29.69% in nominal terms and 24.74% in real terms. In 2000, the State Bank of Pakistan adopted a market based exchange rate system. However, the rupee continued its downward movement and the nominal exchange rate further devalued from 51.78 in 1999 to 58.03 in 2000 i.e. showed a decline of 12.07% in nominal terms and 11.87 % in real terms respectively. During 2008 the nominal exchange rate was 62.55 showed a depreciation of 2.17% in nominal terms. However, in real terms the rupee showed an appreciation of 6.02%. (For detail see table.1, Appendix c).

The above discussion makes it clear that there is a need to assess the causes of fluctuations in the real exchange rate of Pakistan. Although there is already some empirical work has been done for examining the determinants of both nominal and real exchange rate in Pakistan i.e. Ahmed, 1992; Chishti and Hasan, 1993; Afridi, 1995; Siddiqui et al, 1996 etc. However, none of the studies accounted for the role of foreign factors in the determination of real exchange rate and focused only on domestic variables. Second, all the studies ignored the role of structural shifts i.e. regime shifts[6] in the behavior of real exchange rate. Third, all of these studies defined real exchange rate in internal terms i.e. in terms of tradable and non-tradable goods.

The paper contributes to the literature to fill in the gap in the existing knowledge on the issue in several aspects. First, unlike the previous studies for Pakistan it examines the role of both the domestic and foreign factors[7] in the determination of real exchange rate of Pakistan in the framework of two variant backward looking models. Second, a large span of data covering the period 1973-2008 is used. The sample size is selected so that it covers the two regime shifts i.e. a movement from fixed to managed float exchange rate system in 1982 and to floating regime in 2000. Third, unlike the previous studies for Pakistan instead of defining the RER in internal terms it is defined in external terms. Fourth, all the data is converted into cyclical form after excluding the trend from it by using Hodrick-Prescott method.

Two research questions have been answered in this paper. First, what are the factors that causes fluctuations in the RER of Pakistan?. Second, whether regime shifts play any role in determination of RER or not?. The results show that both domestic and foreign factors determine the RER of Pakistan. Also, regime shifts are not neutral and it affects the RER of Pakistan.

The rest of the paper is organized as follows. Section-2 deals with the theoretical framework of the model. Estimation results are given in Section-3. Whereas, in Section-4, the study is concluded.

2. Theoretical Framework

Generally two approaches are used for the measurement of real exchange rate (RER). One approach is to compute RER in internal terms by multiplying the nominal exchange rate with the relative prices of tradable and non-tradable goods i.e. $q = EP^T/P^N$ (Khan and Qayyum, 1987; Faruqee, 1995). However, this definition of the RER can be more useful when the purpose of the study is to measure the trade competiveness of a country in the international market. It shows both internal and external equilibrium of an economy simultaneously. However, for empirical analysis and especially in developing countries because of general lack of data and unavailability of appropriate proxies for price indexes, RER is usually measured in form of "$Q= E P^*/P$"(Edwards, 1988). Here, Q stands for the real exchange rate, E for the nominal exchange rate, P and P* for the domestic and foreign price indexes respectively. One benefit of defining

[3]Kent and Naja (1998) and Carrera and Vuletin (2003) argued that higher variability in exchange rate under flexible regimes is due to the relative sluggishness in price adjustment.

[4]In this study exchange rate system and exchange rate regime will be used interchangeably.

[5]. Whereas, it was the largest devaluation of rupee in the history of Pakistan.

[6]Although Afridi(1995), also used a dummy variable for three regimes periods. i.e. two fixed(1960-1972, 1973-82) and one flexible(1983-1990) in his paper. However, his results do not give a clear picture of the role of regime shifts in the determination of real exchange rate of Pakistan. Also his sample size and regimes periods are different from the sample size and regimes periods used in this study.

[7]However, the foreign variables are taken so that it is assumed that domestic policies (monetary or fiscal) have no influence on it. It is also assumed that the country is dependent for its exports and imports and it cannot influence the prices in the international market. Further, the monetary authority is following an open economy Taylor rule where interest rate is used as a policy instrument and it also reacts to exchange rate fluctuations.

RER in this way is that it is based on the purchasing power parity doctrine[8](PPP) which offers a basic economic model for its explanation. Another advantage of defining the RER in this way is that it is determined by the internal price structure across countries which provide a better established link between the goods and assets markets of the two countries and it is easily extendable by incorporating more real and monetary variables. For computation of the RER Pakistan rupee is taken as quoted currency and US dollar is a based currency i.e. (PKR vs USD). The RER is computed against United States (US) dollar keeping in view the fact that US is one of the major trading partner of Pakistan with imports and exports shares of 18.5% and 5.4% among the top four trading partners i.e. United Kingdom (UK) (2.6%, 4.9%), Japan (3.6%, 0.6%), Germany (3.8%, 4.2%), and Saudi Arabia (12.3%, 2.6%) respectively (Economic Survey of Pakistan, 2008-09). The second reason is that Pakistan's major part of international trade is invoiced in US dollar. The third reason is that US dollar is the most trading currency in the world markets because of its stable value. Hence, the RER of Pakistani rupee against US dollar will take the following form:

$$Q_{PK/US} = E_{PKR/USD}(P^{US}/P^{PK}) \qquad (1)$$

Here, $Q_{PK/US}$, $E_{PKR/USD}$, P^{US} and P^{PK} stand for real exchange rate, nominal exchange rate, and price indexes of the Pakistan and USA. Whereas, in growth terms the RER will become like as under:

$$q_{PK/US} = e_{PKR/USD} + \pi^{us} - \pi^{pk} \qquad (2)$$

Here, $q_{PK/US}$, $e_{PKR/USD}$, π^{us} and π^{pk} are the real exchange rate, nominal exchange rate, and Pakistan and USA price levels in growth terms. However, as the RER used in this study is a combination of three regimes i.e. fixed[9], managed float and full float exchange rate systems. Hence, the structure of RER under different exchange rate systems will be like as below:

$$q_{PK/US\ (1973\text{-}1981)} = {}^{c}e_{PKR/USD} + \pi^{us} - \pi^{pk} \qquad (5)$$

$$q_{PK/US\ (1982\text{-}1999)} = e_{PKR/USD} + \pi^{us} - \pi^{pk} \qquad (6)$$

$$q_{PK/US\ (2000\text{-}2008)} = e_{PKR/USD} + \pi^{us} - \pi^{pk} \qquad (7)$$

Equation (5) shows the measurement of real exchange rate (RER) of Pakistan under the fixed exchange rate period. Whereas, equations (6) and 7 show the structure of RER under the managed float and full float periods. Hence, for the full sample period RER will be a combination of all the three regimes periods and will be like as under:

$$q_{PK/US(1973\text{-}2008)} = e + (\pi^{us} - \pi^{pk}) \qquad (8)$$

Now for examining the role of the different factors (domestic and foreign) and of two regime shifts i.e. $Regm_1$ (occurred in 1982) and $Regm_2$ (occurred in 2000) during the study period a backward looking framework has been designed. The general form of the model is as under:

$$q = f(x + z) \qquad (9)$$

Equation (10) shows the general functional form of the model used in this study. Here "q" stands for RER,"x" is taken as a vector for explanatory variables and "z" is a vector for the two regime shifts i.e. $Regm_1$ and $Regm_2$.

First, for examining the role the of both domestic and foreign factors in the determination of real exchange rate (RER), equation (9) is transformed into the following equation which is given as under:

$$q^g_t = \lambda_0 + \sum_{t=1}^{i} \gamma_{\pi pk,i}(\pi^g{}_{t-ipk}) + \lambda_{ipk}(i^g_{t\text{-}1pk}) + \lambda_{tbpk}(tb^g_{tpk}) + \lambda_{ius}(i^g_{tus}) + \sum_{t=1}^{j} \gamma_{qpk,j}(q^g{}_{t-jpk}) + \varepsilon_t \qquad (10)$$

Whereas, $(Regim_1 = Regim_2 = 0)$

Here $i = 1,2,..4 \quad j = 1...2$

Equation (10) is a backward looking restricted model used for examining the role of different factors in the determination of RER (q^g_t) of Pakistan. Here, four variables i.e. domestic Inflation gap (π^g_{tpk}), domestic interest rate gap (i^g_{tpk}), domestic trade balance gap (tb^g_{tpk}) and foreign interest rate gap (i^g_{tus}) have been included in the model as explanatory variables. However, the variables π^g_t and i^g_{tpk} have been taken in lag forms i.e. $\pi^g_{t\text{-}ipk}$, i^g_{t-1pk} whereas, tb^g_{tpk} and i^g_{tus} are used in contemporaneous form. Lags of the real exchange rate ($q^g_{t\text{-}jpk}$) are also included in the model for showing its influence on RER (q^g_t) . Whereas, $\lambda_{\pi pk}$, λ_{ipk}, λ_{tbpk}, λ_{ius} and λ_{qpk} are the related coefficients and λ_0 stands for the intercept term. Whereas, ε_t represents the error term. The two dummy variables are set equal to zero ($Regm_1 = 0$, $Regm_2 = 0$) which shows that the role of the regime shifts is not considered.

However, if the constraints ($Regm_1$=0, $Regm_2$=0) are relax and the role of the two regime shifts is also considered in the determination of RER (q^g_t), in that case equation (10) will be changed into the following form.

$$q^g_t = \lambda 1 + \sum_{t=1}^{i} \gamma_{\pi pk,i}(\pi^g{}_{t-ipk}) + \lambda_{ipk}(i^g_{t\text{-}1pk}) + \lambda_{tbpk}(tb^g_{tpk}) + \lambda_{rempk}(rem^g_{tpk}) + \lambda_{ius}(i^g_{tus}) + \lambda_{Regm1}(Regm_1) + \lambda_{Regm2}(Regm_2) + \sum_{t=1}^{j} \gamma_{qpk,j}(q^g{}_{t-jpk}) + \varepsilon_t \qquad (11)$$

$$\text{Whereas, } \begin{pmatrix} 1 \text{ for } Regim_1,\ 0 \text{ otherwise} \\ \text{0r} \\ 1 \text{ for } Regim_2,\ 0 \text{ otherwise} \end{pmatrix}$$

[8]For detail analysis of purchasing power parity theory see Cassel (1918), Edison (1987), Patel (1990), Bhatti(1996), Alba and Park(2003) and Mohammad et al (2009) etc.

[9]. During the study period the first regime of Pakistan is based on fixed exchange rate system against US dollar and lost for 9 years from 1973 to1981. As in this study real exchange rate is used instead of nominal exchange rate hence the movement i.e. increase or decrease in the real exchange rate for this period will be determined only by the price differential of domestic and foreign countries only for that particular period.

Here i = 1,2,..4 j = 1...2

Equation (11) represents an unrestricted model where the role of the two regime shifts has been also taken into account. Here both the dummy variables i.e. $Regim_1$ and $Regim_2$ are included in the model so that $Regim_1$ takes the value "1" for the full period of the second regime (1982-1999) and "0" for the other two regimes i.e. 1973-1981 and 2000-2008. Similarly $Regim_2$ takes the value "1" for the full period of the third regime(2000-2008) and "0" for the other two periods i.e. 1973-1981 and 1982-1999. Here both the dummy variables are included for the shifts in intercept which will affect q^g_t directly in case if both of these variables turned significant. The coefficient "λ_1" represents the intercept term.

However, if instead of including both the domestic and foreign variables directly their differential is taken, in that the restricted model given in equation (10) will become like as under:

$$q^g_t = \lambda_2 + \sum_{t=1}^{i} \gamma_{\pi^g d,i}(\pi^g d_{t-i}) + \lambda_i{}^g{}_d((i^g d_{t-1}) + \sum_{t=1}^{j} \gamma_{q^g d,j}(q^g d_{t-j}) + \varepsilon_t \quad (12)$$

Whereas, ($Regim_1 = Regim_2 = 0$)

Here i = 1,2,..4 j = 1...2

Equation (12) shows the restricted form of the backward looking model, where the differential variables (the difference between domestic and foreign counterpart variables) are included in the model for investigating its role in the determination of the RER (q^g_t) of Pakistan. Only four variables i.e. two domestic and two foreign are selected for this purpose. The first variable shows the difference between domestic and foreign inflation rates i.e. ($\pi^g_d = \pi^g_{pk} - \pi^g_{us}$) and the second shows the difference between the domestic and foreign interest rates i.e. ($i^g_d = i^g_{pk} - i^g_{us}$). Also like equation (10) the lags of RER (q^g_{t-jpk}) have also been included in the model. Here, $\gamma_{\pi^g d}$ and $\gamma_{i^g d}$ are the related coefficients whereas, λ_2 stands for intercept term.

Now if the role of the two regime shifts i.e. $Regm_1$ and $Regm_2$ is also considered in that case equation (12) will be transformed into the following model.

$$q^g_t = \lambda_3 + \sum_{t=1}^{i} \gamma_{\pi^g d,i}(\pi^g d_{t-i}) + \lambda_i{}^g{}_d((i^g d_{t-1}) + \lambda_{Regm1}(Regm_1) + \lambda_{Regm2}(Regm_2) + \sum_{t=1}^{j} \gamma_{q,j} q^g{}_{t-jpk} + \varepsilon_t \quad (13)$$

Whereas, $\begin{pmatrix} 1 \text{ for } Regim_1\text{ , } 0 \text{ otherwise} \\ 0\text{r} \\ 1 \text{ for } Regim_2\text{, } 0 \text{ otherwise} \end{pmatrix}$

Here i = 1,2,..4 j = 1...2

Equation (13) shows the unrestricted form of the backward looking model given in equation (12) where two dummy variables i.e. $Regm_1$ and $Regm_2$are also included. Whereas, λ_3 represents the intercept term.

Now before moving to the empirical section given in section-3, it is important to understand the channels of relationship between the different explanatory variables and RER. It is known that under a fixed exchange rate system the nominal exchange rate is fixed and it is determined by the monetary authority whereas under a floating system it is determined by the interaction of the market demand and supply forces. However, as in this study instead of nominal exchange rate, real exchange rate (RER) has been used hence it will show upward and downward movements under both the fixed and flexible exchange rate systems. However, under the fixed exchange rate system the RER- will only be the difference between the domestic and foreign inflation rates. Whereas, under the floating regime the RER will take into account both the shifts in nominal exchange rate and the inflation rates. Hence, it is clear that unlike the nominal exchange rate, the RER shows fluctuations under both the fixed and floating exchange rate systems and it is determined by the market demand and supply forces.

Hence, the general form of the relationship between the market demand and supply factors and real exchange rate will be like as under:

$\uparrow\downarrow D_{PKR} \rightarrow \downarrow\uparrow S_{PKR} \rightarrow \downarrow\uparrow Q_{PKR} \rightarrow \downarrow\uparrow q_{PKR}$

Here, the arrows "↑" and "↓" show the up and downward movements and the arrow "→" shows the direction of the relationship between variables. The above relationship shows that an increase in market demand for rupee ($\uparrow D_{PKR}$) will decrease its market supply ($\downarrow S_{PKR}$). This will in turn decrease the quantity of rupee ($\downarrow Q_{PKR}$) in the foreign exchange market which will ultimately decrease (appreciate) the RER($\downarrow q_{PKR}$) of Pakistan and vice versa.

Now keeping the above general relationship as a focal point the relationship between all the explanatory variables used in this study and the RER will be like as under:

($\uparrow\downarrow \pi^g_{PAK}$ and $\uparrow\downarrow \pi^g_{USA}$) → ($\uparrow\downarrow q^g_{PKR}$)

The above relationship shows the interaction between domestic (π^g_{PAK}) and foreign (π^g_{USA}) inflation rates and RER (q^g_{PKR}). It shows that a rise in inflation in Pakistan will overvalue the rupee value which will decrease the foreign demand for domestic exports and ultimately increase RER and vice versa. Similarly, a rise in the foreign inflation will increase prices of imported inputs which will increase the cost of production in the domestic country. This will increase inflation rate and will ultimately results in the depreciation of RER.

($\uparrow\downarrow i^g_{PAK}$) → ($\downarrow\uparrow q^g_{PKR}$) and ($\uparrow\downarrow i^g_{USA}$) → ($\uparrow\downarrow q^g_{PKR}$)

Similarly, the above relationship shows that how domestic (i^g_{PAK}) and foreign (i^g_{USA}) interest rates influence the RER(q^g_{PKR}). It shows that an increase in domestic interest rate will attract foreign investment inflow in the country. This will appreciate the real exchange rate via increase demand for rupee and vice versa. Conversely, if there is an increase

in the US interest it will reduce the foreign investment inflow in the domestic country and will ultimately depreciates RER via decrease demand for rupee and vice versa.

$(\uparrow\downarrow tb^g_{PAK}) \rightarrow (\downarrow\uparrow q^g_{PKR})$

Trade balance also play a major role in the determination of the rupee value of a country. The above relationship shows that if there is an improvement in the domestic trade balance (tb^g_{PAK}) it will increase foreign demand for rupee which will ultimately results in the appreciation of the RER through various channels i.e. improvement in terms of trade, increase in foreign investment inflow etc. and vice versa.

$(\uparrow\downarrow rem^g_{PAK}) \rightarrow (\downarrow\uparrow q^g_{PKR})$

Workers' remittances also play an important role in the determination of currency value and it accounts for a large part in Gross Domestic Product in Pakistan. The relationship shows that an increase in remittances (rem^g_{PAK}) will increase the investment activities in the domestic country which will rise exports production and demand and ultimately results in the appreciation of RER and vice versa.

3. ESTIMATION RESULTS

The empirical analysis is divided into two parts i.e. Part-1 and Part-2 respectively on the basis of a two variant approach. A backward[10] looking framework has been adopted for estimation in both the parts. Whereas, instead of focusing on the behavior of RER in the long run this study is focus only on the short term movements in RER after obtaining the cyclical components of the data by using Hodrick-Prescott Filter method. Specifically, the explanatory variables[11] included in the models are domestic inflation gap (π^g_{tpk}), domestic interest rate gap (i^g_{tpk}), domestic trade balance gap (tb^g_{tpk}), domestic remittances gap (rem^g_{tpk}), foreign inflation gap (π^g_{tus}) and foreign interest rate gap (i^g_{tus}). Also as the sample size of this study consist on three regimes i.e. fixed exchange rate system (1973-1981), managed float exchange system (1982-1999), and floating exchange rate system (2000-2008) hence for this purpose two dummy variables i.e. $Regm_1$ and $Regm_2$ have also been included in the model for examining its impact on RER(q^g_t). Whereas, here $Regm_1$ is a dummy variable represents the shift towards the managed float exchange rate system occurred in 1982 and $Regm_2$ is the dummy variable stands for the shift towards the full float exchange rate system occurred in 2000. The subscript "g" on the variables shows that all the variables are in cyclical form.

For analysis Ordinary Least Squares method has been used. In Part-1, two regressions i.e. Regression-1 and 2 given in table.1 are computed. Regression-1 is derived for examining the role of both domestic and foreign variables in the determination of RER (q^g_t) after imposing the restrictions i.e. $Regim_1 = 0$ and $Regim_2 = 0$. Both the restrictions show that the role of the regime shifts is not considered. However, in Regression-2 the impact of the two regime shifts is also considered and the restrictions $Regim_1 = 0$ and $Regim_2 = 0$ are relaxed. The main purpose here is to find out that whether regime shifts are neutral or play any role in determination of RER.

Similarly, in Part-2 two more regressions are computed which are given in table. 3. However, here unlike table.1, instead of including both the domestic and foreign variables directly, their differentials have been taken. For this purpose two domestic variables (π^g_{pk}, i^g_{pk}) and two foreign variables (π^g_{us}, i^g_{us}) are selected. The domestic variables are selected on the basis of the foreign variables. For the selection of the foreign variables (π^g_{us}, i^g_{us}), United States(US) is selected as a foreign country. The US economy is selected on the basis of two reasons. One reason is that as in this study the RER ($q^g_{pk/us}$) for Pakistan is computed against USA. The Second reason is that United States is the major trading Partner of Pakistan. Only two foreign variables i.e. inflation (π^g_{us}) and interest (i^g_{us}) are taken by considering it the most important factors affects the exchange rate of Pakistan. The difference between the domestic and foreign variables is computed so that for computing inflation differential rate, US inflation rate is subtracted from Pakistan inflation rate i.e. $\pi^g_d = \pi^g_{pk} - \pi^g_{us}$. Similarly, for the computation of the interest rate differential, US interest rate is subtracted from the Pakistan interest rate i.e. $i^g_d = i^g_{pk} - i^g_{us}$.

Like table.1 of part-1 two regressions (Regression-1 and 2) are derived. First, Regression-1 is computed to investigate the role of the differential variables (DVs) in the determination of RER (q^g_t) with the imposition of the restrictions i.e. $Regim_1 = 0$ and $Regim_2 = 0$. After that Regression-2 is computed where the role of the two regime shifts have also considered in the determination of RER (q^g_t) by relaxing the restrictions $Regim_1 = 0$ and $Regim_2 = 0$ in the presence of differential variables (DVs). The main purpose here is to find out that how q^g_tbehaves if instead of including both domestic and foreign variables directly their differential is taken. Also to know that whether regime shifts play any role the determination of RER in the presence of the DVs or not?. The results derived are as follows.

Part-1

In Part-1, table.1 shows the results obtained for the two regressions[12] i.e. Regression-1 and Regression-2. First, Regression-1 results are computed with restrictions $Regm_1 = 0$ and $Regm_2 = 0$ for examining the role of both the domestic and factors i.e. π^g_{tpk}, i^g_{tpk}, tb^g_{tpk}, i^g_{tus} in the determination of real exchange rate. After that Regression-2 results

[10]In part-1, the model is not a pure backward looking model and some variables have been included in it contemporaneously. However, in Part-2 a pure backward looking model has been used where only lags of all the variables have been included.

[11] For a detail discussion about all the variables see Appendix A.

[12]Each equation is computed separately by using Ordinary Least Squares method. However, to avoid the problems of spurious relationship between the variables and series implications for the t-statistic, standard errors and Durbin Watson(DW) statistic, Newey-West HAC (Heteroskedasticity and Autocorrelation Consistent) is applied.

are derived and the restrictions $Regm_1$=0 and $Regm_2$=0 are relaxed. The purpose here is to examine that whether regime shifts play any role in the determination of the RER of Pakistan or not. The detail is given in table.1 as below.

Table.1
Dependent Variable: q^g_t
Method: Least Squares
Newey-West HAC Standard Errors and Covariance

Sample:1973-2008	**AdjSample:1977-08**	**AdjSample:1977-08**
Independent Variables	Regression-1 Coefficient (S.E.)	Regression-2 Coefficient (S.E.)
π^g_{t-1pk}	-0.730115*** (0.231258)	-0.561270** (0.161174)
π^g_{t-2pk}	0.824647*** (0.262542)	0.832545*** (0.193420)
π^g_{t-3pk}	-0.322134* (0.164032)	-0.395448*** (0.150420)
π^g_{t-4pk}	0.657441*** (0.128270)	0.669502*** (0.097005)
i^g_{t-1pk}	-0.810312* (0.401611)	-0.652078* (0.375838)
tb^g_{tpk}	-8.88E-06* (4.61E-06)	-8.92E-06** (2.90E-06)
rem^g_{tpk}	--------	-4.785253** (1.707835)
i^g_{tus}	0.806831** (0.217760)	0.693351*** (0.164366)
$Regm_1$	--------	-2.817979** (0.792681)
q^g_{t-1}	-0.307195* (0.1675712)	-0.434699** (0.139841)
q^g_{t-2}	-0.403646** (0.170924)	-0.491666** (0.147075)
R^2	0.69	0.77
$AdjR^2$	0.54	0.66
DW	2.14	2.21

- Asterisks "*" , "**" , "***" stands for 90%, 95%, and 99% confidence level
- Figures in parenthesis show SEs(Standard Errors) of the estimates.
- The best regressions results are obtained by using AC criterion statistic, LM test and CUSUM stability test.
- Other variables $Regm_2$, Domestic output gap, foreign output gap and domestic government expenditures are dropped from the model after founding it insignificant. The intercept term is also dropped from the model.

The results of both the regressions i.e. Regression-1 and Regression-2 are given in table.1. The results of the Regression-1 show that all the variables turned out significant according to the theoretical expectations. It is found that domestic inflation (π^g_{tpk})showed a lag influence on q^g_t. It affects the q^gt with four lags i.e. π^g_{tpk-1}, π^g_{tpk-2}, π^g_{tpk-3} and π^g_{tpk-4}.

The coefficients signs of π^g_{t-1pk} (-0.730115) and π^g_{t-3pk} (-0.322134) are negative, whereas the coefficients signs of both π^g_{t-2pk} (0.824647) and π^g_{t-4pk} (0.657441) are positive. However, the overall impact of π^g_{tpk}on q^g_t is positive i.e. (+0.824647) >(-0.730115) and (+0.657441)>(-0.322134) showing that an increase in π^g_{tpk}also increase (depreciates) q^g_t. Similarly, domestic interest rate (i^g_{tpk}) also remained significant with the expected negative sign. However, its effects are also transmitted to q^g_t with a lag of one year i.e. i^g_{tpk-1} (-0.810312). This result shows that a 1% increase in i^g_{tpk}will bring 0.81% decrease (appreciates/revalue) in q^gt via channels of foreign investment inflows etc. Similarly, as expectedly domestic trade balance (tb^g_{tpk}) also shows a negatively significant relationship with q^g_t i.e.-8.88E-06. This result shows that an improvement in tb^g_{tpk}will put a negative effect on q^gt through channels of improvement in terms of trade, foreign investment inflows etc. The impact of the domestic remittances inflow (rem^g_{tpk}) on q^g_t has also been investigated however, it is dropped from the model after founding it insignificant. Similarly, the impact of the foreign interest rate (i^g_{tus}) on q^g_t has been examined which is also turned out positively significant i.e. 0.806831. it shows that a 1% increase in the i^g_{tus} will increase the q^g_t by 0.80%. This result is also according to expectations as an increase in foreign interest rate (US) i.e. i^g_{tus} will decrease demand for domestic currency via channels of reduction in foreign investment inflow. This will increase the supply of domestic currency and ultimately leads to deprecation of q^g_t. Similarly, lags of q^g_t have also been included in the model which also turned significant at lag-1 and 2 i.e. q^g_{t-1} and q^g_{t-2}. The signs of both the lags are negative (-0.307195 and -0.403646). The value of the R^2 (0.69) shows that the explanatory variables explained most of the variations in q^g_t. Also the Durbin Watson (DW) statistic value is 2.14 which shows that there is no serial correlation problem in the residuals. These results are also confirmed by using the post diagnostic tests i.e. Q-statistic, LM-statistic and CUSUM-square test which are given in Appendix B.

Similarly, in Regression-2, two dummy variables represents the two regime shifts[13] i.e. $Regm_1$ and $Regm_2$ have also been introduced for investigating its impact on q^gt after relaxing the restrictions $Regm_1$=0, $Regm_2$=0. $Regm_1$ is included in the model so that it takes the value of "1" for the full period of the managed float exchange rate system (1982-1999) and "0" otherwise. Similarly, $Regm_2$ is included in the model so that it takes the value of "1" for the full period of floating exchange rate system (2000-2008) and "0" otherwise. The main purpose here is to find out that whether regime shifts are neutral or not in respect to the behavior of q^g_t in the presence of other explanatory variables. Both the dummy variables are included in the model. However, the coefficient of $Regm_1$ turned significant with a negative sign. Whereas, $Regm_2$ remained insignificant and showing no influence on q^g_t. The negative sign of the $Regm_1$ shows that a shift towards a more floating regime against fixed regime although increased the variability in q^gt. However, it decreases the q^gt shows a positive influence on rupee value against US dollar. Similarly, all the explanatory variables i.e. π^g_{tpk}, i^g_{tpk}, tb^g_{tpk}, $i^g_{tus}$are still significant with the expected signs, and showing almost the similar impact on q^g_t in terms of level of significance and magnitudes. The results show that π^g_{tpk} is still shows a similar lag impact on q^g_t and significant up to four lags i.e. π^g_{tpk-1}, π^g_{tpk-2}, π^g_{tpk-3} and π^g_{tpk-4} like Regression-1. However, here the overall impact of π^g_{tpk} on q^g_t increased with the consideration of the regime shifts i.e. 0.545329 > 0.4229425. Similarly, i^g_{tpk} is still negative and affecting q^g_t with a lag of one year i.e. $i^g_{tpk-1.}$ However, its effect on q^g_t decreased comparatively i.e. 0.652078 < 0.810312. The tb^g_{tpk} is still significant with a negative sign. However, its impact on $q^g_t$is also increased i.e. 8.92E-06 > 8.88E-06. Similarly, $i^g_{tus}$is also significant expectedly however, and its overall impact on q^g_t decreased i.e. 0.693351 < 0.806831. This decrease effect of i^g_{tus} is justified in the sense that as a shift towards a more floating regime enables the monetary authority to use its monetary policy more independently of foreign influences. Hence, the impact of the foreign interest rate i^g_{tus} will be minimum and defendable in comparison to fixed exchange rate system. Also with the inclusion of the dummy variables for the regime shifts unlike Regression-1, in Regression-2 domestic remittances (rem^g_{tpk}) also turned significant with the expected negative sign. This shows that with a 1% increase in rem^g_{tpk} will decrease q^g_t by 4.78% via channels of rise in domestic investment activities and exports production etc. The lags of q^g_t are still significant with negative signs. The R^2 (0.77>0.69) is also improved and the DW statistic (2.21) value show that these results are reliable which is also supported by the Q-statistic, LM-statistic and CUSUM-square test given in Appendix B.

Overall, the results show that although the coefficient of $Regm_2$ remained insignificant, however the significance of $Regm_1$ clearly shows that regime shifts are not neural and affect the RER (q^g_t) of Pakistan. F-statistic is used, which confirmed the overall significance of all the explanatory variables in Regression-2.

[13]. It would be more interesting to examine the behavior of RER under the three regimes i.e. fixed, managed float and full float by dividing the full sample size into three periods i.e. 1973-1981, 1982-1999 and 2000-2008. However, because of the small sample period of the study a sub-sample analysis was difficult to perform. Also, selection of appropriate variables was another problem.

Table.2
Wald/F test for Overall Significance of Regressors:

Dependent Variable: q^g_t

Results	Explanatory Variables	F-Statistic
Regression:1	π^g_{t-1pk}, π^g_{t-2pk}, π^g_{t-3pk}, π^g_{t-4pk}, i^g_{t-1pk}, tb^g_{tpk},, i^g_{tus}, q^g_{t-1}, q^g_{t-2}	13.16**
Regression:2	π^g_{t-1pk}, π^g_{t-2pk}, π^g_{t-3pk}, π^g_{t-4pk}, i^g_{t-1pk}, tb^g_{tpk}, rem^g_{tpk}, i^g_{tus}, $Regm_1$,$Regm_2$, q^g_{t-1}, q^g_{t-2}	51.68**

- Asterisks " ** " stands for 95% confidence level

For overall significance of all the variables of both the regressions i.e. regression-1 and 2 of table, F test has been used. The results computed are given in table.2. It is found that all the variables in both the regressions are also significant altogether.

Part-2

In Part-2, two more regressions Regression-3 and 4 has been computed. Regression-3 is derived for investigating the role of differential variables (DVs) i.e. π^g_d and i^g_d in the determination of q^g_t after imposing the restrictions $Regim_1$=0 and $Regim_2$=0. After that Regression-4 is computed and the restrictions $Regim_1$=0 and $Regim_2$=0 have been relaxed. The purpose here is to find out that whether regime shifts affect the of q^g_t or they are neutral. The results for both the regressions are given in table. 3 as follows.

Table. 3
Dependent Variable: $q^g t$
Method: Least Squares
Newey-West HAC Standard Errors and Covariance

Sample:1973-2008	**AdjSample:1977-08**	**AdjSample:1977-08**
Independent Variables	Regression: 1 Coefficient (S.E.)	Regression: 2 Coefficient (S.E.)
π^g_{td-1}	-0.482833** (0.172167)	-0.415676** 0.139573)
π^g_{td-2}	1.001340*** (0.214361)	1.003640*** (0.179243)
π^g_{td-3}	-0.322742* (0.155885)	-0.260502* (0.151261)
π^g_{td-4}	0.759628*** (0.164626)	0.796352*** (0.142917)
i^g_{td-1}	-0.797667** (0.449293)	-0.940872** (0.330274)
$Regm_1$	--------	-2.382353*** (0.503364)
q^g_{t-1}	-0.237703 (0.130650)	-0.396669*** (0.086148)
q^g_{t-2}	-0.405737 (0.123161)	-0.545540** (0.086546)
R^2	0.58	0.73

$AdjR^2$	0.46	0.64
DW	1.74	2.10

- Asterisks "*" , "**" , "***" stands for 90%, 95%, and 99% confidence level
- Figures in parenthesis show SEs(Standard Errors) of the estimates.
- The best regressions results are obtained by using AC criterion statistic, LM test and CUSUM stability test.
- Other variables $Regm_2$, foreign output gap, domestic output gap, domestic government expenditures, domestic remittances and intercept term are dropped from the model after founding insignificant.

The results obtained in Regression-1 show that both the DVs i.e. inflation differential (π^g_d) and interest rate differential (i^g_d) turned significant with the expected signs. π^g_d shows a lag influence on $q^g_t$and remained significant up to lag-4 i.e. π^g_{d-1}, π^g_{d-2}, π^g_{d-3}, π^g_{d-4}. Whereas, π^g_{d-1} (-0.482833) and π^g_{d-3} (-0.322742) it shows a negative and at π^g_{d-2} (+1.001340) and π^g_{d-4} (+0.759628) it shows a positive relationship with q^g_t respectively. However, its overall impact on $q^g_t$is positive i.e. (+0.955393) showing that an increase in the π^g_d of the domestic (Pakistan) country against the foreign (United States) country also increases the RER (q^g_t) via channels of exports etc. Similarly, i^g_dalso negatively influence q^g_t with a lag of one year i.e. i^g_{d-1} (-0.797667). This result shows that an increase in the i^g_t of domestic country against the foreign country also decreases q^g_t via channels of foreign investment inflows etc. The results further show that $q^g_t$is still influence by its lags and turned significant up to lag-2 i.e. q^g_{t-1} and q^g_{t-2} respectively. Also, the signs of both the variables are still negative. The R^2 value is 0.58 which shows that the fit is good. The DW statistic value is 1.74 which shows that there is no serial correlation in the residuals. The reliability of the results has been also confirmed by applying the Q-statistic, LM-test and CUSUM-square test which are given in Appendix B.

After that for examining the role of the two regime shifts , Regression-2 is computed. Two dummy variables i.e. i.e. $Regm_{-1}$ and $Regm_{-2}$has been included in it. The main aim here is to find out that whether regime shifts play any role in the determination q^g_t if instead of including both domestic and foreign variables separately their differential has been included. The results shows that $Regm_1$ turned negatively significant. However, $Regm_2$ remained insignificant. This result shows that regime shifts are not neutral and show its influence on q^g_t. The DVs i.e. π^g_d and i^g_d are still significant with the expected signs. Like Regression-1, π^g_d shows its influence on q^g_t up to four lags i.e. π^g_{d-1}, π^g_{d-2}, π^g_{d-3}, π^g_{d-4} and remained negative at π^g_{d-1} (-0.415676) and π^g_{d-3} (-0.260502) and show a positive relationship with q^g_t at π^g_{d-2} (+1.003640)and π^g_{d-4} (+0.796352). However, its overall impact on q^g_t is positive and increased as compared to the results of Regression-1 i.e. (1.123814> 0.955393). Similarly, the coefficient of i^g_d also turned negative like Regression-1. However, it shows a greater impact on q^g_t comparatively i.e. 0.940872 > 0.797667. Like Regression-1 both the lags of the dependent variable (q^g_t) are still significant with negative signs. The R^2 (0.73 > 0.58) shows that the fit is improved. Also the DW statistic (2.10) value shows that the model is correctly specified and there is no serial correlation problem in the residuals. This result is supported by Q-statistic, LM-test. For stability of the parameters the CUSUM square test is used which shows that the test statistic is within the 5% percent significance lines and the parameters are stable. For detail about all the tests see Appendix B.

Overall, the results of both Part-1 and Part-2 show that both the domestic and foreign factors play an role in the determination of RER (q^g_t). Similarly, Regime shifts also influence the q^g_t. Comparing the results of both Part-1 and Part-2 it is found that the results obtained for both the sections are quite similar. This argument is also stands for the role of the two regime shifts in determination of q^g_t in both the parts.

Table. 4
Wald/F test for Overall Significance of Regressors
Dependent Variable: q^g_t

Results	Explanatory Variables	F-Statistic
Regression:1	π^g_{td-1}, π^g_{td-2}, π^g_{td-3}, π^g_{td-3}, i^g_{td-1}, q^g_{t-1}, q^g_{t-2}	10.26**
Regression:2	π^g_{td-1}, π^g_{td-2}, π^g_{td-3}, π^g_{td-3}, i^g_{td-1}, $Regm_1$, $Regm_2$, q^g_{t-1}, q^g_{t-2}	21.67**

- Asterisks " ** " stands for 95% confidence level

Table.4 shows the results of the F-statistic obtained for the significance of all the variables of Regression-1 and 2 given in table.3. The results show that overall all the variables are also significant in both the regressions.

Concluding Remarks

The paper examined the role of both the domestic and foreign factors in the determination of Pak-rupee real exchange rate (RER) over the period 1973 to 2008 in the framework of a two variant backward looking model. The analysis is carried out so that first the impact of both domestic and foreign factors have been examined individually on the rupee RER. After that the role of the differential variables (DVs) computed by taking the difference between the domestic and foreign variables have been investigated in the determination of RER. Furthermore, the role of the dummy variables replicates the two regime shifts (i.e. occurred during 1982 and 2000) have also been assessed in the determination of RER. The results show that both domestic and foreign variables i.e. domestic inflation, domestic

interest rate, trade balance, remittances, US interest rate and US inflation influence the RER of Pakistan. Moreover it is found that although the second dummy variable represents the movement towards the full float exchange rate system remained insignificant however, the dummy variable stands for the shift from the fixed to the managed float exchange rate system turned out significant showing that the exchange rate policies of State Bank of Pakistan influence the RER. These results are also consistent with the results obtained for the DVs. The post diagnostic tests i.e. Q-statistic, LM. test and CUSUM squares test have been applied which confirmed the reliability of these results.

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Appendix: A

Data Sources and Variables Definition

In this study annual data has been used for the period 1973 to 2008. The data is also divided into three sub-samples on the basis of fixed, managed and flexible exchange rate regimes followed by the country during 1973-1981, 1982-1999 and 2000-2008 respectively. However, the original periods are i.e. fixed exchange rate system from 1947 to 7th January 1982, managed from On 8th January 1982 and full float exchange rate system from 19th May 1999 onwards. However, it is modified purposively as in this study annual data has been used.

DOMESTIC VARIABLES

Variables	Definition	Proxies
1.Exchange Rate	Real exchange rate of Pakistan rupee vs USA dollar	q^g_t
2.Pak Inflation Rate	Average percentage change in consumer price index	π^g_{tpk}
3. Pak Interest Rate	Annual money call rate	i^g_{tpk}
5.Pak remittances	Total workers' inflow of remittances in million of rupees	rem^g_{tpk}
6.Pak Trade Balance	Total exports minus total imports in million of rupees	tb^g_{tpk}
7. Pak CPI	Consumer price index of Pakistan	
8. $Regm_1$	Dummy variable for the shift towards the managed float exchange rate system of SBP occurred in 1982.	
9. $Regm_2$	Dummy variable for the shift towards the full float exchange rate system of SBP occurred in 2000.	

FOREIGN VARIABLES

1.US Inflation Rate	Average percentage change in consumer price index	π^g_{tus}
2.US Interest Rate	Annual federal reserve rate	i^g_{tus}
3.US GDP	Gross domestic product of US in million of Pakistan rupees	y^g_{tus}
4. US CPI^{usa}	Consumer price index of USA	

Data Sources: All the data are collected from, Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan and International Financial Statistics, IMF.

1. $i^g_t = i_t - i^*_t$ is Pakistan interest rate gap which is used as a monetary policy instrument in this study. It is computed by taking the difference between actual money call rate(i_t) and targeted money call rate(i^*_t). For de-trending Hodrick-Prescott Filter technique is used.
2. $i^g_{tus} = i_t - i^*_t$ is US interest rate gap which is used as a monetary policy instrument in this study. It is computed by taking the difference between actual money call rate(i_t) and targeted money call rate(i^*_t). For de-trending Hodrick-Prescott Filter technique is used.
3. $\pi^g_{tpk} = \pi_t - \pi^*_t$ is Pakistan inflation gap which is the difference between actual inflation rate(π_t) and targeted inflation rate(π^*_t). For de-trending Hodrick-Prescott Filter technique is used.
4. $\pi^g_{tus} = \pi_t - \pi^*_t$ is US inflation gap which is the difference between actual inflation rate(π_t) and targeted inflation rate(π^*_t) of USA. For de-trending Hodrick-Prescott Filter technique is used.

5. $q^g_t = q_t - q^*_t$ is the real exchange rate gap. It is the difference between actual(q_t) and targeted real exchange rate(q^*_t) after converting nominal exchange rate into real from. Whereas, real exchange rate is defined as the nominal exchange rate of Pakistan currency against US dollar multiplied by the ratio of the foreign to domestic price level (RER = q(CPI^{usa} / CPI^{pak}). For converting RER into growth terms log of it has been taken.
6. $tb^g_{tpk} = tb_t - tb^*_t$ = is trade balance gap which is computed by taking the difference between actual(tb_t) and targeted(tb^*_t) trade balance. For de-trending Hodrick-Prescott Filter technique is used.
7. $rem^g_t = rem_t - rem^*_t$ is the remittances of Pakistan. For computation first it is converted into real form by using 1976 as base year. After that log of it has been taken. Hodrick-Prescott filter is used for de-trending and multiplied with 100.
8. $Regm_1$ stands for shift towards the first regime. It takes the value of 1 for the full period of the second regime and 0 otherwise.
9. $Regm_2$ stands for shift towards the second regime. It takes the value of 1 for the full period of the third regime and 0 otherwise.
10. $\pi^g_d$is computed by taking the difference between Pakistan and US inflation rates ($\pi^g_{tpk} - \pi^g_{tus}$). For de-trending Hodrick-Prescott Filter technique is used.
11. $i^g_d$is computed by taking the difference between Pakistan and US interest rates ($i^g_{tpk} - i^g_{tus}$). For de-trending Hodrick-Prescott Filter technique is used Eviews. 6 is used for analysis of the data.

Appendix :B

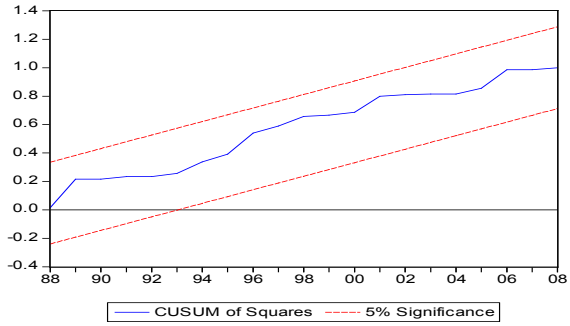
Part-1

Regression: 1 Corrlelogram-Q-Statistics						
Sample: 1977-2008						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. *| . |	. *| . |	1	-0.082	-0.082	0.2347	0.628
. *| . |	. *| . |	2	-0.072	-0.079	0.4221	0.810
. |* . |	. |* . |	3	0.135	0.124	1.1089	0.775
. | . |	. | . |	4	-0.050	-0.035	1.2075	0.877
. | . |	. | . |	5	0.003	0.015	1.2079	0.944
. | . |	. | . |	6	0.070	0.050	1.4106	0.965
. |* . |	. |* . |	7	0.085	0.109	1.7244	0.974
. | . |	. | . |	8	0.014	0.035	1.7339	0.988
.**| . |	.**| . |	9	-0.217	-0.224	3.9651	0.914
. |* . |	. |* . |	10	0.131	0.089	4.8140	0.903
. *| . |	. *| . |	11	-0.098	-0.119	5.3090	0.915
. | . |	. | . |	12	-0.006	0.053	5.3112	0.947
. |* . |	. | . |	13	0.118	0.049	6.1085	0.942
.**| . |	.**| . |	14	-0.303	-0.295	11.658	0.634
. | . |	. | . |	15	0.012	0.022	11.667	0.704
. | . |	. *| . |	16	-0.063	-0.124	11.934	0.748

Breusch-Godfrey Serial Correlation LM Test:

Independent Variables		F-Statistic	
F-statistic	0.427012	Prob. F(4, 17)	0.7871
Obs*R-squared	2.921603	Prob. Chi.Square(4)	0.5710

CUSUM Square Test for Stability

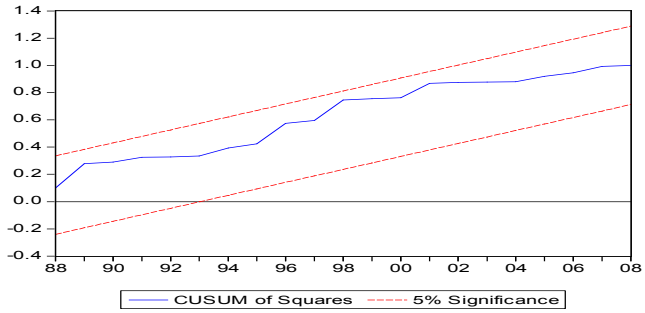


Regression:2 Corrlelogram-Q-Statistics						
Sample: 1977-2008						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. *| . |	. *| . |	1	-0.113	-0.113	0.4468	0.504
. *| . |	.**| . |	2	-0.194	-0.210	1.8157	0.403
. *| . |	. *| . |	3	-0.095	-0.153	2.1511	0.542
.**| . |	.**| . |	4	-0.235	-0.340	4.2978	0.367
. | . |	. *| . |	5	0.058	-0.125	4.4344	0.489
. |* . |	. *| . |	6	0.077	-0.120	4.6801	0.585
. | . |	. *| . |	7	0.048	-0.072	4.7793	0.687
. | . |	. *| . |	8	0.023	-0.088	4.8023	0.778
. *| . |	.**| . |	9	-0.203	-0.282	6.7561	0.662
. | . |	. *| . |	10	0.052	-0.101	6.8883	0.736
. | . |	.**| . |	11	-0.048	-0.266	7.0065	0.799
. |* . |	. *| . |	12	0.097	-0.117	7.5212	0.821
. |**. |	. |* . |	13	0.297	0.125	12.556	0.483
.**| . |	.**| . |	14	-0.271	-0.281	16.986	0.257
. | . |	. | . |	15	0.060	0.048	17.214	0.306
. | . |	. | . |	16	0.002	-0.017	17.214	0.372

Breusch-Godfrey Serial Correlation LM Test:

Independent Variables		F-Statistic	
F-statistic	1.798067	Prob. F(4,17)	0.1758
Obs*R-squared	9.479954	Prob. Chi.Square(4)	0.0502

CUSUM Square Test for Stability



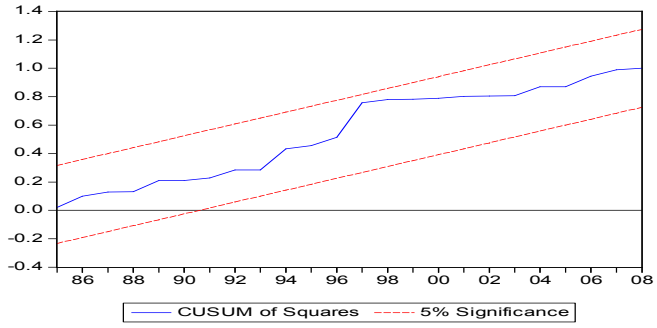
Part-2

Regression: 3						
Corrlelogram-Q-Statistics						
Sample: 1977-2008						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	-0.023	-0.023	0.0189	0.891
. *| . |	. *| . |	2	-0.093	-0.094	0.3347	0.846
. | . |	. | . |	3	-0.007	-0.012	0.3368	0.953
. | . |	. | . |	4	0.001	-0.009	0.3368	0.987
. |* . |	. |* . |	5	0.193	0.193	1.8355	0.871
. | . |	. | . |	6	0.026	0.036	1.8629	0.932
. | . |	. | . |	7	-0.033	0.005	1.9104	0.965
. | . |	. | . |	8	-0.012	-0.007	1.9165	0.983
. *| . |	. *| . |	9	-0.097	-0.106	2.3647	0.984
. | . |	. | . |	10	0.006	-0.041	2.3667	0.993
. *| . |	. *| . |	11	-0.081	-0.120	2.7106	0.994
. | . |	. | . |	12	0.047	0.046	2.8303	0.997
. *| . |	. *| . |	13	-0.086	-0.101	3.2536	0.997
.**| . |	.**| . |	14	-0.267	-0.241	7.5646	0.911
. |* . |	. |* . |	15	0.110	0.100	8.3442	0.909
. *| . |	. *| . |	16	-0.067	-0.087	8.6476	0.927

Breusch-Godfrey Serial Correlation LM Test:

Independent Variables		F-Statistic	
F-statistic	0.343794	Prob. F(4,20)	0.8451
Obs*R-squared	0.000000	Prob. Chi.Square(4)	N.A

CUSUM squares test for stability

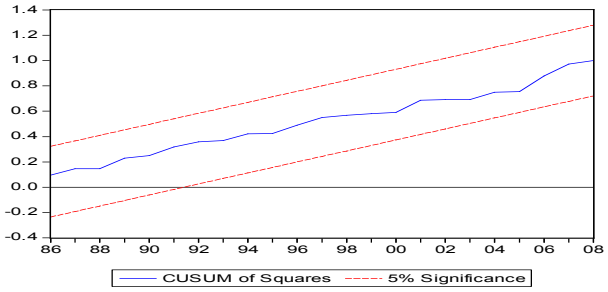


Regression: 4						
Corrlelogram-Q-Statistics Sample: 1977-2008						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. *| . |	. *| . |	1	-0.071	-0.071	0.1786	0.673
.**| . |	.**| . |	2	-0.228	-0.234	2.0662	0.356
. *| . |	.**| . |	3	-0.204	-0.256	3.6311	0.304
. *| . |	.**| . |	4	-0.118	-0.257	4.1754	0.383
. |**. |	. |* . |	5	0.250	0.089	6.6951	0.244
. | . |	. *| . |	6	-0.047	-0.168	6.7884	0.341
. *| . |	. *| . |	7	-0.103	-0.154	7.2527	0.403
. |* . |	. | . |	8	0.079	0.048	7.5321	0.480
. | . |	. | . |	9	0.024	0.008	7.5594	0.579
. | . |	. | . |	10	0.067	0.001	7.7796	0.650
. *| . |	. | . |	11	-0.102	-0.060	8.3155	0.685
. | . |	. |* . |	12	0.022	0.112	8.3429	0.758
. | . |	. | . |	13	0.028	-0.004	8.3890	0.817
.**| . |	.**| . |	14	-0.243	-0.308	11.971	0.609
. |* . |	. |* . |	15	0.128	0.080	13.020	0.601
. | . |	. *| . |	16	-0.000	-0.067	13.020	0.671

Breusch-Godfrey Serial Correlation LM Test:

Independent Variables		F-Statistic	
F-statistic	1.191709	Prob. F(4,19)	0.3464
Obs*R-squared	6.303930	Prob. Chi.Square(4)	0.1776

CUSUM Square Test for Stability



Appendix :C

Table.1:

year	NER	NER (%)	RER (%)
1971	4.79	---	---
1972	11.03	**+130**	---
1973	**9.9**	**-10.24**	**-13.70**
1974	9.9	0	-18.96
1975	9.9	0	-17.58
1976	9.9	0	-5.93
1977	9.9	0	-4.17
1978	9.9	0	-1.43
1979	9.9	0	5,75
1980	9.9	0	3.03
1981	9.9	0	-0.5
1982	**12.84**	**29.7**	**24.74**
1983	13.5	5.14	2.74
1984	15.36	13.78	10.81
1985	15.98	4.04	1.94
1986	17.25	7.95	5.46
1987	17.45	1.16	1.31
1988	18.65	6.88	4.60
1989	21.42	14.85	9.29
1990	21.9	2.24	1.60
1991	24.72	12.88	4.45
1992	25.7	3.96	-3.58
1993	30.12	17.2	10.31
1994	30.8	2.26	-6.40
1995	34.25	11.2	0.99
1996	40.25	17.52	9.65
1997	44.05	9.44	-0.01
1998	45.89	4.18	-2.08
1999	51.78	12.83	9.28
2000	**58.03**	**12.07**	**11.87**
2001	60.86	4.88	3.29
2002	58.53	-3.83	-5.78
2003	57.22	-2.24	-3.07
2004	59.12	3.32	1.43
2005	59.83	1.2	-4.69
2006	60.92	1.82	-2.87
2007	61.22	0.49	-4.42
2008	**62.55**	**2.17**	**-6.03**

*. (-ve) sign stands for appreciation and (+ve) for depreciation

Table.2: Duration of Business Cycles in Pakistan

Business Cycles	1st B. Cycle (1949-1969)	2nd B. Cycle (1969-1991)	3rd B. Cycle (1991 - ?)
Recession	1949-1950 to 1959-60 (11 years)	1969-70 to 1978-79 (10 years)	1991-92 to 2004-05 * (14 years)
Trough	1959-60	1978-79	2004-05 *
Recovery	1960-1961 to 1968-69 (9 years)	1979-80 to 1990-91 (12 years)	2005-06 to ?
Peak	1968-69	1990-91	

Source: Farooq (2001), State Bank of Pakistan, Working Paper Series. No.1

The above table showed the business cycles duration in Pakistan since inception. It shows that soon after the inception Pakistan economy went into recession which was continued for almost 11 years. The main reasons for this longer period of recession was the slow economic progress in the country because of the different problems i.e. communal upsets, poor infrastructure weak industrial base, lack of private sector etc. During 1960 the economic conditions are improved and which helps the economy to enter in the second phase i.e. recovery because of different economic planning and its effective implementation. During 1970s the economy once again fell into recession again. Separation of East Pakistan , nationalization of industries etc. might be the the main reason for that. After a long period of 12 years the economy recovered for a 9-year period. The third recession started in 1991 and is estimated to be continue till 2004-05.