EFFECTS OF EXCHANGE RATE VARIATIONS ON ECONOMIC GROWTH, PRICES AND ITS IMPACT ON RESERVES OF FOREIGN EXCHANGE IN PAKISTAN (1975-2010)

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A DISSERTATION SUBMITTED TO THE UNIVERSITY OF PESHAWAR
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD
OF
DEGREE OF DOCTOR OF PHILOSOPHY IN ECONOMICS

DEPARTMENT OF ECONOMICS
UNIVERSITY OF PESHAWAR
KHYBER PAKHTUNKHWA PAKISTAN

Session 2010-2015

APPROVAL SHEET

Certified that the thesis entitled **"EFFECTS OF EXCHANGE VARIATIONS ON ECONOMIC GROWTH, PRICES AND ITS IMPACT ON RESERVES OF FOREIGN EXCHANGE IN PAKISTAN (1975-2010)"** Submitted by **Mr. Amanullah,** Ph.D. Research as partial fulfillment of the requirements for the award of the degree of Doctor of Philosophy (Ph.D.) in Economics is hereby approved by the Supervisory Committee.

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Date: **July 28, 2015**

ACKNOWLEDGEMENTS

Thanks to Allah the most Merciful and Almighty for blessing me with great opportunities in life.

Foremost I wish to express my gratitude and heartiest appreciation to my supervisor Prof. Dr. Muhammad Naeem, Chairman Department of Economics, University of Peshawar for encouragement, constructive suggestions and critical evaluation during this research work. It is only because of his personal interest and efforts that I have completed my research. It is an honor for me to be one of his students. In my view he is the asset of Economics department and I pray for his good health and long life.

Many thanks to Prof (R). Dr. Ijaz Majid, Ex-Chairman Department of Economics for his kind attitudes and helpful ideas. I am also impressed with the friendly behavior of my well-wishers Dr. Zilakat Khan Malik and Dr. Amjad Amin who really supported me during difficult times. Countless thanks to all other teachers and staff of the Department of Economics for their sincere cooperation.

In friends, first I appreciate my friends Mr. Zahid Gul, Arbab Saeed Ullah Khan, Kaleem Ullah Khan, Muhammad Qasim Khan and Syed Muhammad Arif Shah for continuously motivating and supporting me to complete this research. I am also grateful to Arbab Sami Ullah Khan for his parental behavior and support during all the process of this research.

I am deeply indebted to the University of Peshawar for giving me this great opportunity to continue my Ph.D studies.

In family, first I want to appreciate the efforts of my siblings who took all the responsibilities at their shoulders since the initial stages of my study. I am also lucky that Allah bestowed me a very sweet mother who always blessed me with her prayers which really worked for me throughout my life (May her soul rest in peace). In the first month of 2014 I lost her but I can see that her prayers lead me to success and will remain with me till End.

Finally, I am proud of being the son of Noor Muhammad who gives special attention to me and also takes deep interest in my education. He has always encouraged me and provided me good environment for education. He constantly advises me about the benefits of education since my school days and blessed me with his all support in all critical situations. I want to say him; I love you "DAJI". You are a very nice father.

Amanullah

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ABBREVIATIONS

ADF	Augmented Dickey Fuller
API	Average Propensity to Import
APS	Average Propensity to Save
DW	Durbin Watson
ECB	European Central Bank
GDP	Gross Domestic Product
HAC	Heteroskedasticity and Autocorrelation Consistent
HP	Hodrick Prescott
IS	Investment -Saving
MPI	Marginal Propensity to Import
NKPC	New Keynesian Phillips Curve
SBP	State Bank of Pakistan
SE	Standard Error
VAR	Vector Autoregressive
US	United States
OLS	Ordinary Least Squares
SDR	Special Drawing Rights
IMF	International Monetary Fund
IFS	International Financial Statistics
WDI	World Development Indicators

ABSTRACT

A stable exchange rate plays a significant role in the settlement of major macroeconomic variables like output, price level and foreign exchange reserves. Whereas, its instability hinders investment, trade flow and economic growth in an economy. It also provides additional aggregate demand and supply transmission channels which help in the implementation of suitable monetary policy. Exchange rate is determined by a number of factors, the identification of which can be useful for maintaining economic stability and solving monetary problems.

Among the developing countries, Pakistan experienced a unique downward trend in rupee value and frequent transitions in the exchange rate systems. These distinctive features make Pakistan economy an interesting case study for the empirical examination of the rupee exchange rate and its role in the monetary policy and macroeconomic performance. The purpose of the present study is to find out which of the macroeconomic indicators has led the Pak-rupee Real Exchange Rate (RER) depreciations during the study period. Moreover, the role of the RER in a Taylor rule based monetary policy of the State Bank of Pakistan (SBP) has also been analyzed. Likewise, the impact of RER on output has been examined in an open economy IS curve framework for testing the contractionary hypothesis of real devaluations in Pakistan. Also, the influence of the RER on inflation has been investigated in the framework of an open economy Phillips curve approach. Furthermore, the effect of the RER on foreign exchange reserves has also been studied in the framework of a mercantilist approach. Finally, the relationship of the different exchange rate systems with the RER, monetary policy, output, price level and foreign exchange reserves have also been explored.

Time series annual data covering the period 1975 to 2010 has been used for the empirical analysis. Augmented Dickey Fuller test has been used for checking the unit root in the data. Hodrick Prescott filter method has been applied for extracting the cyclical components from the observed series. Ordinary Least Squares method is used for the estimation of regression equations. The overall significance of the models has been analyzed by using Wald test. For avoiding the problems of spurious relationship between the variables and series implications for the standard errors and Durbin Watson statistic, Newy-West test has been applied.

The reliability of the results has been confirmed by using the Diagnostic tools i.e. Q-statistic and LM test. CUSUM stability tests are used for checking the stability of the parameters and regression variances.

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The collapse of Bretton woods system in 1970s caused the world economies to shift from fixed to flexible exchange rate system. With this development the variability of exchange rate (both nominal & real) increased in the overall economic outlook and it became the central focus of the monetary authorities in both the developed and developing countries. Real exchange rate plays a significant role in the settlement of major macroeconomic variables in an economy and its instability hinders investment, trade flow and economic growth (Frankel and Rose, 2002). Similarly, Stockman (1980) and Kempa (2005) pointed out that real exchange rate fluctuations which mainly occur due to demand and supply side factors can affect price level, output growth and foreign exchange reserves. Although identification of the factors causing real exchange rate fluctuations can be useful for the monetary authorities to maintain economic stability and solving monetary ills. However, it is still a debatable issue and there is no agreed consensus in the literature over its specific determinants. Enders & Bang(1997) and Wang (2005) stated that only real (demand and supply) factors bring fluctuations in the real exchange rate. In contrast, Lee and Lin (2003) find out that both monetary and supply side factors affect the real exchange rate. Whereas, Chen (2004) mentioned that real exchange rate is affected by only demand side factors and the role of other factors is less important.

Real Exchange Rate (RER) provides additional aggregate demand and supply transmission channels for monetary policy. Thomas and Schorfheide (2007) and Parsley & Popper (2009) concluded that monetary policy in which central banks respond to RER fluctuations produced optimal results. Hence, in an open economy limiting monetary policy to only inflation and output gaps might not work well without taking into account the role of some

othermacroeconomic factors such as real exchange rate etc.

Moreover, the relationship between the RER and output also remained debatable in the literature. The traditional approaches (elasticities, absorption and Keynesian) stated that real devaluations operate through aggregate demand channels and its ultimate effects on output are positive (See, Alexander, 1952; Pearce, 1961; Turnovsky, 1980; Domac, 1997). However, in contrast, the new structuralist economists mentioned that real depreciations bring reduction in the output level in an economy through various aggregate demand and supply channels (Alejandro, 1963; Gylfason&Schmid, 1983). Similarly, the literature shows a number of empirical approaches i.e. the control group approach, the before and after approach, the macro simulations approach and the econometric approach undertaken for investigating the relationship between the real exchange rate and output. However, like the theoretical controversies, no common consensus existed among the economists also empirically about the relationship between the real depreciations and the output level both for the developed and developing countries (See, Alejandro, 1965; Roca and Priale, 1987; Bahmani-Oskooeeand Miteza, 2006).

Likewise, the transformation effects of the real depreciations on inflation has also remained a hot issue for the researchers and policy makers over the years (Choudhri and Hakura, 2006). Real depreciations can influence domestic prices through both aggregate supply and aggregate demand side channels. On the supply side fluctuations in RER affect imported good prices both directly and indirectly (Volkan*et al* 2007). On the one side, real depreciation of domestic currency against the foreign currencies directly results in higher imported goods prices and vice versa. On the other hand, the potentially higher cost of imported inputs associated with real depreciations increase the marginal cost of production and indirectly leads to the higher prices of domestically produced goods. Whereas, on the demand side, increased foreign demand for net exports may also bid up the domestic prices, causing higher inflation.

In the same scenario despite the wide spread theoretical and empirical studies

about the foreign exchange reserves holdings, one issue which received minimum attention in the literature is the relationship between the real exchange and foreign exchange reserves. Foreign exchange reserves are the financial assets held by the central banks for the monetary and exchange rate policies adjustment in an economy. Real depreciations can also put positive and negative influences on foreign exchange reserves holdings. On the one side, real depreciations raise the level of foreign exchange reserves in country through increased demand for exports. Whereas on the other side real depreciation may hurt investor confidence on the domestic currency results in the reduction of foreign exchange reserves.

In Pakistan, monetary policy has passed through different stages. First, the State Bank of Pakistan followed a fixed exchange rate system from 1975 to 7th January 1982 and the rupee exchange rate was kept at 9.9 per US dollar. On 8th January 1982, the State Bank of Pakistan adopted a managed float exchange rate system but the rupee kept its downward trend. During the period1982-99 it further depreciated from 12.71 to 51.77 per US dollars. After that the State Bank of Pakistan introduced a full float market based system on 19th May 1999, determined by the demand and supply side factors in foreign exchange market. But the value of rupee declined further and it depreciated from 58.03 to 62.55 per US dollar during the period 2000-10 (State Bank of Pakistan, 2005). Looking at the growth performance, the GDP growth rate was 6.80% during 1975 which reduced to 1.70% in 1997 and again raised to 4.10% during 2010. Similarly inflation in the country was at its highest, 26.71% during 1975 reduced to 3.59% in 1987 and again raised to 12% during the period 2010. The trade balance of the country remained surplus with an amount of 153 million rupees only in the year 1973. After that it showed a downward trend and reached to a deficit of 51799 million rupees in 1985 and this condition deteriorated further as the deficit reached to 1515454 million rupees during 2010. The foreign exchange reserves although showed an increasing pattern but with a slow growth rate. During 1975 it was 3970.4 million rupees that raised to 78986 million rupees in 1994 and again raised to 594723.8 million rupees in 2010 (State Bank of

Pakistan, 2005; Economic Survey, 2011-2012).

In brief, the above discussion makes it clear that in case of Pakistan one of the distinctive characteristic of the economy is the continuous downward movement of the rupee value and frequent transitions in the exchange rate systems during the study period, 1975-2010. The GDP growth performance and inflation rate also showed both up and downward trends during the same period. The foreign reserves of the country also showed fluctuations. Keeping in view the facts and figures, the causes of RER fluctuations, its linkages with the monetary policy and its impact on the macroeconomic aggregates i.e. output, price level and foreign exchange reserves of Pakistan needs to be explored. So far no study has been undertaken for Pakistan to analyze these issues. This study has been conducted to cover this gap.

1.2 Significance of the Study

Among the developing countries, Pakistan has an interesting experience of exchange rate systems and real devaluations. The continuous decline in the rupee value and poor macroeconomic performance of the country during the study period shows that the State Bank of Pakistan (SBP) remained completely unsuccessful in the proper implementation of itsmonetary and exchange rate policies. Whereas, the importance of these policies cannot be ignored for a small open economy Pakistan which has weak exports base mostly consists of primary agricultural goods and large dependency on imported goods. There is a need of monetary policy for Pakistan which should be compatible to today's new environment where most of the central have been shifted from targeting monetary aggregates to some policy rules.

These distinctive features of the Pakistan economy has become a source of motivation to undertake a broad level study by focusing on the possible indicators of RER and its role in the monetary policy, output, price level and foreign exchange reserves. The literature shows that no work has been done before on these issues both in the developed and developing countries and

particularly in Pakistan. This provides us a room to undertake this study. It is expected that the findings of this research work will be helpful for the SBP in understanding the behavior of real exchange rate and its significance for the monetary policy and macroeconomic aggregates like output, price level and foreign exchange reserves. It will also guide the government in assessing the soundness of the present and future monetary and fiscal policies in the country. It is also expected that this research will provide guidelines for import based and export competing industries in the country. It can also be beneficial for the banking sector of the country in the management of their future strategies.

1.3 Objectives of the Study

The objectives of the study are given as follows:

1. To find out the factors causing variations in the Real exchange rate of Pakistan.
2. To investigate the role of Real exchange rate in the monetary policy of Pakistan.
3. To analyze the impact of Real exchange rate on output level of Pakistan.
4. To examine the impact of Real exchange rate variations on the prices level in Pakistan.
5. To investigate the impact of Real exchange rate on foreign exchange reserves in Pakistan.

1.4 Hypotheses

1. Foreign factors play a role in the determination of real exchange rate of Pakistan.
2. Real exchange rate plays a role in the monetary policy of the State Bank of Pakistan.
3. The State Bank of Pakistan reacts differently to output and inflation gaps under different exchange rate systems in its monetary policy.
4. Real devaluations are inflationary in Pakistan.

5. Real depreciations increase foreign exchange reserves holdings in Pakistan.

1.5 Research Methodology

This part of the study presents information about the data sources, variables, theoretical models and econometric techniques that will be used in the study. The time period of the study is from 1975 to 2010. Keeping in view the nature of the study secondary data shall be relied upon. Different sources for the data shall be approached for instance, government of Pakistan, private sectors and international organizations. In order to convert nominal data into real data financial year 1976 will be used as a base period.

Augmented Dickey Fuller (ADF) test will be used to check the stationarity of the data. It is important because if the ordinary least square (OLS) is applied on a non-stationary time series data, all the results will be counterfeit. Hodrick-Prescott filter method will be used for de-trending the data. The HP filter technique decomposes the given observed series into trend and cyclical components. The applications of the HP filter method allow the researchers to focus only on the short run fluctuations of the time series data. Eviews software will be used as statistical software for the computation of results.

1.6 Limitations of the Study

This study is an empirical assessment of the RER and its role in the monetary policy, output, price level and foreign exchange reserves holdings for a single developing country Pakistan based on time series annual data for the period, 1975-2010. For the estimation of regression models ordinary least squares has been used. Hodrick-Prescott (1981) filter method has used for decomposing the data into cyclical and trend components. Although it is expected that this work will provide some important policy suggestions, yet, due to the complex macro-economic structure and unique experiences of Pakistan economy, it is difficult to generalize the findings of this study for other developed or

developing countries. A cross sectional analysis in this respect might produce some more interesting findings and policy guidance, however, as the objectives of this study cover many issues, hence it is difficult to conduct this work for several countries at the same time. Also data availability, time limitation and resources availability is another major problem. Another interesting study can be to make a long run analysis or a system analysis of the underlining series by using different econometric techniques such as co integration, 2SLS, GMM, VAR etc. However, the application of Hodrick Prescott method to the data restricts us to analyze these issues in the long run. Also a system analysis of these large number of macroeconomic variables is difficult to manage. These issues are left for the future research work.

1.7 Organization of the Study

The study consists of six chapters. Introduction, objectives, hypotheses, significance and limitations of the study have been given in chapter-1. Chapter-2 shows review of the previous theoretical and empirical research work on the RER and its linkages with the monetary policy, output, price level and foreign exchange reserves of Pakistan. In chapter-3, data sources, theoretical frameworks, and econometric techniques have been presented. Chapter-4 is based on the historical review of the trends in the major macroeconomic variables including exchange rate, output growth, inflation, foreign exchange reserves and trade balance of Pakistan.

Chapter-5 shows the regression results derived from all the models. First, regression models have been estimated for examining the role of the domestic and foreign factors in the determination of RER and the influence of the regime switches on the RER. Then for investigating the role of RER in the monetary policy of the State Bank of Pakistan, different results have been computed. For highlighting the role of different exchange rate systems in the monetary policy, a cross systems analysis has also been carried out. Then some results have been derived for testing the contractionary hypothesis of real exchange rate depreciation for Pakistan. The impact of the two regime switches

on the output gap of Pakistan has also been examined. In chapter-5, the impact of the real depreciations on the inflation of Pakistan has been analyzed. In addition, the impact of regime shifts on inflation has also been studied. Finally, result for the impact of real depreciation on foreign exchange reserves holdings in Pakistan have been computed. Moreover, results for the investigation of the role of the regime switches in the determination of foreign exchange reserves have also been constructed.

Finally, Chapter-6 concludes the study and gives policy recommendations and identifies the future research areas.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

This chapter gives a detailed description of the previous theoretical and empirical debates relevant to the objectives of the study. Review of literature is considered as an essential part of any type of research work. It provides guidance to the researcher in finding out the knowledge gap in the relevant field which needs to be explored. It helps the researcher in understanding the important concepts, development of theoretical frameworks and application of empirical techniques. The literature review for this study has been organized in the following manner.

First, a review of the previous studies on the determinants of the real exchange rate has been presented. Then previous work on the role of real exchange rate in the monetary policy has been given. After that, studies on the impact of real exchange rate on output have been discussed. Next the literature on the impact of real exchange rate on inflation has been explained. Finally, previous studies on the relationship between real exchange rate and foreign exchange reserves have been reviewed.

2.2 Studies on the Determinants of Real Exchange Rate

Although, the literature showed a number of studies undertaken for investigating the factorsdetermining the real exchange rate, yet, it is still a debatable issue and there is lack of consensus in the literature over its specific determinants.

Frenkel (1976) analyzed the role of money, prices and future expectations in the determination exchange rate for Germany by using monthly data for the period 1920:M1 to 1923:M11. Supporting his theoretical hypotheses, the main finding of the study was that expectations and monetary policy played a key role in the determination of exchange rate in Germany.

Stockman (1980) provided a theoretical view of the factors affecting the exchange rate of a country. The results showed that a rise and fall in the demand or supply affects the relative prices of goods which bring variations in the exchange rate. The study argued that this simultaneous shift in exchange rate and terms of trade may develop a relationship between the two but it is not possible for the government to explore this relationship for bringing improvement in terms of trade of the country.

Barlow (1986) applied a Vector Auto regression model (VAR) to find out the main causes of the fluctuations in the exchange rate of Canadian and US dollar. The main conclusion of the study was that both real and monetary factors determined the exchange rate of both the countries.

Clarida and Gali (1994) examined the sources of real exchange rate variations in four countries i.e. Germany, Japan, Canada and Britain against US dollar for the post Bretton Woods period by using a three version open economy macroeconomic model. The main results of the study were that monetary and demand shocks played a key role in the real exchange rate of Japan and Germany against the supply shocks. Whereas, for Britain and Canada the role of the monetary factors was minimum as compared to the demand and supply side factors.

Afridi (1995) investigated the factors determining the real exchange rate of Pakistan. The study concluded that excess demand for domestic credit and capital flow showed a negative and significant relationship with the real exchange rate. Whereas, the government expenditure variable turned out positively significant. However, the terms of trade variables remained insignificant.

Amano and Simon (1995) used an Error Correction and Co-integration models to examine the relationship between the exchange rate and terms of trade for Canada & US by using monthly data for the period 1973:M1 to 1992:M2. First, for the non-stationary data the study found a long run relationship between the two.

However, the study mentioned that changes in exchange rate occurred due to change in terms of trade in these countries. The study also analyzed the relationship between the two for a stationary data after applying appropriate econometrics techniques and reached the similar conclusions.

Faruqee (1995) undertook an empirical study for exploring the long run determinants of the US and Japan exchange rate. The study showed that structural forces were the dominant sources for the variations in the exchange rate of both countries.

De Jong (1997) used a target zone model for investigating the role of macroeconomic variables in the determination of exchange rate. The study concluded that in the short run the fluctuations in exchange rate were mostly occurred due to the changes in macroeconomic variables. The study further showed that the type of exchange rate system did not show any influence on the relationship between exchange rate and macroeconomic variables. However, the study recommended that both micro and macro approaches should be jointly applied for the proper understanding of the determinants of exchange rate.

Klein and Nancy (1997) used a logit model by using annual data for the period 1957-1990 to find out the duration of exchange rate systems in 16 Latin American countries. The study concluded that real exchange rate, trade openness, level of international liquidity and political factors played a key role in the determination of exchange rate systems in those countries. The study recommended that although with the adoption of new exchange rate system the chances of devaluation were more in the start of system yet it declined gradually.

Brada (1998) mentioned that as all the countries do not follow the same exchange rate policies hence that is the reason that one type of shocks dominate the other type of shocks in different countries. These views were also supported by Desai (1998) who found that because of the different monetary and fiscal policies, the path of exchange rate is different across the countries.

Liang (1998) concluded that regime shifts do not influence the real exchange rate. In contrast, Kocenda and Valachy (2006) found out that regime shifts are not neutral and the behavior of real exchange rate is different under different regimes i.e. its variability increases under a flexible exchange rate system.

Mucoet *al* (1999) used monthly data from 1992:M10 to 1997:M7 to investigate the determinants of exchange rate in Albania. The study concluded that exchange rate movements in Albania mostly occurred because of the domestic factors. The study suggested that if Albania wants to be less dependent on free market exchange rate system, it should develop its banking sector and interbank system of foreign exchange.

Alexius (2001) used a VAR model to find out the factors causing fluctuations in the exchange rate of four Nordic countries i.e. Denmark, Finland, Norway and Sweden. The study used quarterly data over the period 1960: QI to 1998: QII. The results showed that supply side shocks i.e. productivity shocks played a greater role in the variation of exchange rate in all the countries. However, the study pointed out that the shocks in their exchange rates were temporary not permanent.

Dibooglu and Kutan (2001) investigated the role of nominal and real shocks in the real exchange fluctuations of Hungary and Poland. They found out that real shocks were the main derivers of real exchange rate fluctuations in Hungary. Whereas in Poland, the role of nominal shocks were larger than the real shocks in the determination of real exchange rate. The study suggested that the Central Bank of Poland can manage their nominal exchange rate by following an appropriate exchange rate and monetary policies for the improvement of external competitiveness. Whereas, the government of Hungary was required to focus on the real side of the economy i.e. increasing productivity efficiency etc.

Aleisa and Dibooglu (2002) explored the factors affecting the real exchange rate of Saudi Arabia in the framework of a VAR model by using monthly data for the period 1980:M2 to 2000:M2. The study concluded that oil production

shocks played a dominant role in the determination of the real exchange rate of Saudi Arabia as compared to price shocks. The study suggested that for the stabilizing of its real exchange rate, the monetary authority of Saudi Arabia needs to increase the production of oil.

Hau (2002) applied a theoretical monetary model to explore the various factors determining the exchange rate. It was found out that monetary and aggregate supply shocks were the main determinants of exchange rate fluctuations. However, the study mentioned that the extent of variation brought by these factors in the exchange depends on the degree of the trade openness of a country. For a country with more trade openness, these factors play a little role in the variation of their exchange rate and vice versa. The study also tested this hypothesis empirically by carrying out a cross sectional study for 48 countries and reached to similar conclusions.

Lee and Lin (2003) investigated the sources of real exchange rate fluctuations in the framework of a rational expectations model by using the floating regime periods for four countries namely France, Italy, Canada and Japan. The main findings of the study were that monetary shocks play a dominant role in the variation of real exchange rate of Canada. Whereas in France and Italy, private expenditure shocks and in Japan foreign price shocks play a key role in the determination of their real exchange rates.

Gelbard and Nagayasu (2004) regressed the real exchange rate on the foreign interest rate, oil price and trade balance to examine the main factors caused variations in the real exchange rate of Angola. Using monthly data for the period 1992:M1 to 2002:M1, the study tested two hypotheses including the fluctuations in exchange rate based on purchasing power parity and that the exchange rate of the country followed a random walk. After analysis, the study rejected the first hypothesis and concluded that fluctuations in exchange occurred mainly due to two exogenous factors such as oil price and foreign interest rate. However, the study supported the hypothesis that Angola's exchange rate followed a random walk. The study recommended that as compared to fixed exchange

rate system, a flexible exchange rate system can be more appropriate for the country.

Gelbard and Nagayasu (2004) studied the determinants of real exchange rate in Angola for the period 1992:M1-2002:M1 by using a general exchange rate equation in which q was real exchange rate, r was foreign interest rate, Oil used for oil prices, t was stock of net foreign assets, BBA was basic balance. By using Hansen Modified OLS method, the study concluded that exogenous factors such as oil price and foreign interest rate were the key factors bringing variations in the real exchange rate of Angola. The study further suggested that for Angola flexible exchange rate system was more appropriate as compared to fixed exchange rate system.

Kempa (2005) used a structural exchange rate model to explore the factors bringing variations in exchange rate. The study compared the currency's value of Britain, Germany and Japan with US dollar by using quarterly data for the period 1973: QII to 1998: QIV. It was suggested that as compared to nominal shocks, real shocks such as trade balance deficit, increase in prices of imports were the main causes of fluctuations in exchange rate of these countries. Similarly, Jakab and Kovacs (1999) stated that supply side factors (productivity shocks) are the important determinants of real exchange rate. In contrast, Clarida and Gali(1994) and Rogers (1999) mentioned that real exchange rate ismostly affected by monetary and demand side factors and the role of supply side factors is minimum.

Wang (2005) used a structural VAR model to find out the determinants of the real exchange rate of China by using annual data for the period 1980-2003. The study considered the role of all the macroeconomic shocks namely demand, supply and nominal shocks. The results showed that nominal shocks were the main factors of exchange rate fluctuations in China. However the study suggested that the supply shocks and demand shocks both were alsoresponsible for these variations in the exchange rate of China.

Hsing (2006) investigated the short term exchange rate fluctuations in Poland by using quarterly data for the period 1996: QI to 2004: QI in the framework of an open extended economy model. The study concluded that real exchange is negatively correlated with real money supply, foreign interest rate and expected rate of inflation. Whereas, the government deficit/GDP ratio showed a positive relationship with the real exchange rate. The study also recommended that for the estimation of expected rate of inflation and expected exchange rate, a large sample size and better techniques might give better results in this regard.

Inoue and Hamori (2009) used monthly data over the period 1999:M1 to 2009:M2 for examining the factors affecting the nominal and real exchange of India in the framework of a tri-variate structural VAR model. The main variables included in the model were relative output, nominal exchange rate and real exchange rate. The results showed that real shocks persistently influenced both the nominal and real exchange rate of India. It was suggested that the Central Bank of India should focus on the real side of the economy i.e. technological development, increase in production etc. instead of exchange rate policies for bringing improvement in the external competitiveness. These results was also supported by Morre and Pentecost (2006) who found that real shocks were the main drivers responsible for the fluctuations in both the nominal and real exchange rate of India.

Utami and Inanga (2009) investigated the impact of interest rate differentials on the exchange rate of Indonesia against four industrialist countries namely Japan, Singapore, UK and USA in the framework of an International Fisher Effect approach. The study showed that interest rate differentials had a significant but negative impact on the Indonesian exchange rate against Japan. However, for the other three countries i.e. Singapore, UK and US. The relationship between the interest rate differentials and exchange rate were found to be positive but insignificant.

Rehman*et al* (2010) analyzed the relationship between the inflation, interest rate and exchange rates by using monthly data over the period 1994 to 2009. The

findings of the study showed that inflation positively affected exchange rate whereas, interest rate influence on exchange rate was negative.

2.3 Exchange Rate and Monetary Policy

The literature showed a large number of empirical investigations carried out for analyzing the conduct of the monetary policy both in the developed and developing countries. However, as the conduct of monetary policies is different across the countries because of their macro-economic structures, hence previous studies on whether central banks respond to real exchange rate in its monetary policies reached to different conclusions.

Taylor (1999b) found out that in market economies, the central banks react to exchange rate movements. He further mentioned that the inclusion of exchange rate in the monetary policy produces better results and brings stability in the economy. Batini*t al* (2001) and Thomas and Schorfheide (2007) used Taylor Rule for investigating the response of macroeconomic variables to interest rate, pointed out that inclusion of exchange rate increase the success probability of monetary policy. Chang (2000) also explicitly investigated the link between monetary policy and exchange rate and reached to similar conclusion. These views are also supported by Setlhare (2002), Thomas and Schorfheide (2007) and Parsley and Popper (2009).

Svensson (2000) mentioned that in an open economy, real exchange rate provides both direct and indirect additional transformation channels to monetary policy. This view was empirically supported by Eichengreen (2004) who suggested that exchange rate provides additional transformation channels for the conduct of monetary policy in Korea and any reaction of the Central Bank of Korea to exchange rate movements would produce optimal results.

Taylor (2001) showed the indirect effect of exchange rate on the interest rate under the monetary policy regimes of flexible exchange rate, monetary policy rule and inflation targeting. He further mentioned that this indirect

channel exists even in the absence of direct channels and it keeps the interest rate more stable. He suggested that as exchange rate influences terms of trade and flows of exports and imports, hence for the clear understanding and generalization of this indirect effect of exchange rate, broad level studies are required. Dennis (2003) for Australian economy found out that reaction towards the exchange rate increases the success probability of monetary policy. In contrast, Leitmo and Soderstrom(2005) found no support for the benefits with the inclusion of real exchange rate in a monetary policy rule.

Klau and Mohanty (2004) mentioned that central banks in emerging economies respond consistently to exchange rate in their monetary policy mandate.

Shambaugh (2004) mentioned that exchange rate provides additional aggregate demand and supply transmission channels for the conduct of monetary policy in an economy. On the one side, a change in it affects the relative prices of domestic and foreign goods which, in turn, influence domestic and foreign demand for domestic goods and, hence, contribute to the aggregate demand channel of monetary policy. Also, directly depreciation affects the domestic currency prices of imported goods which raise domestic inflation. Indirectly, exchange rate by affecting the prices of imported inputs influence the nominal wages which, in turn, affect the cost of production and leads to domestic inflation.

Bask (2006) used a three version Taylor rule for a small open economy to find out whether the central banks need to respond to exchange rate in their monetary policy mandate or not. The study showed mixed results. It was concluded that if the exchange rate include contemporaneously in the model, the central bank reacts to it. However, it did not respond to exchange rate movements when it was included in lag form.

Lubik and Schorfheide (2007) used quarterly data covering the period 1981:Q1 to 2002:Q4 to find out whether the Central Banks of Australia, Canada, New Zealand and UK target exchange rate in addition to output and inflation

movements by following a Taylor rule based monetary policies. The main results of the study were that the Central Banks of Canada and England responded whereas the Central Banks of Australia and New Zealand did not respond to exchange rate fluctuations. It was also mentioned that the role of terms of trade was almost negligible. However, it was suggested that the inclusion of some additional variables including capital accumulation, asset markets and different product sectors might increase the role of terms of trade fluctuations in the monetary policy.

Benigno and Benigno (2008) used a two country optimizing agent open economy model for the determination of exchange rate under different interest rate rules i.e. Taylor rules of monetary policy. They stated that exchange rate volatility depends on the monetary policy regimes carried out by the monetary authorities. Although the study suggested that there was no need to react to exchange rate fluctuations explicitly, yet, it was mentioned that the extension of the Taylor rule to an open economy framework where movements in the exchange rate and terms of trade should also be taken into account provides new insights to the monetary policy rules and exchange rate system, benefits from monetary policy, optimizing the response to foreign shocks etc. It was also mentioned that the monetary authorities need to be more aggressive towards the domestic inflation under the clean float regimes against the fixed regimes.

Chami*et al* (2008) carried out an empirical study for analyzing whether an interest rate rule based monetary policy works in Yemen or not? The results showed that keeping a floating exchange rate system, the Central Bank of Yemen (CBY) is required to follow a rule based monetary policy with a clear focus on inflation in addition to exchange rate. On the basis of the results, it was recommended that the CBY should revise its monetary policy stance by adopting a more formal framework for the achievement of its objectives. It was also suggested that following a floating exchange rate path could also be helpful in controlling inflation and instabilities in exchange rate.

2.4 Studies on Real Exchange Rate and Output

The literature provides rich debates of individual countries and cross countries studies on the relationship between the real exchange rate and output level with the application of different econometric techniques. However, in spite of these substantial number of theoretical and empirical studies conducted both for the developed and developing countries, the question whether real exchange rate devaluations put expansionary or contractionary effects on output is still not conclusive.

Alexander (1952) theoretically explained the impact of devaluation on output. The study used both the elasticities and absorption approaches to identify the various demand and supply channels through which devaluation affects the trade balance of a country. The results showed that devaluation put positive impact on trade balance through both import and export side channels which ultimately result in the expansion of output in an economy.

Alejandro (1963) examined that devaluation through its redistribution effect brings reduction in the level of output in an economy. He supposed that if there are two groups in a society, the wage earner group and profit earner group the marginal propensity to save will be greater in the profit earner group as compared to the wage earner group. So when devaluation occurs it will raise the prices of goods in export and import competing industries. This increase in prices will raise the income of profit earner group and reduce the real wages of wage earner group. Hence, as the marginal propensity to save is greater in profit earner group, there savings will increase which reduce the level of output. Alejandro (1965) also checked the empirical validity of his theoretical hypothesis for Argentina and reached to similar conclusions.

Dornbusch (1973) mentioned that the effects of devaluation are negligible and its effects occur through various channels in an economy. He developed a theoretical monetary model and concluded that devaluation is a monetary phenomenon and when it occurs, it reduces the real value of money in a

country.Hence, when there is a fall in the real value of money, the people reduce their expenditures on domestic goods because of the reduction in their real balances which leads to the reduction of output.

Gylfason and Schmid (1983) utilized a simultaneous model to explore the effects of exchange rate fluctuations on economic growth in 10 developing countries namely United States, Germany, United Kingdom, Japan, Philippines, Brazil, Canada, India, Turkey and Pakistan by using yearly data over the period 1957 to 1978. The study concluded that on a supply side devaluation effects the output growth through imported inputs costs channels whereas, on demand side through imports, exports and expenditures channels. The study, however, pointed out that the demand side effects dominated the supply side effects in these economies.

Andres (1986) explored the impact of devaluation on output, employment and trade balance in Chile. In the framework of a simple macro model, the study mentioned that the impact of devaluation in Chile depended on the behavior of the price elasticties of demand for imports and exports, the composition of costs in export and import competing industries and the behavior of nominal wages. The study concluded that in short and medium run the effects of devaluation on all the three variables were contractionary and the Marshall-Lerner condition did not hold for Chile. The study suggested that expansionary fiscal policies could help in removing these contractionary effects of devaluation in Chile.

Edwards (1986) used a reduced form equation to examine the impact of exchange rate fluctuations on output growth for 12 developing countries by using annual data for the period 1965-1980. The names of countries were India, SouthAfrica, Malaysia, Sri Lanka, Philippines, Yugoslavia, Israel, Colombia, Brazil, Thailand, El Salvador and Greece. The study concluded that in short run devaluation decreased the real output, however in the long run the impact of devaluation on output was neutral.

Lizondo and Montiel (1989) theoretically examined the relationship between the devaluation and real output for the developing countries in an analytical framework. The study concluded that it is difficult to decide whether devaluation put contractionary or expansionary effects on output in developing countries.

Chadha (1990), in an open economy model, examined the relationship between the real exchange rate, output and price level. The results found a fixed price level under which the variation in output decreased if the price level remained sticky. The study further explained that the stickiness of price disturbs the direct relationship between exchange rate and outputlevel. If the prices are sticky and devaluation occurs, it will first decrease the output level and then increase.

Morely (1992) studied the impact of devaluation on output growth for 28 developingcountries during the period 1974 to 1983. The main variables of the study were real exchange rate, balance of trade, terms of trade and GDP.The study showed that there was a significant negative impact of devaluation on real output in all countries.It was further mentioned that these contractionary effects of devaluation on real output was not because of the increase in saving but due to decline in investment. However, the study suggested that to get advantage from devaluation, these countries should focus on external factors such as terms of trade and the capacity to import instead of monetary and fiscal policies which play a minor role in this regard.

Domac (1997) tested the contractionary hypothesis of devaluation in Turkey by using yearly data over the period 1960-1990. The study analyzed the effects of devaluation on output growth through anticipated and unanticipated devaluation. The empirical model of the study was consisted of real GNP growth rate, real exchange rate, real energy prices, interest rate, money supply and real government spending. The results showed that unanticipateddevaluation increased the level of output in Turkey. In contrast, anticipated devaluation put contractionary effects on the growth rate of output. It was suggested that devaluation in Turkey could be effective if the

authorities managed its monetary and fiscal policies tactfully.

Upadhyaya and Upadhyay (1999) investigated the impact of currency depreciation on aggregate output in the long run for six countries i.e. Pakistan, India, Sri Lanka, Thailand, Malaysia, and Philippines. Utilizing annual data for the period 1963-1993, the study found out that devaluation was contractionary in Pakistan and Thailand whereas, in all the other countries devaluation showed no impact on output. However, the study suggested that to get a clear picture of the relationship between the exchange rate and output, the number of countries should be increased.

Kamin and Rogers (2000) examined the relationship between real exchange rate and output in Mexico by using quarterly data over the period 1980: QI to 1996: QII. Using a VAR model, the study found that real devaluation brought reduction in economic activity and raised inflation in Mexico even the sources of spurious correlation and reverse causation werecontrolled. However, it was suggested by the study that for a country like Mexico, it should be less risky to adopt a devaluation policy for bringing the exchange rate to its equilibrium position.

Yeyati and Federico (2003) used annual data during the period 1974 to 2000 for a sample of 183 countries to examine the impact of exchange rate systems on output level. The results of the study showed that exchange rate systems played a key role in the economic performance of developing countries. Whereas the shift in exchange rate systems did not influence the output level in industrial countries. The study suggested that for developing countries flexible exchange rate system was more appropriate as compared to fixed exchange rate system.

Bjornland (2004) used quarterly data from 1972: QI to1994: QIV to find out the relationship between exchange rate and business cycle in a small open economy Norway. The main objectives of the study were to examine the impact of exchange rate fluctuation on output of Norway. The results derived from the VAR model including the macroeconomic variables such as, real

exchange rate, unemployment rate, GDP and the real wage showed that there was little impact of exchange rate fluctuations on output level of Norway. The study recommended that for Norway, a free and independent exchange rate system was beneficial.

Dritsaki and Adamopoulos(2005) examined the interrelationship among the key macro-economic variables i.e. money supply, exchange rate, price level, interest rate, and gross domestic product for the European Union countries. The study used Johansen Co-integration and Granger Causality tests for the analysis. The time period of the study was form 1970: QI to 2000: QIV by using quarterly data. The study showed a long run relationship among the variables. The study further stated that changes in money supply occurred due to variations in exchange rates and interest rates, where output was also determined by price level, exchange rate and interest rates. Finally, the study found that interest rates brought changes in price level and changes in price level brought by exchange rate.

Ahmed*et al* (2006) utilized a Structural VAR model to explore the sources of economic fluctuations in Pakistan by annual data for the fiscal period 1976-1977 to 2004- 2005. It was found that external shocks (remittances, foreign output, and terms of trade) have a reasonable impact on domestic output, inflation and exchange rate. Moreover, exchange rate depreciation shocks decreased output and increased inflation where their results for thechoice of exchange rate are mixed.

Choudhary and Chaudhary (2007) examined the impact of the nominal effective exchange rate on output and inflation for Pakistan in the framework of a VAR model by using quarterly data over the period 1975-QI-1985-QIV. Their main findings were that devaluation declined output and increased the price level in Pakistan.

Kandil*et al* (2007) analyzed the impact of exchange rate variations on the economic performance of Turkey by using annual data for the period 1980 to

2004 in the framework of a Theoretical Rational Expectation Model. The study decomposed fluctuation in the exchange rate into anticipated and unanticipated components. It was found out that anticipated appreciation reduced real output growth, demand for domestic investments and exports, and increases the level of inflation. Whereas, unanticipated exchange rate shocks were due to its asymmetric effects increased export but decreased output, consumption and investment. The study recommended that only adjustment in the domestic policies could help Turkey in the reduction of reduction of exchange rate volatility.

Bahmani-Oskooee and Kutan (2008) conducted a study for analyzing the contractionary effects of devaluation on real output in the emerging countries of Eastern Europe namely Belarus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Russia and Slovak Republic. He regressed GDP on money supply, government expenditures and real exchange rate by using quarterly data varied within the range of 1993:QI to 2006:QII. By using bound testing approach the results showed that in the short run depreciation increased the real output in Belarus, Latvia, Poland and Slovak Republic and decreased the real output in Czech, Estonia and Russia. However, the study did not find any long run relationship between depreciation and real output growth for any country. The study suggested that Eastern European countries should properly manage their fiscal and monetary policies for increasing output.

De Silva and Zhu (2008) used VAR and ECM models to investigate the impact of exchange rate movements on trade balance and output in Sri Lanka. GDP, trade balance, inflation, exchange rate and FDI were the main variables of the study. By using quarterly data for the period 1977: QII to1998: QII, the study concluded that devaluation improved trade balance of Sri Lanka but with no impact on real output. It was recommended that Sri Lanka should increase the productivity of labor to bring improvement in level of output and should maintain its present competitive advantage on other countries.

El-Ramly and Abdel-Haleim (2008) used a Vector Auto-regression model to examine the influence of devaluation on output in Egypt by using annual data for

the period 1982 to 2004. The study used real effective exchange rate, fiscal deficit as a percentage of GDP, broad money growth rate and real output. It was concluded that variations in output growth strongly affected by the changes in real exchange rate. The study also concluded that in the short run devaluation decreased output but in the long run it increased output. The study suggested that government intervention was required for making the exchange rate stable.

Kalyoncu*et al* (2008) studied the role of devaluation in determination of output level in 23 OECD countries by using quarterly data for the period varied within range of 1980:QI to 2005:QIV. The results of the study were mixed and country specific. It was concluded that in 9 out of 23 countries, exchange influenced and brought changes in the level of output. However, the study mentioned that in 6 countries, a devaluation reduced the output growth and in 3 countries, it increased the output.

Kalyoncu*et al* (2009) used quarterly data from 1979:QI-2005:QIV, 1981:QI-2005:QIV, 1991:QI-2005:QIV and 1993:QI-2005:QIV for four Latin American countries i.e. Peru, Mexico, Brazil and Argentina respectively to study the short and long run relationship between devaluation and trade balance by using Johenson co-integration test and impulse response function. The results of the study concluded that depreciation worsened the trade balance in Argentina and Peru while, in the long run, it improved the trade balance of these countries. The results further explained that in Brazil and Mexico there was no long run relationship in depreciation and trade balance. The study recommended that the J-curve effects occurred only in Argentina and Peru.

2.5 Studies on Real Exchange Rate and Inflation

A string of literature exists on the forces that affect inflation. However, the empirical results are mixed and still seem to be in the data. Some studies

have analyzed inflation in a monetarist framework whereas others have used a structuralist approach for its modeling.

Dornbusch (1987), theoretically, explained the relationship between exchange rate and prices for an open economy by applying various approaches including purchasing power parity model based on the law of one price, Keynesian model based on the assumption that each country is fully specialized in its home production, Cournet Model based on oligopolistic market and the Dixit-Stiglitz Model based on a utility maximization function of consumers.

The study assumed that in the short run the changes in output and profitability due to changes in exchange rate do not influence the wage rate in industries. However, the study mentioned that in the long run because of appreciation of currency when the output and profit of firms affected due to loss in competitiveness the wage rate fall which ultimately decreases the price level. The study recommended that a micro level study is also required to study this phenomenon in more detail.

Hossain (1989) investigated the causes of acceleration in inflation in South Asian countries namely India, Sri Lanka, Bangladesh, Nepal and Pakistan. The main purpose of the study was to find out whether monetarist or Neo-Keynesian views explained the acceleration of inflation in these countries. The study used different annual data for each country varying within the range of 1961 to 1988. Contrary to the Keynesian view, the study supported the monetarist view and concluded that changes in the real money balances of the people in these countries had a significant impact on the acceleration of inflation. The study further mentioned that changes in bond-financed government expenditures did not have any positive effect on inflation in these countries except Bangladesh.

Parsley and Helen (1998) used quarterly data from 1975 to 1992 to show the impact of changes in US exchange rate on prices. For regression analysis, the study used Error Correction and Vector Auto-regression models taking

exchange rate, CPI, M2 and GDP as main variables. The study found that prices of non-durable goods and some services responded to changes in exchange rate. When the role of monetary policy was considered, the relationship between these variables became more observable.

Odusola and Akinlo (2001) examined the relationship among devaluation, output and inflation in Nigeria by using quarterly data for the period 1970: QI to 1995: QIV. The study used a restricted vector autoregressive (VAR) model where real Gross Domestic Product, money supply (M2), official exchange rate, parallel exchange rate, prices (consumer price index and lending rates) were the main variables of the study. The results showed thatdevaluation of Naira influenced both output and inflation in Nigeria. It increased the level of output both in the medium and long run and decreased it in the short run. The study also found that devaluation was inflationary in Nigeria. It was recommended that the Central Bank of Nigeria should give autonomy in some policy instruments to make the monetary policy effective for controlling inflation and to raise the level of output. Moreover, adoption of flexible exchange rate system could only be beneficial if the government provides confidence and support to the people.

Berument and Pasaogullari (2003) analyzed the role of real exchange rate in the determination of output level and inflation in Turkey by quarterly data for the period 1987: QI to 2001:QIII. The study modeled real exchange rate, money supply (M1), gross domestic product and whole sale price index in a VAR model. It was found that real exchange rate depreciations had a negative relationship with output and a positive relationship with inflation. The study suggested that the authorities should control overvaluation of currency to avoid the unfavorable effects of devaluation on output and price level in Turkey.

Kandil and Mirzaie (2003) studied the effects of exchange rate fluctuations on real output and price level in 33 developing countries by using annual data for the period 1971 to 2000. The movements in exchange rate were decomposed into anticipated and unanticipated components. The variables of the model were exchange rate, GDP, Inflation, government spending and money supply.

The study showed that the effect of anticipated exchange rate depreciation on output and inflation was small as compared to unanticipated exchange rate fluctuations in all the developing countries. The study recommended that to reduce the fluctuations in exchange rate, to avoid the speculative attacks and increase money demand, the monetary policy should be managed properly in all these countries.

Lu and Zhang (2003) analyzed the impact of exchange rate fluctuations on price level in China by using quarterly data for the period 1986: QI to 1993: QIV. The main variables of the study were price level, money supply, a measure of sectorial disequilibria and effective exchange rate. Using a VAR model, the results showed a long run relationship between exchange rate and price level in China. It was further added that Chinese exchange rate policies, both in short and long run, were inflationary. The study recommended that a well-designed monetary policy for controlling the inflationary consequences of devaluation was required.

Arize*et al* (2004) analyzed the relationship between exchange rate and inflation by using a quarterly data from 1973: QII to 1998: QI for 82 countries. The main purpose of the study was to test the hypothesis that changes in nominal exchange rate play a significant role in the variation of inflation. The empirical results obtained supported the hypothesis of the study. Two alternative approaches i.e. recursive and rolling measures were also used by the study to find out the robustness of the relationship between the two variables. The results showed the same results for both variables. The study concluded that the authorities in these countries should consider the implications of exchange rate variability by making strategies for controlling the inflation.

Hyder and Shah (2004) studied the impact of exchange rate fluctuations on prices in Pakistan. The study modeled exchange rate, consumer price index, Whole Sale price index, industrial output, money supply and oil prices in a Recursive VAR model by using monthly data for the period 1988:M1-2003:M9. The study concluded that exchange fluctuations affect both consumer prices and Whole

Sale prices in Pakistan. However, it was mentioned that the pass through effects of exchange was stronger on Whole Sale prices against consumer prices and high during the periods of high inflation as compared to low inflation periods. It was further mentioned that the exchange rate pass-through effect on consumer prices was stronger under managed float exchange rate system in comparison to flexible exchange rate system. It was suggested that these results, showing the importance of a free monetary policy under inflation, targeted exchange rate system for Pakistan.

Barlow (2005) used monthly data for the period 1991:M6 to 2002:M2 to explore the relationship between exchange rate and inflation in Hungary. The study divided the whole period into two periods before and after March 1995. The results showed that in the first period depreciation of currency was inflationary because of which real exchange rate also showed downward trend. However, during the second period after the adoption of crawling pig exchange rate system the depreciation of currency become more sensitive to real exchange rate as compared to inflation. The study recommended that for targeting inflation the central bank should change its policy methods.

Hossian (2005) used Granger Causality test for studying the interrelationship between currency devaluation, money supply, inflation and output growth in Indonesia. The study tested three hypotheses i.e. inflation is caused by increase in money supply, devaluation of currency causes inflation and inflation influence output growth. In the short run, the study found that there was an inter-relationship between rise in money supply and inflation and devaluation of currency and inflation. In the long run, the study also found a causal relationship between money supply and inflation. However, the study mentioned that the impact of inflation on money supply growth was stronger than the impact of money supply growth on inflation. The study further added that in the short run the causal relationship between currency devaluation and inflation was weak. About the relationship between inflation and output growth, the study did not find any causal relationship between the two in the

short run.

Broda (2006) used annual data from 1980 to 1998 to investigate the relationship between exchange rate systems and price levels for more than 100 countries. The study concluded that for developing countries, with fixed exchange rate system, the inflation rate was 20 percent higher in comparison to those countries which had flexible exchange rate systems. The study also found the same but a comparatively weaker relationship for industrial countries.

Volkan*et al* (2007) stated that exchange rate oscillations pass on to the domestic prices through aggregate demand and supply side channels. On the supply side, fluctuations in the exchange rate affect imported goods prices either consume or enter the production chain through both direct and indirect channels. On the one side, a depreciation/devaluation of the domestic currency exchange rate directly results in the higher imported goods prices. Indirectly, the potentially higher cost of imported inputs associated with exchange rate depreciation increases marginal cost of production and indirectly leads to higher prices of domestically produced goods. Similarly, on the demand side, a rise in the foreign demand for domestic country exports may bid up the price level and cause inflation. These views are also supported by Barhoumi 2006; Lim and Papi, 1997; Liu and Tsang, 2008).

Omotor (2008) empirically analyzed the role of exchange rate in price distortion in Nigeria by using annual data for the period 1970-2003. The study used price level, money supply, real GDP and exchange rate. Both Vector Error Correction (VEC) and Slope-dummy methodology were adopted for the economic and statistical importance of exchange rate variation made by government in determination of inflation. The impulse response function showed that depreciation of naira raised inflation and reduced output level. The error variance decomposition concluded that changes in both exchange rate and money supply stronglyinfluenced inflation in Nigeria. The slope-dummy results also verified the above results.

Overall, the results showed that in Nigeria exchange rate variability played an important role in the determination of inflation rate in the country. The study suggested that a strong monetary policy for controlling exchange rate and money supply was needed to control inflation in Nigeria. The study also suggested that for the fulfillment of growing demand of food, the domestic output expansion particularly in the agriculture sector was required in Nigeria.

2.6 Studies on the Real Exchange Rate and Foreign Exchange Reserves

A number of theoretical and empirical studies can be found in the literature undertaken for the analysis of foreign exchange reserves demand. However, no common view existed on the modeling of foreign exchange reserves. Some studies mentioned that foreign exchange reserves holdings in both the developed and developing countries are the result of their precautionary measures, however, others supported the mercantilist view.

Archibald and Richmond (1971) concluded that exchange rate systems affect the foreign exchange reserves holdings and its demand increases under the fixed regime as it works as a buffer stock for keeping exchange rates fixed. On the other hand, Frenkel (1983) pointed out that although theoretically it is believed that under the floating regime, the monetary authorities decrease the demand for reserves because they are no more bound to maintain the peg, however, in recent years the experience of a number of countries show that their reserves assets increased substantially even after their official announcements of keeping the flexible exchange rate system. This is also supported by the studies of Mishra and Sharma (2011), Wijnholds and Kapteyn (2001) and Sula (2011).

Hipple (1974) stated that countries, carrying a floating exchange rate system, required less stock of foreign exchange reserves. This view was also supported by Edwards (2003) who conducted a study for 23 developing countries and concluded that countries maintaining a fixed exchange rate system required more foreign exchange reserves as compared to countries following a floating regimes.

Dooley, *et al* (2003) mentioned that foreign exchange reserves accumulation in the Asian economies is the by-product of their exports and foreign direct investment promotion policies by following undervalued exchange rate policies. Similarly, Aizenman and Lee (2007) also examined the importance of the precautionary and mercantilist approaches for the developing countries. They concluded that both mercantilist and precautionary motives played role in the reserves accumulation of these countries. Aizenman, *et al* (2007) further supported these views by examining the foreign exchange reserves demand in Korea. They found out that reserves accumulation in Korea is the by-product of their export promotion policies through undervalued exchange rate.

Khan and Ahmed (2005) who used quarterly data over the period 1981-QI to 2003-QII to investigate the short and long run determinants of the foreign exchange reserves in the framework of a Co-integration framework by keeping the variation in balance of payments, money market rate, the average propensity to import, the level of imports and workers' remittances, a short run variable monetary disequilibrium and dummy variables for capturing the influence of the events of September 11 (2001), the military take over and the autonomy of the State Bank of Pakistan, 1997 Act in their model. They found a positive impact of the variation in the balance of payments and the imports and negative effect of the opportunity cost and remittances on the foreign exchange reserves demand in Pakistan. Their dummy variable representing the autonomy of the State Bank of Pakistan also showed significantly positive relationship with the FER. However, one major drawback of their study is that despite the fact exchange related policies are of great concern specifically for the Asian economies as highlighted by a number of studies, they did not consider exchange rate in their model. The second weakness of the study is that they examined the determinants of the foreign exchange reserves both for the short and long term period but interestingly by using the quarterly data.

Gosselin and Parent (2005) concluded that foreign exchange reserves holdings in the eight Asian emerging economies namely China, India, Indonesia, Korea,

Heller and Khan (1978) results for the non-oil producing countries showed that movement from fixed to floating exchange rate system did not show any relationship with the reserves holdings in these countries.

Frenkel (1984) mentioned that reserves structure in the developed countries is different as compared to developing countries.

Bahmani-Oskooee and Niroomand (1988) conducted a study for examining the role of real effective exchange rate in the movements of foreign exchange reserves. The study concluded that real depreciations had historically showed a positive relationship with the reserves demand of these countries.

IMF (2001) investigated the determinants of foreign exchange reserves in a panel of 122 emerging economies by using annual data over the period 1980 to 1996. It was concluded that GDP per capita, imports ratio to GDP, population level and exchange rate volatility were the main determinants of reserves holdings in almost all the countries. On the other hand, Aizenman and Lee (2005) for China found out that as compared to mercantilist motives, precautionary motives play a greater role in the determination of foreign exchange reserves holdings in China.

Wijnholds and Kapteyn(2001) mentioned that demand for foreign exchange reserves depends on the type of exchange rate system. With the change in exchange rate system, demand for foreign exchange reserves also change.

Flood and Marion (2002) mentioned that reserves holdings in the emerging economies are better explained by the inventory model.

Aizenman and Marion (2003) conducted a study for analyzing the causes of high demands for a panel of 125 developing countries by using annual data over the period 1980 to 1996. It was found that the size of international transactions, exchange rate and political instability were the main determinants of reserves holdings in almost all the countries.

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Prabheeshet *al* (2007) applied a Co-integration and Error Correction Approaches for investigating the determinants of foreign exchange reserves in India by using quarterly data over the period 1983:Q1 to 2005:Q1. They included real reserves, population, real GDP per capita, ratio of imports to GDP, ratio of real trade to GDP and ratio of current account deficit to GDP, ratio of real capital account to GDP, ratio of short-term debt to GDP, ratio of real money supply to GDP, standard deviation of exchange rate and interest rate differential in their model. They found out that reserves demand in India was determined by ratio imports to GDP, ratio of broad money to GDP, exchange rate flexibility and interest rate differential in the long run. They suggested that RBI needs to manage their foreign exchange reserves accumulation. Another study for India was carried out by Prasad and Raju (2010) who applied Engle-Granger and Johansen Co-integration tests using quarterly data during the period 1996:QI to 2009:QI. They found out that ratio of imports to GDP, a measure of openness and exports turned out to be the main determinants of foreign exchange reserves holdings in India.

Ra (2007) conducted a full sample and sub-sample analysis for examining the determinants of foreign reserves demand in Korea. The full sample period were based on monthly data covering the period 1973:M5 to 2005:M12. Whereas, the sub-sample periods were consisted of pre and post crisis periods i.e.1990:M1 to 1997:M11 and 1998:M3 to 2005:M12 divided on the basis of 1997 Asian financial crisis. The Co-integration results showed that overall reserve demand in Korea was more sensitive to trade openness as compared to opportunity cost of capital after the 1997 crisis. However, the sub-sample results showed a mixed results in this regard. The study suggested that the government of Korea needs to focus more on the external shocks as compared to internal shocks.

Jalil and Bokhari (2008) investigated the optimal demand for foreign exchange reserves in Pakistan by using monthly data during the period 1995:M6 to 005:M6. The study concluded that opportunity cost of capital played a greater role as compared to reserve volatility in the reserves holdings of Pakistan. The results

also showed that the structural shift representing the reforms of SBP, the stock of reserves in Pakistan has also increased substantially.

Choudhry and Hasan (2008) studied the demand for foreign exchange reserves under fixed and floating exchange rate regimes for three developing countries namely Mexico, Kenya and Philippines by using quarterly data over the period 1986:QI-2000:QIV. It was estimated that average propensity to import variability of reserves and volume of imports were the main determinants of foreign exchange reserves in these countries for the full sample period. However, the sub-sample results of the study showed that the behavior of foreign exchange reserves remained the same under both the regimes periods.

Eliza *et al* (2008) applied an ARDL bounds testing approach for investigating the factors affecting foreign exchange reserves demand in ASEAN economies including Indonesia, Malaysia, the Philippines, Singapore and Thailand. The results of the study showed that GDP per capita, average propensity to import, export volatility, the ratio of current account to GDP and the ratio of external debt to GDP were having a long run relationship with foreign exchange reserves holdings in all the countries.

Kasman and Duygu (2008) studied the relationship between exchange rate and foreign exchange reserves in Turkey by using monthly data for the period 1982:M1 to 2005:M11. Using Unit root and Co-integration tests, the study concluded that there was a relationship between exchange rate and foreign exchange reserves. The study further mentioned that for real effective exchange rate, the causality runs only for foreign exchange reserves both in short and long run. However, about the relationship of nominal exchange rate and foreign exchange reserves, the study concluded that in the long run nominal exchange rate affected foreign exchange reserves. In the flexible exchange rate system, foreign exchange reserves holdings become low. The study suggested that to avoid any possibility of financial crisis in future foreign exchange reserves could be used an important tool to reduce the negative effects of exchange rate volatility.

Sehgal and Sharma (2008) used quarterly data over the period 1990:QII to 2006:QI for investigating the role of precautionary, mercantilist, transactions and sensitive factors namely, average propensity to import ratio to GDP, GDP, external debt ratio to GDP, portfolio investment ratio to GDP, opportunity cost of capital and export growth in the determination of foreign exchange reserves in India. Econometric techniques i.e. ADF, VEC and Johansen maximum likelihood Co-integration have been applied for the analysis of the data. The main conclusion of the study was that both mercantile and precautionary factors affected foreign exchange reserves holdings in India. However, the study suggested that as the reserves stock in India was high the RBI should not increase its limit above the threshold limit.

Ahmad and Pentecost (2009) undertaken a threshold Co-integration analysis for examining the long run relationship between exchange rate and foreign exchange reserves in some African countries by using quarterly data over the period 1980:QI to 2004:QIV. It was concluded that a long run relationship existed between the exchange rate and foreign exchange reserves in almost all the countries. It was also found out that foreign exchange reserves holdings in these countries were higher under the floating regime as compared to peg regime period.

Prabheesh*et al* (2009) used monthly data for the period 1993 to 2007 for examining the role of mercantilist and precautionary measures in the foreign exchange reserves demand of India. They included imports, foreign institutional investment, opportunity cost measure and real exchange rate as possible determinants. The Co-integration results showed a long run relationship between the foreign exchange reserves and its factors when the real exchange rate is used as a proxy for the mercantilist motive. It was also found that all the variables play a significant role in the holdings of foreign exchange reserves in India. However, the measures of the mercantilist approach were found to be more significant comparatively.

Wei (2010) results over the period 1978 to 2007 showed that economic

scale, the gap between savings and investment, dependence on foreign trade, GDP and exchange rate were the main factors affected the foreign exchange reserves holdings in China.

Jo (2011) examined the determinants of foreign exchange reserves hoarding in Korea in the framework of a mercantilist approach. The study found out that increase in the reserves stock of Korea, both in the short and long run, was the by-product of export competitiveness concern of the country.

2.7 Summary

The overall literature provides inconclusive results regarding the determinants of real exchange rate, its role in the monetary policy and its relationship with the output, inflation and foreign exchange reserves. Also due to different sample sizes, econometric techniques and economic structure these results cannot be generalized to other countries. Studies regarding the determinant of real exchange rate showed that so far no study has been undertaken for both the developed and developing economies to examine the role of external factors in the real exchange rate determination. Covering this gap the impact of the foreign factors on the real exchange rate of Pakistan has been examined in this study.

Another finding from the literature is the lack of studies in Pakistan for examining whether State Bank of Pakistan reacts to real exchange rate or not. For this purpose a full and sub sample analysis divided on the basis of the three exchange rate systems has been undertaken. Also the third addition of the study to the literature is the examination of the contractionrayhypothesis of real depreciations in an IS curve framework. The literature showed that this type of study is clearly lacking for all the countries and specifically for Pakistan.

The fourth addition of the study to the literature is the analysis of the interaction between the real exchange rate and inflation in the context of an open economy Phillips curve framework. Fifth, previous studies for Pakistan focused only on the precautionary factors in the determination of foreign exchange reserves

demand in Pakistan. This study adds to the literature by examining the role of the mercantile factors i.e. real exchange in the foreign exchange reserves holdings in Pakistan.

Finally, it is evident from the literature that no comprehensive study has been carried out before to examine the determinants of real exchange rate and its relationship with the monetary policy and macroeconomic aggregates. Hence this study is an effort to fill the gap.

CHAPTER 3
DATA AND METHODOLOGY

3.1 Introduction

This chapter presents information about the data sources, variables, theoretical models and econometric techniques used in the study. First section 3.2 shows the sources of data variables definitions and methods used for the data transformation. After that section 3.3 presents the different theoretical models used for building the relationships between the dependent and independent variables. The section has been divided into several sub-sections on the basis of the objectives of the study. First, section 3.3.1 shows the models used for the real exchange rate. Then in section 3.3.2 models for the monetary policy rules has been given. Likewise, section 3.3.3 presents the models for the output. Similarly, in section 3.3.4 models for inflation has been presented. Whereas, models for the foreign exchange reserves of Pakistan has been given in section 3.3.5.

Finally, section 3.4 gives information about the analytical tools used for the derivation of the empirical results of the study. The details are given as follows.

3.2Data Sources and Variables Definitions

3.2.1 Sources of Data

The time period of the study is from 1975 to 2010. This period also consist of the three exchange rate systems followed by the SBP since independence i.e. fixed exchange rate system from 1947 to 7th January 1982, managed float from 8th January 1982 to 19th May 1999 and full float exchange rate system from 19th May 1999 onwards. However as in this study annual data will be used hence these three exchange rate systems periods have been restricted to cover only the study period i.e. fixed (1973-1981), managed (1982-1999) and flexible (2000-2008) by keeping 1982 and 2000 as a regime shifts periods. For the transformation of the nominal data into real form "1976" has been used as a base period. All the data have been collected from different sources namely:

- International Financial Statistics (IFS) various issues.
- Economic Survey of Pakistan (ESP) Finance Division various issues.

- A Handbook of Statistics of State Bank of Pakistan 2005 and various annual reports.
- World Development Indicators (WDI) data.
- Federal Bureau of Statistics (FBS) various years data.

3.2.2 Variables Definitions

The variables and proxies used in this study are given in table 3.1, which are as follows:

Table. 3.1 Variables and Proxies

VARIABLES	DEFINITIONS	PROXIES
	Domestic Variables	
Exchange Rate	Exchange rate of Pakistan rupee against US dollar	q^g_{tpk}
Interest Rate	Average annual money call rate of Pakistan	i^g_{tpk}
GDP	Gross Domestic Product of Pakistan in millions of rupees	y^g_{tpk}
Inflation Rate	Average annual percentage change in CPI of Pakistan	π^g_{tpk}
FER	Foreign Exchange Reserves in millions of Pak rupees	fer^g_{tpk}
Money Supply	Money supply (M2) of Pakistan in millions of Pak rupees	m^g_{tpk}
Remittances	Total workers' remittances inflow in millions of Pak rupees	rem^g_{tpk}
Trade Balance	Total exports minus total imports in millions of Pak rupees	tb^g_{tpk}
Trade Openness	Imports divided by GDP multiplied with 100	api^g_{tpk}
---	Consumer Price Index of Pakistan	CPI_{tpk}
---	Dummy variable stands for the shift towards the managed float exchange rate system of SBP occurred in 1982	D_{Regm_1}
---		D_{Regm_2}
---	Dummy variable stands for the shift towards the full float exchange rate system of SBP occurred in 2000	D_{Inf_1}
---		D_{Inf_2}
---	Dummy variable stands for the first high inflation period of 1976	
	Dummy variable stands for the first high inflation period of 1977	π^g_{tus}
		i^g_{tus}
	Foreign Variables	CPI_{tus}
Inflation Rate	US average annual percentage change in consumer price index	
Interest Rate	US annual percentage change in Federal Reserve rate	
---	Consumer Price Index of United States	i^g_d
	Differential Variables	π^g_d
---	i^g_d is computed by taking the difference between Pakistan and US interest rates (i^g_{tpk}- i^g_{tus})	
---	π^g_d is computed by taking the difference between Pakistan and US inflation rates (π^g_{tpk}- π^g_{tus})	

- Data Sources: Economic Survey of Pakistan various issue, Fifty Years Statistics of SBP, International Financial Statistics, IMF

All the proxies of the study variables given in table 3.1 have been computed in the following way:

- $q^{g}_{tpk} = q_t - q^{*}_t$ stands for the real exchange rate gap computed by using HodrickPrescott (HP) filter method. It is the difference between actual (q_t) and targeted (q^{*t}) real exchange rates. For obtaining q^{g}_{tpk} first the nominal exchange rate has been converted into growth form i.e. $e_{tpk} = (NER_t - NER_{t-1})/ NER_{t-1} * 100$. After that the real exchange rate has been defined as the nominal exchange rate of Pakistan currency against US dollar multiplied by the ratio of the foreign to domestic price level i.e. $RER = q_t(CPI^{us} / CPI^{pk})$. However, for computation purposes real exchange has also been used in growth form i.e. $q^{g}_{tpk} = e_{tpk} + (\pi^{us} - \pi^{pk})$. Whereas, NER stands for nominal exchange rate, e_t for the nominal exchange rate in growth form and RER for the real exchange rate.
- $i^{g}_{tpk} = i_t - i^{*t}$ represents the Pakistan interest rate gap. It has been computed by taking the difference between actual money call rate (i_t) and targeted money call rate (i^{*t}).
- $y^{g}_{tpk} = 100*(y_t - y^{*t})$ shows the output gap of Pakistan computed from the Gross Domestic Product (GDP) of Pakistan at current market prices. For estimation first nominal GDP is converted into real form by using 1976 as a base year period and log of it has been taken. After that it is transformed into deviation form i.e. $y^{g}_{tpk} = 100*(y_t - y^{*t})$ by taking the difference between the actual GDP (y_t) and potential GDP (y^{*t}) and multiplied with a factor 100.
- $\pi^{g}_{tpk} = \pi_t - \pi^{*t}$ is the Pakistan inflation gap computed by taking the difference between the actual inflation rate (π_t) and targeted inflation rate (π^{*t}). Inflation is defined here as the average annual percentage change in consumer price index i.e. $\pi_{tpk} = (CPI_{tpk} - CPI_{tpk-1}) / CPI_{tpk-1}) *100$. It is used in nominal form.
- $fer^{g}_{tpk} = fer_t - fer^{*t}$ shows the foreign exchange reserves gap of Pakistan. Forcomputation first nominal foreign exchange reserves is converted into real form by using 1976 as base year and log of it has been taken. After

that it has beentransformed into deviation form i.e. $fer^{g}_{tpk} = 100*(fer_t - fer^{*t})$ and multiplied with afactor 100.

- $m^{g}_{tpk} = m_t - m^{*t}$ stands for the Pakistan money supply gap. For computation nominal money supply is converted into log real form. After that the deviation between the actual (m_t) and targeted (m_{t*}) money supply has been taken and it is multiplied with 100 i.e. $m^{g}_{t} = 100*(m_t - m_{t*})$.
- $rem^{g}_{tpk} = 100*(rem_t - rem^{*t})$ is the remittances gap of Pakistan. For computation first it is converted into real form. After that log of it has been taken. Hodrick-Prescott filter method is used for de-trending and then it is multiplied with 100.
- $tb^{g}_{tpk} = 100*(tb_t - tb_{t*})$ is the trade balance gap of Pakistan which is computed by taking the difference between actual(tb_t) and targeted(tb^{*t}) trade balance. For computation first nominal trade balance is converted into real form. Then HP filter method is used for obtaining tb^{g}_{tpk} and 100 is multiplied with it.
- $api^{g}_{tpk} = api_t - api_{t*}$ is the cyclical part of the average propensity to imports ofPakistan which is used as a proxy for the trade openness.
- $CPI^{pk} = S_D (CPI)^{D}t + S_D (CPI)^{M} t$. Here, CPI^{D} stands for the index of the domestic goods prices and CPI^{M} is for the index of imported goods prices. Whereas, $S_D = (1 - S_M)$ is the share of domestically produced goods in the CPI and S_M shows the imported goods share
- D_{Regm_1} is the sequential dummy variable stands for the first regime shift. It takes the value of 1 for the full period of the second regime and 0 otherwise.
- $D_{Regm_2}$is the dummy variable for the second regime shift. It takes the value of 1 for the full period of the third regime and 0 otherwise.
- $\pi^{g}_{tus} = \pi_{tus} - \pi^{*}_{tus}$ is the US inflation gap computed by taking the difference between the actual inflation rate(π_{tus}) and targeted inflation rate(π^{*}_{tus}). Inflation is defined here as the average annual percentage change in consumer price index of USA i.e. $\pi_{tus} = (CPI_{tus} - CPI_{tus-1}) / CPI_{tus-1}) *$

100. It is also used in nominal form.

- $i^{g}_{tus} = i_{tus} - i^{*}_{tus}$ is the US interest rate gap. It is computed by taking the difference between the federal reserve rate (i_{tus}) and targeted federal reserve rate (i^{*}_{tus}). For de-trending Hodrick-Prescott Filter technique is used.
- $CPI^{us} = S_D (CPI)^D t + S_M (CPI)^M t$. Here, CPI^D stands for the index of the domestic goods prices of USA and CPI^M is an index of imported goods prices. Whereas, $S_D = (1 - S_M)$ is the share of US produced goods in the CPI and SM shows the imported goods share. Hodrick-Prescott filter method is used for de-trending the data. Eviews.6 is used as statistical software for the computation of results.

3.2.3 ADF Test & HP Filter Technique

This section presents the ADF test & HP filter Technique applied to the data, the details of which are as follows:

3.2.3.1 Augmented Dickey Fuller Test

Augmented Dickey Fuller (ADF) test has been used for checking the stationarity of the data. It is important because if the ordinary least squares (OLS) is apply on a non-stationary time series data, all the results will be spurious. The ADF tests show that if the estimated value is greater than the critical value i.e. $t^* >$ ADF, the null hypothesis of the unit root will not be rejected. However, if the computed value is less than the critical value i.e. $t^* <$ADF, the null hypothesis of the unit root will be rejected and the underlying data will be stationary. For the selection of the optimum lag Akaike Information Criterion (AIC) has been used. The ADF test results are given in Table. 3.2 of Appendix. B.

3.2.3.2 Hodrick-Prescott Filter Technique

The Hodrick-Prescott (HP) filter method has been used to data by keeping in view two things. First, according to the ADF test applied for examining the unit root in the time series data most of the variables are non-stationary at level and

showing a trend. This might made the coefficients non-reliable and lead to spurious results. Second, the long run trend has been removed from the variables to enhance the ability of all the models in capturing only the short run fluctuations.

Although the literature suggested a number of procedures, however the HP filter is the most widely used technique applied by a large number of empirical studies (See, Hodrick and Prescott, 1981; Danthine, 1989; King and Rebelo, 1993 and Dolado, *et al* 1993 etc.). These studies referred HP filter the most suitable and optimal technique because of its simplicity, flexibility and reproducibility. The HP filter technique decomposes the given observed series into trend and cyclical components. The applications of the HP filter method allow the researchers to focus only on the short run fluctuations of the time series data. While being subject to possible critiques the HP filter method has an advantage over the simple de-trending procedure based on the linear trend in that it is a time varying method and allows the trend to follow a stochastic process, whereas, the traditional method assumes that the trend series grows at a constant rate. One can also find the long run relationship (Co-integration) between the variables. However, Muller and Watson (2008) mentioned that the inferences derived on the basis of the co-integarting models are weak as it relies on the assumption of I (1) model for the common stochastic trends, which might leads to the wrong conclusions about the persistence in the data. Also because of the structural breaks such common trends might be difficult to interpret (see, i.e. Claridaet *al* 2000; Lubik and Schorfheide, 2004; Cogley and Nason, 1995; Boivin and Giannoni, 2006). The HP filter method brings in focus only the short run fluctuations in the interest variables that appear to be economically very sensible (Castelnuovo, 2010). Similarly Razzak (1997), Gerlach and Yiu (2004) and Miseet *al* (2005) also used HP filter technique in their studies for obtaining the cyclical components of the data. All these studies referred Hodrick-Prescott filter method as an important technique in the field of applied econometrics because it is consistent with policy makers' interpretation in knowing how much an economic variable is above the trend

and helps in forecasting.

3.3 Theoretical Models

The main aim of the present study is to find out the determinants of real exchange rate, its role in the monetary policy and its impact on the major macroeconomic variables namely output, inflation and foreign exchange reserves. For this purpose a number of models with different theoretical frameworks have been developed for building the relationships between the independent and dependent variables. These models have been organized in the following manner:

First section 3.3.1 presents the theoretical models constructed for the real exchange rate. Then in section 3.3.2 models for the monetary policy rules have been given. After that section 3.3.3 shows the models for the output. Likewise, in section 3.3.4 models for inflation has been presented. Finally, section 3.3.5 consists of the models for the foreign exchange reserves.

3.3.1 Models for Real Exchange

The aim of the present section is to develop a theoretical framework for modeling the RER of Pakistan. However, before the development of the model it is important to define the RER. Generally two approaches are used for the measurement of real exchange rate (RER). One approach is to compute the RER in internal terms by multiplying the nominal exchange rate with the relative prices of tradable and non-tradable goods i.e. $q = P^T/P^N$ (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 the 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 and P and P* for the domestic and foreign price indexes respectively. One benefit of defining RER in this way is that it is based on the purchasing power parity doctrine (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 the computation of the RER Pakistan rupee is taken as quoted currency and US dollar is a base 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.

$$Q_{PK/US} = E_{PKR/USD}\,(P^{US}/P^{PK}) \qquad (3.1)$$

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:

$$q_{PK/US} = e_{PKR/USD} + \pi^{us} - \pi^{pk} \qquad (3.2)$$

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, managed float and full float exchange rate systems. Hence, the structure of RER under different exchange rate systems will be like as below:

$$q_{PK/US\ (1975\text{-}1983)} = e^{cPKR/USD} + \pi^{us} - \pi^{pk} \quad (3.3)$$

$$q_{PK/US\ (1984\text{-}2001)} = e_{PKR/USD} + \pi^{us} - \pi^{pk} \quad (3.4)$$

$$q_{PK/US\ (2002\text{-}2010)} = e_{PKR/USD} + \pi^{us} - \pi^{pk} \quad (3.5)$$

Equation (3.3) shows the measurement of real exchange rate (RER) of Pakistan under the fixed exchange rate period. The symbol "c" on $e_{PKR/USD}$ shows that nominal exchange rate remained constant under the fixed exchange rate system. Whereas, equations (3.4) and (3.5) 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:

$$q_{PK/US\ (1975\text{-}2010)} = e + (\pi^{us} - \pi^{pk}) \quad (3.6)$$

Now for examining the role of the different factors (domestic and foreign) and of two regime shifts i.e. D_{Regm_1} (occurred in 1982) and D_{Regm_2} (occurred in 2000) during the study period a backward looking framework has been designed.

First, for examining the role of both the domestic and foreign factors in the determination of real exchange rate (RER), equation (3.6) is transformed into the following equation which is given as under:

$$q^{g}_{tpk} = \lambda_0\lambda_{ipk}(i^{g}_{t-1pk}) + \sum_{t=1}^{i} \gamma_{\pi pk,i}(\pi^{g}_{t-ipk}) + \varepsilon_t) \quad (3.7)$$

$$+\sum_{t=1}^{j} \gamma_{qpk,j}(q^{g}_{t-jpk}) + \varepsilon_t$$

Whereas, $\left(D_{Regm_1} = 0 \text{ and } D_{Regm_2} = 0\right)$

Here i = 1, 2,…..,4 j = 1 2

Equation (3.7) is a backward looking restricted model used for examining the role of different factors in the determination of RER (q^{g}_{tpk}) of Pakistan. Here, four variables i.e. domestic inflation gap (π^{gtpk}), 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_tandi$^g_{tpk}$ have been taken in lag forms i.e. $\pi^g_{t\ -ipk}$ $i^g_{t\ -1pk}$whereas, tb$^g_{tpk}$andi$^g_{tus}$are used in contemporaneous form. Lags of the real exchange rate (q^g_{t-jpk}) are also included in the model for showing its influence on RER (q^g_t). $\lambda_{\pi pk}$, λ_{ipk}, λ_{tbpk}, λ_{ius} and $\lambda_{qpk}$are the related coefficients and λ_0 stands for the intercept term. Whereas, $\varepsilon_t$represents the error term. The two dummy variables are set equal to zero ($D_{Regm1} = 0$ and $D_{Regm2} = 0$) which shows that the role of the regime shifts is not considered. However, if the constraints are relax and the role of the two regime shifts is also considered in the determination of RER (q^g_{tpk}), in that case equation (3.7) will be changed into the following form.

$$q^g_t = \lambda 1 + \sum_{t=1}^{i} \gamma_{\pi pk,i}(\pi^g_{t-ipk}) + \lambda_{ipk}(i^g_{t-1pk}) + \lambda_{tbpk}(tb^g_{tpk}) + \lambda_{rempk}(rem^g_{tpk}) + \lambda_{ius}(i^g_{tus}) + \lambda D_{Regm_1}\ (D_{Regm_1}\ ) + \lambda D_{Regm_2}\ (D_{Regm_2}\ ) + \sum_{t=1}^{j} \gamma_{qpk,j}(q^g_{t-jpk}) + \varepsilon_t \qquad (3.8)$$

$$\text{Whereas,} \left(\begin{array}{l} 1 \text{ for } D_{Regm_1} \text{ and } 0 \text{ otherwise} \\ 0r \\ 1 \text{ for } D_{Regm_2} \text{ and } 0 \text{ otherwise} \end{array} \right) \quad \text{Here } i = 1, 2,..4 \quad j = 1....2$$

Equation (3.8) represent an unrestricted model where the role of the two regime shifts has also been taken into account. Here both the dummy variables i.e. D_{Regm1} and D_{Regm2}included in the model so that the variable D_{Regm1}takes the value "1" for the full period of first regime (1984-2001) and "0"for the other two regimes i.e. 1975-1983 and 2000-2010 and D_{Regm2}takes the value "1" for the full period of the third regime 2002-2010 and "0" for the other two periods i.e. 1975-1983 and 1984-2001. Here both the dummy variables are included for the shifts inintercept 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 individually their differential is taken, in that case the restricted model given in equation (3.7) will become like as under:

$$q^{g}_{tpk} = \lambda_2 + \sum_{t=1}^{i} \gamma_{\pi^g d,i}(\pi^g d_{t-i}) + \lambda_i^g{}_d\,(i^g d_{t-1}) + \sum_{t=1}^{j} \gamma_{q^g pk,j}(q^g{}_{t-ipk}) + \varepsilon_t \quad (3.9)$$

Whereas, ($D_{Regm_1} = 0$ and $D_{Regm_2} = 0$) Here i = 1, 2,...,4 j = 1...2

Equation (3.9) 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_{tpk}) of Pakistan. Only four variables i.e. two domestic and two foreign are selected for this purpose. π^g_d stands for the difference between the domestic and foreign inflation rates i.e. ($\pi^g_d = \pi^g_{pk} - \pi^g_{us}$) and i^g_d shows the difference between the domestic and foreign interest rates i.e. ($i^g_d = i^g_{pk} - i^g_{us}$). Also like equation (3.7) the lags of RER (q^g_{t-jpk}) have also been included in the model. Here, $\gamma_{\pi^g d}$, $\gamma_{i^g d}$ $\gamma_{q^g pk,j}$ are the related coefficients whereas, λ_2 stands for intercept term. Now if the role of the two regime shifts i.e. D_{Regm1} and $D_{Regm2}$is also considered in that case equation (3.9) will be transformed into the following model.

$$q^g_t = \lambda_3 + \sum_{t=1}^{i} \gamma_{\pi^g d,i}(\pi^g d_{t-i}) + \lambda_i^g{}_d(i^g d_{t-1}) + \lambda D_{Regm_1}\ (D_{Regm_1}) + \lambda D_{Regm_2}\ (D_{Regm_2})$$

$$- \sum_{t=1}^{j} \gamma_{q^g pk,j}(q^g{}_{t-ipk}) + \varepsilon_t \quad (3.10)$$

Whereas, $\begin{pmatrix} 1 \text{ for } D_{Regm_1} & \text{and 0 otherwise} \\ 0r & \\ 1 \text{ for } D_{Regm_2} & \text{and 0 otherwise} \end{pmatrix}$ Here i = 1, 2,..4 j = 1....2

Equation (3.10) shows the unrestricted form of the backward looking model given in equation (3.9) where two sequential dummy variables are also included. Whereas, λ_3 represents the intercept term.

3.3.2 Models for Monetary Policy Rules

For examining the role of the real exchange rate in the monetary policy of Pakistan a number of models have been developed. The conceptual framework

of these models is based on the Taylor rule. Taylor (1993) presented a rule for a small closed economy where the monetary authority uses nominal interest rate as a monetary policy instrument for bringing the economy at equilibrium position when inflation and output divert from the targeted levels (Krugman, 1996; Wren and Leith, 2008). The Taylor rule works so that if output and inflation deviates 1% from their targeted levels, the monetary authority is required to increase the nominal interest rate by 1% and 1.5% in reaction by following a tight monetary policy for bringing these variables to a stable position and vice versa. Taylor stated that the coefficients of both inflation and output gaps must be greater than zero i.e. $a_\pi>0$ $a_y>0$, otherwise the system will not be stable. However, he mentioned that the weights attached to the parameters are not strict and it can be adjusted according to the macroeconomic structure and degrees of openness of different economies (Taylor, 1994). The general form of Taylor rule is as under:

$$i_t = \pi_t + r^*_t + a_\pi(\pi-\pi^*) + a_y(y_t-y^*_t) \qquad (3.11)$$

Whereas, $(a_\pi> 0\ a_y > 0)$

Equation (3.11) shows the Taylor rule (TR) which described the policy strategy of the monetary authority in terms of short term nominal interest rate for the achievement of two major operational objectives i.e. inflation and output gaps in a closed economy. Here i_t is the short term nominal interest rate, π_t is actual inflation rate, π^* is targeted inflation rate, r^*_t is long run equilibrium real interest rate, y_t is actual GDP and y^*_t targeted GDP. The constraint $(a_\pi>0\ a_y>0)$ is called Taylor principle.

However, for developing the closed economy TR model for the empirical estimation, equation (3.11) will be used in the following manner:

$$i^g_{tpk} = \gamma_1 + \gamma_{\pi\,pk}\pi^g_{tpk} + \gamma_{y\,pk}y^g_{tpk} + \varepsilon i^g_t \qquad (3.12)$$

Constraint $(\gamma_{ypk} > 0, \gamma_{\pi pk}>0\ , z_{pk} = 0, q^g_{t^{pk}} = 0)$

Equation (3.12) shows a restricted closed economy model. Now suppose, if the monetary authority is working under a fixed exchange rate system, then equation (3.12) will become like as under:

$$^{c}i^{g}_{tpk} = \gamma_2 + \gamma_{\pi pk}\pi^{g}_{tpk} + \gamma_{y pk}y^{g}_{tpk} + \varepsilon i^{g}_{t} \quad (3.13)$$

Constraint ($\gamma_{ypk} \neq 0, \gamma_{\pi pk} \neq 0, z_{pk} = 0, q^{g}_{tpk} = 0$)

In equation (3.13) the Taylor principle ($_{ypk}>0$, $_{\pi pk}>0$) has been relaxed i.e.$_{ypk} \neq 0$, $_{\pi pk} \neq 0$.

This new restriction shows that if the monetary authority is following a fixed exchange rate system then for maintaining a fixed exchange rate system it will keep fixed. So, in that case if both $\pi^{g}_{tpk}$and$^{g}_{tpk}$ move in any direction (increase or decrease) which is shown by the symbol "≠ " the monetary authority will not react to it. The superscript "c" on i^{g}_{tkp}shows that it is fixed.However, under a managed float or full float exchange rate regime if the monetary authority is following a simple TR in that case equation (3.13) will be transformed into the following equation:

$$i^{g}_{tpk} = \gamma_3 + \gamma_{\pi pk}\pi^{g}_{tpk} + \gamma_{y pk}y^{g}_{tpk} + \varepsilon i^{g}_{t} \quad (3.14)$$

Constraint ($\gamma_{ypk} > 0, \gamma_{\pi pk} > 0, z_{pk} = 0, q^{g}_{tpk} = 0$)

Now based on the objectives of this study, suppose if the monetary authority is following a Taylor rule where it also reacts to RER fluctuations in that case equation (3.12) will be modified in the following manner:

$$i^{g}_{tpk} = \gamma_4 + \gamma_{\pi pk}\pi^{g}_{tpk} + \gamma_{ypk}y^{g}_{tpk} + \gamma_{qpk}q^{g}_{tpk} + \varepsilon i^{g}_{t} \quad (3.15)$$

Constraint ($\gamma_{ypk} > 0, \gamma_{\pi pk} > 0, z_{pk} = 0$)

However, under a fixed exchange rate system equation (3.15) will become like as under:

$$^{c}i^{g}_{tpk} = \gamma_5 + \gamma_{\pi pk}\pi^{g}_{tpk} + \gamma_{y pk}y^{g}_{tpk} + \gamma_{qpk}q^{g}_{tpk} + \varepsilon i^{g}_{t} \quad (3.16)$$

Constraint ($\gamma_{ypk} \neq 0, \gamma_{\pi pk} \neq 0, z_{pk} = 0$)

Equation (3.16) shows a calibrated form of the TR under a fixed exchange rate system for an open economy where the monetary authority is using both interest rate and nominal exchange rate as a policy instruments. Hence, in that case if the variables i.e. π^{g}, y^{g}_{tpk}, andq^{g}_{tpk}deviates the monetary authority will not react and will keep fixed for maintaining fixed exchange rate which is shown by the symbol "c" on. However, if the monetary authority is following a managed float or full float exchange rate system in a small open economy where it uses TR i^{g}_{t}so

that it also includes q^{g}_{tpk} in its policy targets in addition with $\pi^{g}_{tpk}$and$^{g}_{tpk}$. Hence, in that case equation (3.16) will be transformed in the following form:

$$i^{g}_{tpk} = \gamma_{6} + \gamma_{\pi pk}\pi^{g}_{tpk} + \gamma_{ypk}y^{g}_{tpk} + \gamma_{qpk}q^{g}_{tpk} + \varepsilon i^{g}_{t} \quad (3.17)$$

Constraint $(\gamma_{ypk} > 0, \gamma_{\pi pk} > 0, z_{pk} = 0)$

Here in equation (3.17) the restriction = 0 has been relaxed. This shows that $q^{g}_{tpk}$is now also included in the monetary authority policy objectives.

Now for developing the backward looking model used in this study equation (3.15) has been further modified so that the real exchange with some additional variables i.e. trade balance and money supply growth is included in it. The main purpose here is to find out that whether SBP reacts to real exchange rate in its TR based monetary policy mandate or not. The general form of the model is as under:

$$i^{g}_{tpk} = \gamma_{7} + \sum_{t=1}^{j} \gamma_{\pi pkj}\pi^{g}_{t-jpk} + \sum_{t=0}^{l} \gamma_{qpkj}q^{g}_{t-lpk} + \gamma_{ypk}(y^{g}_{tpk}) + \gamma_{zpk}(z_{pk}) + \varepsilon i^{g}_{t} \quad (3.18)$$

Constraint $(\gamma_{ypk} > 0, \gamma_{\pi pk} > 0)$ Here $j = 1, \ldots 2, , l = 0, \ldots 2$

Equation (3.18) is the general form of the backward looking model keeping the TR as a focal point. Here γ_{0}, γ_{ypk}, γ_{qpk}, $\gamma_{\pi pk}$: gap, $\pi^{g}_{tpk}$for inflation gap, $^{g}_{tpk}$ for output gap and $q^{g}_{tpk}$for real exchange rate gap and z is taken as a vector for the additional variables m^{gtpk}(money supply gap) &tb^{g}_{tpk} (trade balance gap). Whereas, are the related coefficients and ei^{g}_{t} is the error term. The summation signs i.e. show that the $\sum_{t=1}^{j}$ and $\sum_{t=0}^{k}$ ıbles $\pi^{g}_{tpk}$and $q^{g}_{t}$are also included in the model. The constraint ($_{ypk}$>0, πpk>0) is imposed on the model for making sure that the model satisfy the Taylor principle. The additional variables $q^{g}_{tpk}$and z_{pk} are included in the model to find out their role in the monetary policy of SBP.

3.3.3 Models for Output

For investigating the relationship between the real exchange rate and output a three version backward looking models founded on the basis of the standard IS curve models of Ball (1997, 1998) have been used. Ball (1997) developed a

closed economy model by taking output gap is a function of the lagged real interest rate, lagged output gap and an error term. Whereas, for designing his open economy model Ball (1998) added an additional variable lagged real exchange rate to his closed economy model. First, for constructing the closed economy model, Ball (1997) model has been calibrated and nominal interest rate and inflation rate have been included in it instead of the real interest rate. However, the nominal interest rate is included contemporaneously and inflation rate in lagged form in the model. Moreover, lags of the output gap have also been incorporate in the model. The model in equation form is as under:

$$y^{g}_{tpk} = \alpha_0 + \alpha_{i^{g}pk}\,(i^{g}_{tpk}) + \sum_{t=1}^{i} \alpha_{\pi^{g}.jpk}\,(\pi^{g}_{t-ipk}) + \sum_{t=1}^{j} \alpha_{y^{g}.jpk}\,(y^{g}_{t-jpk}) + \varepsilon_{y^{g}\,t} \qquad (3.19)$$

Whereas, ($D_{Regm_1} = 0, D_{Regm_2} = 0$ *and* $q^{g}_{tpk} = 0$) $i = 1$ to 4, $j = 1$ to 3

Equation (3.19) shows the closed economy IS curve macroeconomic model. μ is an open economy issue in Pakistan a calibrated for of the Ball (1998) open economy IS curve model has been used. Ball (1998) augmented his closed economy model with the lagged real exchange rate. However, the model used in this study has been distinguished from Ball (1998) model so that in addition to the real exchange rate some additional variables i.e. trade balance and foreign exchange reserves have also been included in it. The model in equation form is given below:

$$y^{g}_{tpk} = \alpha_1 + \sum_{t=0}^{j} \alpha_{i^{g}pk.j}(i^{g}_{t-ipk}) + \sum_{t=1}^{k} \alpha_{\pi^{g}pk.k}\,(\pi^{g}_{t-kpk}) + \sum_{t=1}^{l} \alpha_{q^{g}pk.l}\,(q^{g}_{t-lpk}) + \alpha_{tb^{g}pk}\,(tb^{g}_{tpk}) + \sum_{t=1}^{m} \alpha_{fr^{g}pk.m}\,(fr^{g}_{t-mpk}) + \sum_{t=1}^{n} \alpha_{y^{g}pk.n}\,(y^{g}_{t-npk}) + \varepsilon_{y^{g}\,t} \qquad (3.20)$$

Whereas, ($D_{Regm_1} = 0$ and $D_{Regm_2} = 0$) Whereas, $j = 0$ to 5, $k = 1$ to 4, $l = 1$ to 2, $m = 1$ to 3, $n = 1$ to 3

Equation (3.20) shows the open economy IS curve model. In the model stands for the real exchange rate, $tb^{g}_{tpk}$for the real trade balance and the fr^{g}_{tpk} for the real foreign exchange reserves. Here, constraint $q^{g}_{tpk} = 0$) has been relaxed for

identifying that real exchange rate is present in the model. Like Ball (1998) q^{g}_{tpk} has also been included in the model in lag form. However, it is included in the model so that an increase in it stands for the depreciation/devaluation. $fr^{g}_{tpk}$is also include in the model with lags. However, tb^{g}_{tpk}isincluded contemporaneously.

Finally, for capturing the effects of the two regime switches in the open economy IS output gap model, both the dummy variables i.e. D_{Regm1} and D_{Regm2} have also been incorporated. The model is as under:

$$y^{g}_{tpk} = \alpha_{2} + \sum_{t=0}^{i} \alpha_{i^{g}pk,j}(i^{g}_{t-ipk}) + \sum_{t=1}^{k} \alpha_{\pi^{g}pk,k}\ (\pi^{g}_{t-kpk}) + \sum_{t=1}^{l} \alpha_{q^{g}pk,l}\ (q^{g}_{t-lpk}) + \alpha_{tb^{g}pk}\,(tb^{g}_{tpk}) + \sum_{t=1}^{m} \alpha_{fr^{g}pk,m}\ (fr^{g}_{t-mpk}) + \sum_{t=1}^{n} \alpha_{y^{g}pk,n}\ (y^{g}_{t-npk}) + \alpha_{Regm_1}\left(D_{Regm_1}\right) + \alpha_{Regm_2}\left(D_{Regm_2}\right) + \varepsilon_{y^{g}t} \qquad (3.21)$$

Whereas, $\begin{pmatrix} 1 \text{ for } D_{Regm_1}\ ,\ 0 \text{ otherwise} \\ \text{Or} \\ 1 \text{ for } D_{Regm_2}\ ,\ 0 \text{ otherwise} \end{pmatrix}$ Whereas, $i = 0$ to 5, j =1 to 4, k = 1 to 2, l = 1 to 3, m = 1 to 3

Equation (3.21) is the open economy model with the regime shifts. Here, the constraints i.e.

$D_{Regm1} = 0$ and $D_{Regm2} = 0$ have been relaxed for showing that both the regime shifts are considered in the open economy model. The main purpose here is to examine where exchange rate systems affect y^{g}_{tpk}in Pakistan or not.

3.3.4 Models for Inflation

For investigating the impact of the RER on the inflation of Pakistan a three version Phillipscurve model has been designed. So far a limited number of studies used a Phillips curve approach for modeling inflation in Pakistan. Also, all the previous undertake a closed economy Phillips curve approach for modeling inflation. This is quite interesting by looking to the increased application of different versions of Phillips curve for measuring inflation all over the world. Also the significance of the foreign factors like exchange rate

in determination of inflation cannot be ignored for a dependent economy like Pakistan with exports and imports shares of 15222.9 and 32,059.4 million dollars during 2008 (Economic Survey of Pakistan, 2007-2008).

Distinguishing from all the previous research works, this study is carried out to examine the impact of real exchange rate on inflation in an open economy Phillips curve model. For this purpose, three different versions i.e. closed economy, open economy and open economy with regime shifts Phillips curves models will be used. First, the closed economy model has been designed on the basis of the augmented form of the backward looking closed economy benchmark Phillips-curve model produced by Ball (1997). Ball (1997) developed a closed economy backward looking Phillips-curve model in which he used lagged output gap and lagged inflation as explanatory variables. Hence for setting the closed economy model, Ball (1997) closed economy baseline model is calibrated and extended in several aspects. The model is written as under:

$$\pi^{g}_{tpk} = \beta_0 + \beta_y \varepsilon_{pk}(y^{g}_{tpk}) + \sum_{t=0}^{i} \beta_m \varepsilon_{pk,j}(m^{g}_{t-tpk}) + \sum_{t=1}^{j} \beta_\pi \varepsilon_{pk,j}(\pi^{g}_{t-jpk}) + D_{Inf1} + D_{Inf2} + \varepsilon_{\pi^{g}t} \quad (3.22)$$

Whereas, ($D_{Regm_1} = 0$, $D_{Regm_2} = 0$ *and* $q^{g}_{tpk} = 0$) $i = 1$ to 2, $j = 1$ to 2

Equation (3.22) is the augmented closed economy Phillips-curve model used in this study.

Unlike Ball (1997) the model is constructed so that here changes in inflation gap π^{g}_{tpk}depends on output gap (y^{g}_{t-jpk})two dummy variables (D_{Inf1} and D_{Inf2}), money supply gap depends on output gap (tb^{g}_{t-jpk}), lags of inflation (π^{g}_{t-jpk}) and a white noise shock ($\varepsilon_{\pi}{}^{g}_{t-}$). Also output gap is included in the model only contemporaneously. However, the money supply gap is included in the model with time lags. Similarly, the model is also adjusted for the two higher inflation periods occurred in Pakistan. The dummy variables (D_{Inf1} and D_{Inf2}) are included in the model for capturing the effects of the two higher inflation periods of 1974

and 1975 when Pakistan economy has seen two episodes of high inflation rates where annual changes in the consumer price index has exceeded 25 percent i.e. 26% and 30% respectively. The dummy variable is included in the model so that it takes the value of 1 for the year 1974 and 0 otherwise. Similarly, is included in the model so that it takes the value 1 for the period 1975 and 0 otherwise. The inclusion of dummy variables in the model for Pakistan is important for getting a well behaved model which satisfies the diagnostic tests, which areweak due to the small sample size. Whereas, the constraints 0 and $q^{g}_{tpk} = 0$ show that the real exchange rate (q^{g}_{tpk}) and regime shifts are not considered in the model. The random term represents the impact of unobserved shocks on the economy. Whereas, β_1 represents the intercept term in the model. After that to unveil the relationship between the real exchange and inflation an extended version of the open economy backward looking model proposed by Ball (1998) has been used. For developing the open economy model, Ball (1998) augmented his closed economy backward looking Phillips-curve model with the inclusion of an additional variable i.e. lagged real exchange rate. In Ball (1998) model real exchange rate has been included indirectly where an increase in it represents appreciation. Like equation (3.22), for constructing our open economy, Ball (1998) open economy Phillips-curve model is adjusted in the following manner:

$$\pi^{g}_{tpk} = \beta_1 + \beta_{y^{g}pk}(y^{g}_{tpk}) + \sum_{i=0}^{\cdot} \beta_{m^{g}pk,i}(m^{g}_{t-ipk}) + \sum_{j=0}^{\cdot} \beta_{q^{g}pk,i}(q^{g}_{t-jpk}) + \beta_{\pi^{g}pk}(\pi^{g}_{t-1pk}) + D_{Inf1} + D_{Inf2} + \varepsilon_{\pi^{g}t} \qquad (3.23)$$

Whereas, ($D_{Regm_1} = 0$ and $D_{Regm_2} = 0$) Whereas, $i = 1$ to 2 $j = 1$ to 2

Equation (3.23) stands for the open economy Phillips-curve model used in this study. Here, the constraint is relaxed which shows that real exchange rate has been included in the model. Here, like Ball (1998) we include the lagged real exchange rate in the model with lags. However, it is included in the model so that an increase in it stands for depreciation devaluation. Whereas, π^{g}_{t-1pk}shows the lagged effect of inflation. Finally, the two dummy variables i.e. D_{Regm1} and D_{Regm2}

have been included in the open economy model for examining its influence on Pakistan inflation. The model designed is as under:

$$\pi^{g}_{tpk} = \beta_3 + \sum_{i=0}^{i} \alpha_{y^{g}pk,i}(Y^{g}_{t-ipk}) + \sum_{j=0}^{j} \beta_{m^{g}pk,j}(m^{g}_{t-jpk}) + \sum_{k=0}^{k} \beta_{q^{g}pk,k}(q^{g}_{t-kpk}) + \beta_{\pi^{g}pk}(\pi^{g}_{t-1pk}) + D_{Inf1} + D_{Inf2} + \beta_{Regm_1}\left(D_{Regm_1}\right) + \beta_{Regm_2}\left(D_{Regm_2}\right) + \varepsilon_{\pi^{g}t} \quad (3.24)$$

$$\text{Whereas,} \begin{pmatrix} 1 \text{ for } D_{Regm_1}, \ 0 \text{ otherwise} \\ \text{Or} \\ 1 \text{ for } D_{Regm_2}, \ 0 \text{ otherwise} \end{pmatrix} i = 0 \text{ to } 1 \quad j = 1 \text{ to } 2 \quad k = 1 \text{ to } 2$$

Equation (3.24) is an open economy Phillips-curve model with regime shifts.

3.3.5 Models for Foreign Exchange Reserves

This section deals with the modeling of FER for Pakistan. Some researchers prefer to use the precautionary approach for its modeling whereas other applies the mercantilist approach. In contrast, supporters of the mercantilist approach argue that FER accumulations in the Asian countries is the result of the export competitiveness desires of these countries by keeping the exported goods prices low through devaluations (Dooley et al 2003; Aizenmanand Lee, 2007).

Similarly, when coming to the discussion about the reserves holdings of Pakistan economy, a limited number of work has been undertaken so far to model the foreign exchange reserves for Pakistan. Distinguishing this work from the previous studies, this study used a mercantilist approach for modeling the FER holdings of Pakistan. The model used in this study is much closer to the works of the Romero (2005) and Jo (2011). Romero (2005) conducted a comparative study for analyzing the factors of the international reserves demand in China and India by using a fixed exchange rate based sample period for the former and a floating exchange rate based sample period for the later country by using annual data for the period 1980 to 2003.

He included the following variables in his model i.e. current account balance, average propensity to import, and real exchange rate. Whereas, Jo

(2011) undertakes a Co-integration and ECM approach for assessing the determinants of the international reserves hoarding for Korea accounting both for the precautionary and mercantilist factors in his model by using quarterly data over the period 1994 to 2008.

Like Jo (2011), this study is being conducted for a single Asian country Pakistan. However, here the particular focus is on the relationship between the RER and the FER holdings. For the achievement of our objectives, the following model has been designed:

$$fr^{g}_{tpk} = \mu_0 + \sum_{t=1}^{i} \mu_{q^g pk} (q^{g}_{t-ipk}) + \mu_{rem^g pk} (rem^{g}_{tpk}) + \mu_{api^g pk} (api^{g}_{tpk}) + \mu_{i^g d} (i^{g} d_{t-1}) + \varepsilon_{fr^g t} \quad (3.25)$$

Whereas, $(D_{Regm_1} = 0 \text{ and } D_{Regm_2} = 0)$ $i = 1, 2, \ldots 5$

In equation (3.25), fr^{g}_{tpk}stands for the foreign exchange reserves. It has been incorporated in the model as dependent variable at level. Whereas, $q^{g}_{t\text{-}ipk}$is the lagged real exchangerate, $api^{g}_{tpk}$is the average propensity to imports which is included in the model as a proxyfor the trade openness, $i^{g}d_{t\text{-}1}$is the lagged differential interest rate which is used is a proxy for the opportunity cost of capital and rem^{g}_{tpk}stands for remittancesis the intercept term $\mu_{q^g pk}$, $\mu_{rem^g pk}$, $\mu_{api^g pk}$ and $\mu_{i^g d}$:rs to be estimated.

Whereas, π^{g}_{t} is the error term. Although q^{g}_{tpk} is the interest variable, however the historical macroeconomic conditions show that the precautionary approach cannot be weighted down as the SBP also keep the FER as insurance against unpredictable shocks to the economy. For this purpose two other variables two variables i.e. $api^{g}_{tpk}$and $i^{g}d_{t\text{-}1}$have also beenincorporated in the model for studying the role of these precautionary variables in the FERholdings in Pakistan. Another variable rem^{g}_{tpk}has also been included in the model. It hasbeen included in the model because workers' remittances is the dominant source in Pakistan helps in the management of the current account deficits and its total amount reached to 397542.78 million rupees during 2008 ((Economic Survey of Pakistan, 2008-09). Tow restrictions have been imposed on the

model i.e. $D_{Regm1} = 0$ and $D_{Regm2} = 0$. These restrictions show that the regime shifts have not been considered. Whereas, D_{Regm1} and D_{Regm2} arethe two dummyvariables represent the two regime shifts occurred in Pakistan during the studyperiod stands for the first regime shift when the SBP moved from the fixed to the managed float exchange rate system during 1982. Whereas, the D_{Regm2}represents the shift from the managed float to the full float exchange rate system occurred in 2000.

Similarly, to investigate the relationship between the exchange rate systems and FERholdings both the dummy variables. The model is as under:

$$fr^{g}_{tpk} = \mu_1 + \sum_{i=1}^{i} \mu_{q^g ipk} (q^{g}_{t-ipk}) + \mu_{rem^g pk} (rem^{g}_{tpk}) + \mu_{api^g pk} (api^{g}_{tpk}) + \alpha_{i^g d} (i^{g} d_{t-1}) + D_{Regm_1} + D_{Regm_2} + \varepsilon_{fr^g t} \quad (3.26)$$

$$\text{Whereas,} \begin{pmatrix} 1 \text{ for } D_{Regm_1}, \text{ 0 otherwise} \\ \text{Or} \\ 1 \text{ for } D_{Regm_2}, \text{ 0 otherwise} \end{pmatrix} i = 1, 2, \ldots, 5$$

Equation (3.26) shows the model with the regime shifts after relaxing the restrictions $D_{Regm_1} = 0$ and $D_{Regm_2} = 0$.

3.4 Analytical Tools

The estimation part of this study has been divided into five empirical sections. Ordinary Least Squares has been used for the estimation of the regression equations separately. Newy-west HAC is applied for the computation of heteroscedasticity and aturocorrelation consistent standard errors. For the overall significance of the main models, Wald test has also been applied. Diagnostic tests i.e. Q-statistic and LM tests are used for detecting the presence of autocorrelation in the residuals. Although in this regard the Durbin Watson statistics can give useful results yet, being a first order serial correlation test, its validity become doubtful in the presence of lagged dependent variable or higher order autocorrelation. For examining the stability of the parameters and

standard errors of main models CUUM tests i.e. CUSUM and CUSUM squares stability tests have been used. CUSUM test is used for examining the constancy of regression coefficient and CUSUM squared test is used for detecting instability in the variances. The stability of all the main models have been checked with and without the two dummy variables stands for the two regime shifts. Whereas, the dummy variables have been included in the model for smoothing the instabilities in the models and for highlighting the importance of policy shifts i.e. exchange rate policies shifts of SBP.

Because a parametric econometric model is completely described by its parameters, hence model instability generally makes it difficult to interpret regression results which are of particular importance in policy interventions. Hansen (1992) stated that testing the stability of the business cycle measures is important because it helps in knowing whether the empirical results represent the true characteristics of the data or not. In this study the CUSUM squares test is also used in addition to the CUSUM test because theoretical investigations showed that the CUSUM test is essentially a test to detect instability in the intercept alone (Kramer *et al* 1988) and it does not give any information about the variance of the regression error. Also CUSUM squares test is more powerful than the CUSUM test (Garbade, 1977) for the application of the CUSUM tests, the cumulative sum of squares is plot together with the upper and lower bounds of 95% intervals at each point. The time period is taken on the horizontal axies and the confidence intervals on the vertical axies. If there is a structural break that shifts the residual curve downward or upward from the 5% critical lines, it means that the difference between the observed and the residual series is not explained by the data but an outside shock and the given parameters or variances are not stable.

CHAPTER – 4

EXCHANGE RATE AND PAKISTAN ECONOMY: A HISTORICAL REVIEW

4.1 Introduction

Pakistan is a small open economy in Asia which came into being on 14 August, 1947. The small size of the economy is evident from its total GDP which stood 12084380 million rupees in which the shares of money supply, foreign exchange reserves and remittances were 45.59%, 6.97% and 3.92% respectively during 2009-2010. Whereas, the openness of the economy can be judged from the share of its exports and imports in GDP which reached to 11.63% and 24.42% during 2010 (i.e. for detail see table 4.1). Rupee is the name of Pakistan currency, the official code of which is PKR. It consists of 1, 2 and 5 rupee coins and 5, 10, 50, 100, 500, 1000 and 5000 currency notes. As USA is one of the major trade partners of Pakistan and dollar is the most trading currency in the international foreign exchange markets, the exchange rate of rupee is usually measured in terms of US dollar. Although the role of exchange rate was minimum during the fixed exchange rate era, however in the wake of speedy process of trade liberalization and financial integration of the economies, the role of exchange rate has increased significantly in the conduct of monetary policy and overall macroeconomic performance. Although fluctuations in exchange rate can be beneficial for an economy, a large number of studies showed that these positive impacts of the exchange rate become doubtful when it is studied for the developing countries like Pakistan where agriculture fulfils most of the needs of domestic and foreign sectors and looking to their heavy dependence on foreign countries for its exports and imports. The following chapter shows a detail historical overview of the major macroeconomic variables including exchange rate, output growth, inflation, trade balance and foreign exchange reserves of Pakistan during the period 1975 to 2010. The details are given as below.

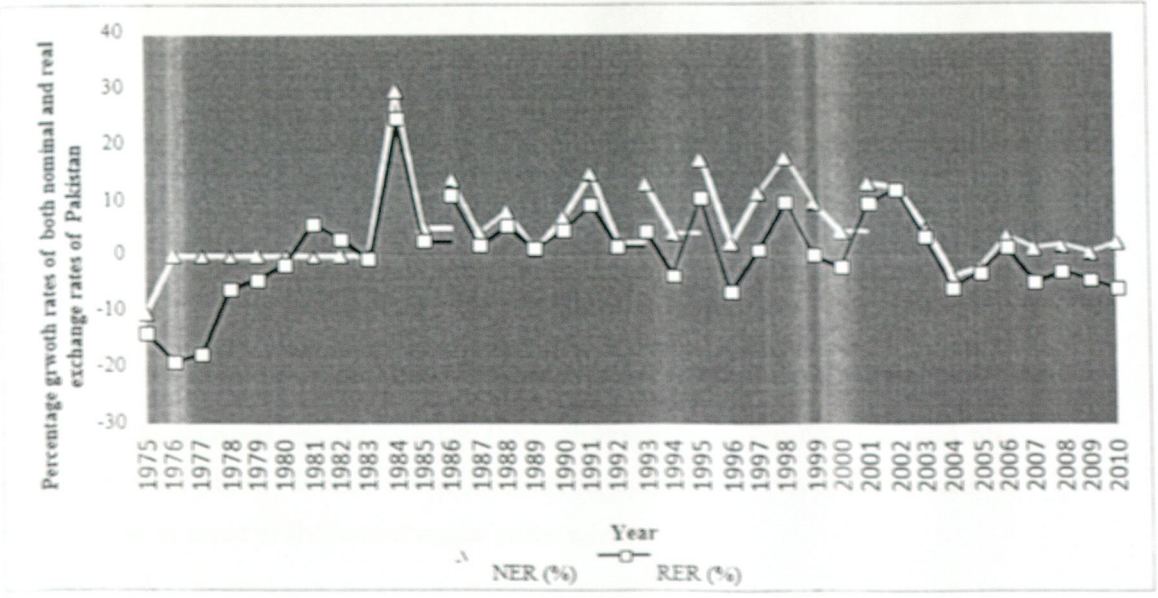
4.2 Exchange Rate of Pakistan

A strong and competitive financial system is considered as a pre requisite for the macroeconomic stability. But how to make a financial system stable, this largely depends on the conduct of the monetary policy. Whereas, monetary policy refers to the use of differentinstruments such as bank rate, cash reserves requirements and open market operations for theachievement of desired goals i.e. higher economic growth, price stability, trade surplus and exchange rate stability. Although, monetary policy is used for the correction of most of the macroeconomic variables, yet, among these variables, exchange rate has always remained at the core its major objectives. It is one of the key macroeconomic variables which connect the country with the rest of the world in both the goods and assets markets and have strong influences for the internal and external sectors of the economy. In contrast, a poor exchange rate policy risks misrepresenting trade opportunities and results in the misallocation of resources in an economy.

In Pakistan, monetary policy is based on targeting monetary aggregates (i.e. growth of money supply). The State Bank of Pakistan (SBP) has the responsibility for maintaining monetary and economic stability in the country. In 1997, SBP and its Central Board were empowered to formulate, conduct and implement monetary policy independently in the country and a Monetary & Fiscal Coordination Board was established to ensure that fiscal policy is well coordinated with the monetary policy (Akhtar, 2007). Like other developing countries, monetary policy in Pakistan has passed through several stages during the last few decades. In 1971, the rupee was delinked from pound sterling and attached with US dollar. After a devaluation 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 was kept fixed against US dollar for almost 9 years 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 led 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 manage 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. showing a decline of 12.07% in nominal terms and 11.87 % in real terms respectively. During 2010 the nominal exchange rate was 62.55 showing a depreciation of 2.17% in nominal terms. However, in real terms the rupee showed an appreciation of 6.02%. For more details see table 4.2.

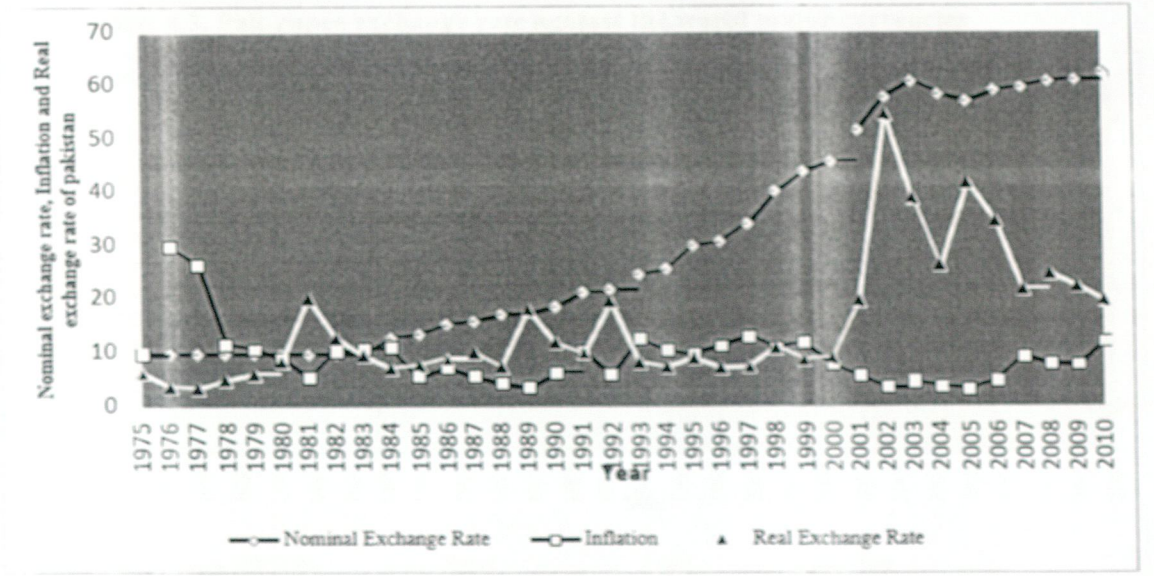
Figure 4.1. Percentage growth rates of both Nominal & Real exchange rates of Pakistan



- Source: Derived by the author for the data given in table 4.2

Although, the trends of both the nominal and real exchange rate mostly remained downward during the study period, however, so for the real exchange rate is concerned beside nominal exchange rate, inflation was another major factor that contributed significantly to the fluctuations in it. During the period 1975-1983, when the nominal exchange rate was kept fixed against the US dollar, even than the real exchange rate showed large fluctuations. However, these fluctuations were only because of the movements in inflation. Similarly, during 1984-2010 although the nominal exchange rate showed fluctuations as the SBP was following flexible exchange rate systems, inflation remained an important factor responsible for the movements in the real exchange rate of rupee. See table 4.3.

Figure. 4.2. Nominal exchange rate, Inflation and Real exchange rate of Pakistan



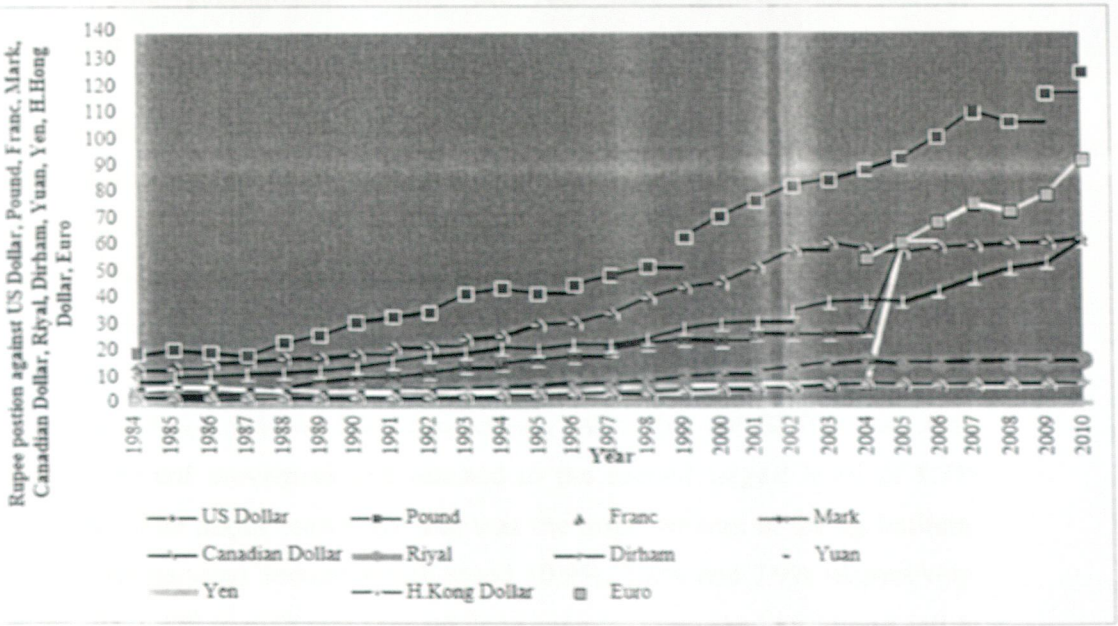
- Source: Plotted for the data given in table 4.3

Whatever the reasons for these large fluctuations in both the nominal and real exchange rate, these factors strongly pushed the rupee value downward in comparison to most of the world major currencies.

Table 4.4 shows the Pak-rupee exchange rate against some of the world leading currencies such as US, UK, France, Germany, Canada, S. Arabia, UAE, China,

Hong Kong and Japan currencies during the period 1984-2010. The data shows that except Yen, all the currencies remained strong against it. Another noted point is that rupee stood the single currency among all these currencies which showed a continuous downward trend. During 1984, the rupee exchange rate against US dollar, Pound, Franc, Mark, Canadian dollar, Riyal, Dirham, Yuan, Yen and Hong dollar were 12.84, 18.95, 1.72, 4.38, 8.31, 2.88, 2.68, 5.66, 0.04, and 1.74 respectively. It raised to 62.55 against US dollar, 125.29 against pound, 92.17 against France and Germany, 61.97 against Candian dollar, 16.69 against Riyal, 17.03 against Dirham, 8.61 against Yuan, 0.57 against Yen and 8.02 against Hong Kong dollar during 2008. Although, the rupee showed appreciation against some currencies except US dollar for a few years. However, that was only because of the internal factors in these countries.

Figure. 4.3. Pak-rupee exchange rate against the world major currencies



- Source: Plotted for the data showed in table 4.4

4.3 Macroeconomic Performance of Pakistan

During the study period, the macro-economic performance of Pakistan remained unsatisfactory. The main reasons for that were the poor monetary and

fiscal policies, large debt burden, worse balance of payments situations and continuous political instability in the country. Another reason for that was the longer periods of economic recessions spread over a longer period of 10 years from 1969-70 to 1978-79 and for 14 years from 1991-1992 to 2004 to 2005. The details of the business cycles of Pakistan are given in table 4.5.

This section shows the trends in the major macroeconomic variables of Pakistan, particularly focusing on the economic growth, inflation and trade performances. The details are as follows:

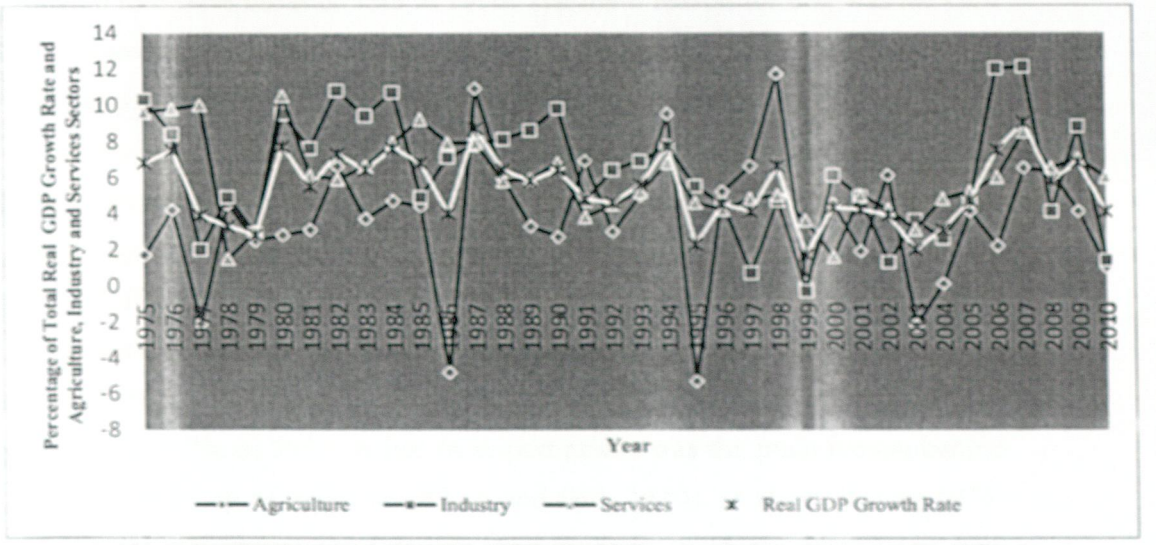
4.3.1. Economic Growth

The strength of an economy can be judged from its economic growth. Whereas, the economic growth refers to the improvement in the major sectors of the economy. The economists usually use real GDP growth rates for its measurement.

During the study period the real GDP growth rates of Pakistan also showed fluctuating trends. During 1975, the real GDP growth rate of Pakistan was 6.8% in which the contribution of the agriculture sector was 1.7% that of the industrial sector, 10.3% and the services sector, 9.6%. After that it showed a downward movement and reached to 2.80% during 1977. This was because of the sharp cuts in the growth rates of the agriculture, industrial and services sectors which stood 2.5%, 2.9% and 3.0% respectively. After that the GDP growth rates showed anupward movement and reached to the second largest level of 8.7% during 1985. The major reason for that was the improvement in the agriculture, industrial and services sectors which stood 10.9%, 7.8% and 7.9% respectively. After that the GDP growth rate showed once again a downward trend and fell to 2.30% during 1993. However, this was only because of the agriculture sector which showed a fall of 5.3% against the improvements in industrial and services sectors which showed improvements of 5.5% and 4.6% respectively. There were signs of improvement for a period of three years when it touched the record lowest level of 1.70% during 1997. The major reason for that

was the poor growth performance of agriculture (0.1%), Industry (-0.3%) and services (3.6%) sectors. This poor performance of the economy was continuing and it again reached to 2% during 2001. However, during 2005 the economy showed a record improvement of 9% real GDP growth rate which was because of the improvements in the agriculture (6.5%), industrial (12.1%) and services (6.0%) sectors. However, during 2010 the growth rate of the GDP once again fell to 4.10% because of the poor performance of both the agriculture (1.0%) and Industrial (1.4%) sectors. However, the services sector showed a growth rate of 6.0%. For details see, table 4.6.

Figure. 4.4. Percentage of Real GDP Growth Rates by Sector



- Source: Plotted for the data showed in table 4.6

4.3.2. Inflation

Inflation adversely affects the overall economic growth including the financial sector development, induces uncertainty, discourages savings and affects the exchange rate of a country. Considering such adverse impacts of inflation on the economy, there is a consensus among the economists that price stability is the prime objective of monetary policy of the central banks in all the countries.

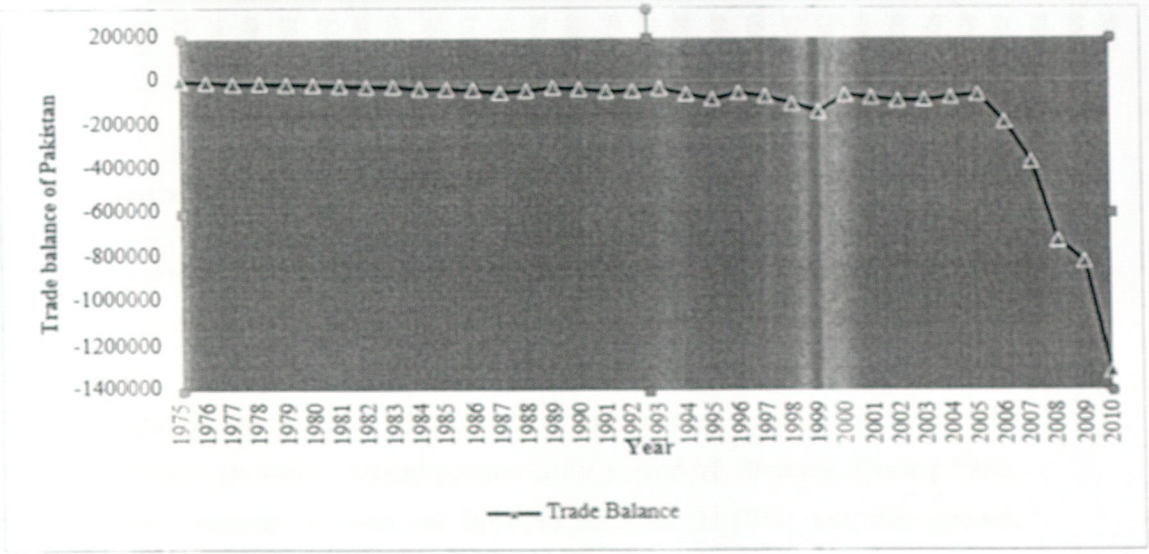
Similarly, in Pakistan one of the significant developments in the current economic scene has been the sharp rise in the rate of inflation and it became a major concern for the policy makers (Hasan, *et al* 1995). During the study period, inflation accelerated considerably in Pakistan. It showed a sharp upward trend and increased from 9.68% in 1975 to a double digit levels 30% and 26% during 1976 and 1977 which was the biggest rise of inflation in the history of Pakistan. The two main reasons for that were the 1973 world oil price hike and nationalization policy of the economy during Zulfiqar Ali Bhutto government, the then Prime Minister of Pakistan (Jones and Khilji 1988). After that it stood at 11.12% in 1982 and decreased to 5.61% with a decline of 49.55% in 1983. During 1991, it was reached to 12.66% showing an increase of 109.60% compared to 6.04% inflation rate in 1990. The main reason for that was the Gulf war. The average inflation rate was 7.4% over the period 1982 to 1993. The low public expenditures, tight monetary policies, covering the supply of goods and reversal of nationalization policy helped in lowering inflation rate. During 2003, it declined and touched its historical low level of 3.1% with a decline of 12.42% against 3.54% in 2002. Tight monetary and fiscal policies of State Bank of Pakistan and government helped in creating that low inflation environment in the country (Khan and Schimmelpfennig, 2006). However, during 2008, inflation again surged to 12% with an increase of 54.44% as compared to 7.7% in 2007. A rise in import prices was the main reason behind that sharp shoot up of inflation (Khan and Gill, 2010). In short, during 1975-2010 the country experienced double digit inflation in 15 out of 36 years with the highest and lowest levels of 30% and 3.1% during 1976 and 2005 respectively. For details see table. 4.3.

4.3.3. Balance of Trade

With the openness of the economies, the external trade becomes an important part of the overall macroeconomic performance of an economy. However, so far the developing countries are concerned, their trade performances always remained unsatisfactory. Being a developing country, the trade balance of

Pakistan also showed a negative trend over the years. During the study period, after showing a surplus of 153 million rupees in1973 it showed a continuous deficit. After a period of 10 years during 1983, this deficit reached to 33709 million rupees. However during 1993 and 2000, it became 81615 and 62078 respectively. After that keeping this downward trend the trade balance further worsened and only in a period of 5 years, it reached to 1315434 million rupees during 2010. For details see table 4.7.

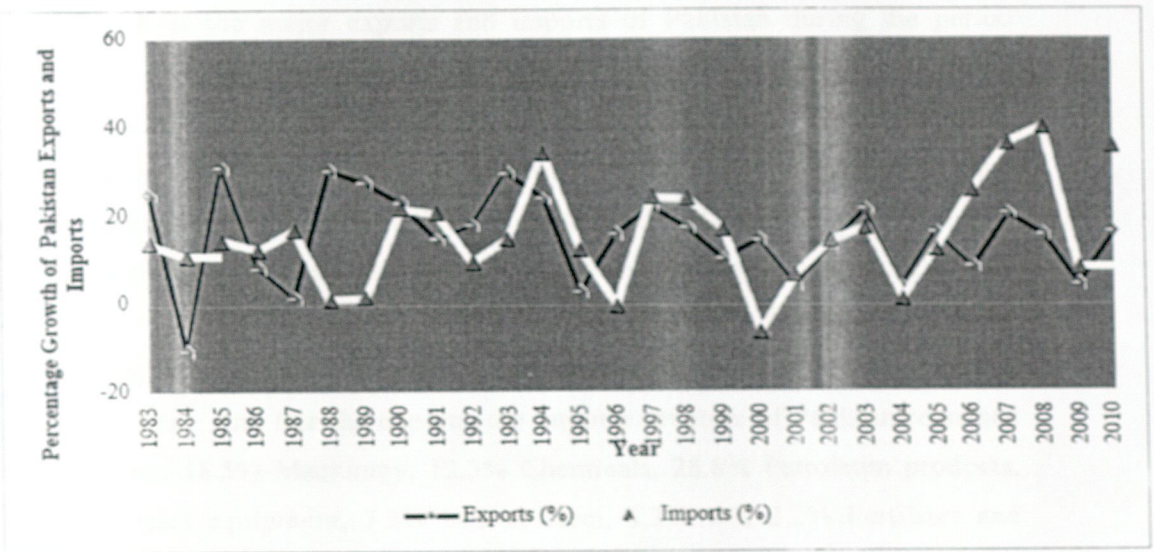
Figure. 4.5. Trade Balance of Pakistan



▪ Source: Plotted for table. 4.7

Although there are many reasons for this worse trade balance of the country, ho one of the main reasons for this is the consistent imbalances in the growth of exports and imports of the country.

Figure. 4.6. Percentage Growth Rates of Pakistan Exports and Imports



- Source: Constructed for table 4.8

Examining the exports and imports performance for the floating period of 1984 to 2010, it is evident that imports increased at a faster rate than the exports of the country. In 1984, a decline of 10.28% had occurred in the exports of Pakistan against the imports which showed an increase of 11.09%. After that both the sectors showed a mixed picture for a period of 10 years. During 1992, although the exports showed an improvement of 24.19%, yet this growth was smaller than the imports of the country which kept 34.35% growth rate. In 2002, both the exports and imports showed an abrupt and sharp deceleration. However, the exports growth rate only being 4.06%, was larger than the imports growth rate of 1.22%. After that both the exports and imports sectors showed improvements. However, the import sector showed a faster growth than the exports which showed a slowdown. In 2010, the exports growth was only 16.26% as compared to the 35.66% rise in imports of the country. The details are given in table 8.

Another reason for that is that Pakistan exports are mainly consisted of agricultural goods such as Cotton, Textiles, Leather, Rice and Sports Goods etc. On the other hand, its imports mostly consist of Machinery, Chemicals,

Petroleum Products, Transport equipment, Steel and Oil etc. Analyzing the percentages of the major exports and imports of Pakistan during the period 2001-2010, it is evident that Pakistan's exports were consisted of 59.1% Cotton, 5.1% Textiles, 6.9% Leather, 6.9% Rice and 3.3% Sports Goods in 2001. However, in 2010 after a period of 10 years, the structure of exports remained the same i.e. 51.9% of Cotton, 2.1% Textiles, 5.8% Leather, 9.8% Rice and 1.6% Sports Goods. Whereas, for the same period, the imports of Pakistan were consisted of 17.9% Machinery, 16.6% Chemicals, 15.5% Petroleum products, 5.7% Transport equipment, 3.1% Iron & steel, 8.7% Oil, 2.8% Fertilizer and 2.4% Tea. And like the exports, the imports structure of Pakistan remained the same i.e. 18.5% Machinery, 12.3% Chemicals, 28.8% Petroleum products, 5.5%Transport equipment, 3.3% Iron & steel, 4.3% Oil, 2.2% Fertilizer and 0.5% Tea during 2010. For details see tables 9 & 10. One more reason for the worst trade balance of the country is that Pakistan's exports and imports are concentrated on only few countries. Tables 11 & 12 show the concentration of exports and imports of Pakistan during the period 2001-2010. It can be seen that USA, UK, Germany, Japan and Saudi Arabia remained the major exports & imports partner of Pakistan with exports & imports shares of 21.8% & 7.7%, 6.6% & 4.3%, 6.6% & 4.1%, 3.5% & 8.3% and 2.4% & 6.8% during 2001. Similarly, during 2010, these countries remained the major trade partners of Pakistan with exports & imports shares of 19.5% & 6.1%, 5.4% & 1.9%, 4.3% & 3.2%, 0.7% & 4.6% and 2.0% & 13.4%.

Table 4.1: Exports, imports, trade balance, remittances, money supply and foreign exchange reserves as a percentage of Gross Domestic Product (1975-2010)

Years	Exports	Imports	Trade Balance	Money	Foreign Exchange Reserves	Remittances
1975	12.66	12.44	0.22	40.10	6.79	1.99
1976	11.53	15.29	3.76	34.82	4.83	1.56
1977	9.25	18.82	9.56	29.74	4.32	1.87
1978	8.63	15.69	7.06	31.94	4.66	2.57
1979	7.54	15.36	7.82	34.57	2.84	3.81
1980	7.36	15.77	8.41	36.10	5.67	6.49
1981	8.68	18.66	9.98	40.33	4.59	7.10
1982	9.99	20.03	10.04	39.46	8.53	7.37
1983	10.52	19.24	8.72	37.60	6.64	7.52
1984	8.10	18.34	10.24	35.94	5.78	8.81
1985	9.45	18.70	9.25	40.07	10.21	10.69
1986	8.89	18.27	9.37	38.89	9.10	10.01
1987	8.04	19.01	10.97	38.94	4.02	8.027
1988	9.63	17.67	8.03	41.02	5.49	8.70
1989	11.06	16.14	5.07	41.92	5.43	6.94
1990	11.61	16.66	5.04	39.90	3.66	5.55
1991	11.71	17.64	5.93	37.73	3.41	5.27
1992	12.43	17.39	4.95	39.86	3.71	4.96
1993	13.54	16.76	3.21	39.25	3.36	4.47
1994	14.17	18.97	4.80	41.73	3.73	3.11
1995	13.19	19.20	6.08	44.37	3.07	3.50
1996	13.06	16.41	3.35	44.71	6.53	2.83
1997	13.34	17.04	3.70	43.82	6.78	3.39
1998	13.76	18.56	4.80	43.82	6.10	27.38
1999	13.23	18.92	5.68	42.86	3.54	2.52
2000	13.93	16.29	2.35	45.05	2.97	2.55
2001	13.28	15.85	2.57	43.58	4.17	1.86
2002	11.59	13.95	2.35	36.60	3.25	1.49
2003	12.80	14.89	2.08	36.24	3.85	1.57
2004	12.59	14.25	1.65	39.55	7.14	3.14
2005	13.37	14.65	1.27	42.63	12.55	4.87
2006	12.57	15.91	3.34	44.08	12.45	4.05
2007	13.14	18.81	5.68	45.54	10.33	3.83
2008	12.91	22.44	9.52	44.69	10.23	3.67
2009	11.86	21.35	9.48	46.87	11.58	3.87
2010	11.63	24.42	12.79	45.59	6.97	3.92

- Source: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan

Table 4.2: Percentage Growth Rates of Nominal &Real Exchange Rates of Pakistan

Year	Nominal Exchange Rate (%)	Real Exchange Rate (%)
1974	+130	---
1975	-10.24	-13.70
1976	0	-18.96
1977	0	-17.58
1978	0	-5.93
1979	0	-4.17
1980	0	-1.43
1981	0	5,75
1982	0	3.03
1983	0	-0.5
1984	29.7	24.74
1985	5.14	2.74
1986	13.78	10.81
1987	4.04	1.94
1988	7.95	5.46
1989	1.16	1.31
1990	6.88	4.60
1991	14.85	9.29
1992	2.24	1.60
1993	12.88	4.45
1994	3.96	-3.58
1995	17.2	10.31
1996	2.26	-6.40
1997	11.2	0.99
1998	17.52	9.65
1999	9.44	-0.01
2000	4.18	-2.08
2001	12.83	9.28
2002	12.07	11.87
2003	4.88	3.29
2004	-3.83	-5.78
2005	-2.24	-3.07
2006	3.32	1.43
2007	1.2	-4.69
2008	1.82	-2.87
2009	0.49	-4.42
2010	2.17	-6.03

- Source: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank ofPakistan and International Financial Statistics, IMF (-ve) sign stands for appreciation and (+ve) for depreciation

Table 4.3: Inflation, Nominal Exchange Rate and Real Exchange Rate of Pakistan

Year	Inflation	Nominal Exchange Rate	Real Exchange Rate
1975	9.68	9.9	6.36
1976	30	9.9	3.64
1977	26.71	9.9	3.38
1978	11.67	9.9	4.87
1979	10.66	9.9	6.03
1980	9.08	9.9	8.34
1981	5.52	9.9	20.21
1982	10.48	9.9	12.76
1983	10.82	9.9	9.44
1984	11.12	12.84	7.11
1985	5.61	13.5	7.72
1986	7.29	15.36	9.1
1987	5.66	15.98	10.05
1988	4.35	17.25	7.37
1989	3.59	17.45	18.18
1990	6.29	18.65	11.89
1991	10.39	21.42	9.96
1992	6.04	21.9	19.58
1993	12.66	24.72	8.26
1994	10.58	25.7	7.36
1995	9.83	30.12	9.04
1996	11.27	30.8	7.13
1997	13.02	34.25	7.39
1998	10.79	40.25	10.93
1999	11.8	44.05	8.73
2000	7.81	45.89	9.11
2001	5.74	51.78	19.75
2002	3.58	58.03	54.79
2003	4.41	60.86	39.05
2004	3.54	58.53	26.29
2005	3.1	57.22	41.89
2006	4.57	59.12	34.67
2007	9.28	59.83	21.85
2008	7.92	60.92	24.84
2009	7.77	61.22	22.45
2010	12	62.55	19.81

- Source: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan and International Financial Statistics, IMF.

Table 4.4: Exchange Rate of Pak-rupees against the World Major Currencies (1982-2008)

Year	USA (Dollar)	UK (Pound)	France (Franc)	Germany (Mark)	Canada (Dollar)	S. Arabia (Riyal)	UAE (Dirham)	China (Yuan)	Japan (Yen)	Hong Kong (Dollar)	EMU (Euro)
1982	12.84	18.95	1.72	4.38	8.31	2.88	2.68	5.66	0.04	1.74	Na
1983	13.50	20.50	1.79	5.15	10.29	3.69	3.46	6.47	0.05	1.94	Na
1984	15.36	19.60	1.65	5.02	10.74	3.84	3.67	6.56	0.05	1.73	Na
1985	15.98	18.56	1.61	4.93	11.32	4.23	4.12	5.65	0.06	1.94	Na
1986	17.25	23.25	2.10	6.49	11.68	4.41	4.39	5.18	0.08	2.06	Na
1987	17.45	26.21	2.70	8.92	12.63	4.58	4.67	4.62	0.11	2.20	Na
1988	18.65	30.85	3.02	10.19	13.73	4.69	4.79	4.72	0.13	2.25	Na
1989	21.42	32.91	3.05	10.35	15.98	5.10	5.23	5.16	0.14	2.46	Na
1990	21.90	34.92	3.58	12.11	18.23	5.72	5.84	5.09	0.14	2.74	Na
1991	24.72	41.57	4.18	14.12	19.42	5.99	6.12	4.44	0.16	2.88	Na
1992	25.70	43.74	4.44	15.08	21.38	6.64	6.78	4.57	0.18	3.20	Na
1993	30.12	42.03	4.89	16.57	20.79	6.94	7.09	4.59	0.21	3.35	Na
1994	30.80	45.16	5.20	17.90	22.55	8.06	8.24	4.33	0.28	3.90	Na
1995	34.25	48.69	5.96	20.68	22.37	8.24	8.42	3.68	0.32	3.99	Na
1996	40.25	51.91	6.69	22.97	24.65	9.06	9.23	4.03	0.32	4.33	Na
1997	44.05	63.06	7.21	24.41	28.54	10.44	10.66	4.69	0.33	5.03	Na
1998	45.89	71.14	7.18	24.09	30.48	11.51	11.76	5.21	0.34	5.57	Na
1999	51.78	76.80	7.96	26.70	31.04	12.48	12.75	5.65	0.37	6.04	Na
2000	58.03	82.49	7.91	26.53	35.16	13.81	14.09	6.24	0.48	6.65	Na
2001	60.86	84.73	7.95	26.65	38.44	15.58	15.91	7.06	0.51	7.49	Na
2002	58.53	88.56	8.38	28.10	39.17	16.37	16.72	7.41	0.48	7.87	54.99
2003	57.22	92.74	Euro	Euro	38.82	15.59	15.92	7.06	0.48	7.49	61.30
2004	59.12	100.6	Euro	Euro	42.85	15.34	15.67	6.94	0.52	7.39	68.62
2005	59.83	110.28	Euro	Euro	47.55	15.80	16.15	7.16	0.55	7.61	75.53
2006	60.92	106.43	Euro	Euro	51.49	15.96	16.29	7.41	0.52	7.71	72.86
2007	61.22	117.18	Euro	Euro	53.57	16.16	16.51	7.75	0.51	7.77	79.17
2008	62.55	125.29	Euro	Euro	61.97	16.69	17.03	8.61	0.57	8.02	92.17

- Source: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan and International Financial Statistics, IMF.

Table 4.5: Business Cycles in Pakistan

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

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

Table 4.6: Percentage of Real GDP Growth Rates by Sector (1975-2010)

Years	Agriculture	Industry	Services	Real GDP Growth Rate
1975	1.7	10.3	9.6	6.80
1976	4.2	8.4	9.8	7.50
1977	-2.1	2.0	10.0	3.90
1978	4.5	4.9	1.5	3.30
1979	2.5	2.9	3.0	2.80
1980	2.8	9.5	10.5	7.70
1981	3.1	7.6	6.1	5.50
1982	6.6	10.8	5.9	7.30
1983	3.7	9.4	6.6	6.40
1984	4.7	10.7	7.9	7.60
1985	4.4	4.9	9.2	6.80
1986	-4.8	7.1	7.9	4.00
1987	10.9	7.8	7.9	8.70
1988	5.9	8.1	5.8	6.40
1989	3.3	8.6	5.9	5.80
1990	2.7	9.8	6.8	6.40
1991	6.9	4.7	3.8	4.80
1992	3.0	6.4	4.5	4.60
1993	5.0	6.9	5.2	5.60
1994	9.5	7.7	6.8	7.70
1995	-5.3	5.5	4.6	2.30
1996	5.2	4.5	4.2	4.50
1997	6.6	0.7	4.8	4.10
1998	11.7	4.7	5.0	6.60
1999	0.1	-0.3	3.6	1.70
2000	4.5	6.1	1.6	4.30
2001	1.9	4.9	5.0	4.20
2002	6.1	1.3	4.2	3.90
2003	-2.2	3.6	3.1	2.00
2004	0.1	2.6	4.8	3.10
2005	4.1	4.7	5.2	4.70
2006	2.2	12.0	6.0	7.50
2007	6.5	12.1	8.5	9.00
2008	6.3	4.1	6.5	5.80
2009	4.1	8.8	7.0	6.80
2010	1.0	1.4	6.0	4.10

- Source: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan

Table 4.7. Trade Balance of Pakistan (1975-2010)

year	Trade Balance
1975	153
1976	-3318
1977	-10639
1978	-9212
1979	-11718
1980	-14835
1981	-19463
1982	-23519
1983	-24264
1984	-33212
1985	-33709
1986	-39368
1987	-51799
1988	-41354
1989	-29076
1990	-34106
1991	-45658
1992	-42384
1993	-32832
1994	-58161
1995	-81615
1996	-52751
1997	-69719
1998	-102834
1999	-139688
2000	-63178
2001	-75622
2002	-90114
2003	-87930
2004	-73683
2005	-62078
2006	-188789
2007	-369621
2008	-726317
2009	-822494
2010	-1315434

- Source Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan

Table 4.8. Exports and Imports Growth Rates of Pakistan (1984-2010)

Years	Exports	Imports
1984	-10.28	11.09
1985	31.11	14.57
1986	8.41	12.55
1987	1.71	17.04
1988	30.58	1.30
1989	27.75	1.63
1990	23.22	21.77
1991	14.96	20.69
1992	18.06	9.58
1993	29.88	14.96
1994	24.19	34.35
1995	3.09	12.51
1996	16.08	-0.15
1997	22.23	24.26
1998	17.35	23.90
1999	10.37	16.96
2000	14.71	-6.16
2001	4.60	6.79
2002	13.66	14.56
2003	21.50	17.46
2004	4.06	1.22
2005	16.28	12.57
2006	8.70	25.68
2007	20.46	36.23
2008	15.71	39.91
2009	4.52	8.22
2010	16.26	35.66

- Source: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan

Table. 4.9: Pakistan's Major Exports

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cotton	59.1	61.0	58.9	59.4	63.3	62.3	57.4	59.4	59.7	51.9
SyntheticTextiles	5.1	5.3	5.9	4.5	5.1	3.8	2.1	1.2	2.5	2.1
Leather	6.9	6.3	7.5	6.8	6.2	5.4	5.8	6.9	5.2	5.8
Rice	6.9	6.3	5.7	4.9	5.0	5.2	6.5	7.0	6.6	9.8
Sports Goods	3.3	3.3	2.9	3.3	3.0	2.6	2.1	2.1	1.7	1.6
Others	18.7	17.8	19.1	21.1	17.4	20.7	26.1	23.4	24.3	28.8

- Source: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of

Pakistan

Table 4.10 Pakistan's Major Export Markets

Year	USA	UK	Germany	Japan	Hong	Saudi	Dubai	Other
2001	21.8	6.6	6.6	3.5	7.1	2.4	5.4	46.6
2002	24.8	6.8	6.0	3.1	6.1	2.5	5.7	45.0
2003	24.4	6.3	5.3	2.1	5.5	2.9	5.3	48.2
2004	24.7	7.2	4.9	1.8	4.8	3.6	7.9	45.1
2005	23.5	7.1	5.2	1.3	4.6	4.3	9.0	45.0
2006	23.9	7.6	4.9	1.1	4.7	2.8	7.3	47.7
2007	23.9	6.2	4.8	1.1	3.9	2.5	3.3	54.3
2008	25.5	5.4	4.2	0.8	4.1	2.0	5.6	52.4
2009	24.6	5.6	4.1	0.7	3.9	1.7	1.1	58.4
2010	19.5	5.4	4.3	0.7	2.7	2.0	0	65.4

- Source: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan

Table 4.11. Pakistan's Major Sources of Imports

Year	USA	UK	Germany	Japan	Kuwait	Saudi	Malaysia	Other
2001	5.3	4.3	4.1	8.3	5.9	6.8	6.7	56.2
2002	6.7	3.4	4.1	6.3	12.0	9.0	4.3	54.6
2003	6.0	3.2	3.5	5.3	8.9	11.7	3.9	58.2
2004	8.5	3.4	4.3	5.0	7.1	11.6	4.4	57.5
2005	7.6	2.9	4.6	6.6	6.6	10.7	4.6	58.0
2006	5.8	2.8	3.9	6.0	6.4	11.4	3.9	57.1
2007	7.6	2.6	4.4	7.0	4.6	12.0	2.6	59.2
2008	5.8	2.8	4.7	5.6	6.2	11.2	3.0	60.7
2009	7.5	2.3	3.9	5.7	5.7	11.4	3.1	60.4
2010	6.1	1.9	3.2	4.6	7.5	13.4	3.9	59.4

- Source: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan

Table 4.12 Pakistan's Major Imports

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Machinery	17.9	13.9	19.3	17.1	18.5	17.8	22.5	18.0	22.1	18.5
Chemicals	16.6	17.5	20.0	15.9	15.1	16.1	15.5	13.4	13.0	12.3
Petroleum	15.5	27.2	31.3	27.1	25.1	20.3	19.4	22.3	24.0	28.8
Transport	5.7	5.5	4.0	4.8	5.6	5.6	6.2	7.7	7.6	5.5
Iron &	3.1	3.0	2.6	3.3	3.3	3.3	4.3	5.1	3.9	3.3
Edible Oil	8.7	4.0	3.1	3.8	4.8	4.2	3.7	2.7	3.1	4.3
Fertilizer	2.8	1.9	1.6	1.7	2.1	1.8	2.0	2.4	1.5	2.2
Tea	2.4	2.0	1.9	1.5	1.4	1.2	1.1	0.9	0.7	0.5
Others	27.3	25.0	16.2	24.8	24.1	29.7	25.3	27.5	24.1	24.6

- Source: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan

CHAPTER – 5

RESULTS AND DISCUSSIONS

5.1 Introduction

This chapter shows the empirical results obtained for all the models. However, before the empirical analysis, the ADF test has been applied for checking the unit root in the data. The ADF test results showed that almost all the variables are non-stationary at level and showing trend. The ADF test results are given in Appendix. B. Hence, Hodrick-Prescott filter has been used for decomposing the observed series into the cyclical and trend series. The cyclical components have been separated from the trend series to focus only on the short run fluctuations of the data. After that Ordinary Least squares method has been applied for estimating the regressions equations in all the sections. The empirical procedures have been carried out so that first in section-5.1 results for all the models of the real exchange rate has been computed. Then results for models of the monetary policy rules have been given insection-5.2. Similarly, section-5.3 showed the results for all the output models. Likewise, results for all the models of inflation have been presented in section-5.4. Finally, results for the foreign exchange reserves models have been showed in section-5.5. The details are as follows.

5.2 Empirical Results for the Real Exchange Rate Models

For estimating the equations of the real exchange rate, the empirical analysis has been carried out in the framework of a two versions backward looking approach. First, in section 5.2.1, two regressions i.e. Regression-1 and 2 given in table.5.1 are computed. Regression-1 is derived for examining the role of both the domestic and foreign variables in the determination of RER (q^{g}_{tpk}). Specifically, the explanatory variables 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}). These results have been estimated with the

restrictions $D_{Regm1} = 0$ and $D_{Regm2} = 0$. 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 $D_{Regm1} = 0$ and $D_{Regm2} = 0$ 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 section 5.2.2 two more regressions are computed which are given in table. 5.3. However, here 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. 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 q^g_{pk} 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. $i^g_d = i^g_{pk} - i^g_{us}$. First, Regression-1 is computed to investigate the role of the differential variables (DVs) in the determination of RER (q^g_{pk})with the imposition of the restrictions i.e. $D_{Regm1} = 0$ and $D_{Regm2} = 0$. After that Regression-2 is computed where the role of the two regime shifts have also considered in the determination of RER (q^g_{tpk}) by relaxing the restrictions $D_{Regm1} = 0$ and $D_{Regm2} = 0$ 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 whether regime shifts play any role the determination of RER in the presence of the DVs or not? The results derived are as follows.

5.2.1 Results for the Backward Looking Restricted and Unrestricted Models with Domestic and Foreign Variables

Section 5.2.1, shows the results obtained for both the restricted and unrestricted models representing by equations (3.7) and (3.8). Here, all the variables have been included in the model individually. These results have been given in table.5.1 which is as follows:

Table.5.1: **Estimation Results for Real Exchange Rate Model Dependent Variable: q^{g}_{tpk}**

Sample Size/s (1975-2010)	**Adj: 1979-2010** Regression: 1	**Adj: 1979-2010** Regression: 2
Independent Vriables	Coefficient (S.E.)	Coefficient (S.E.)
π^{*}_{t-1pk}	-0.730115*** (0.231258)	-0.561270** (0.161174)
π^{*}_{t-2pk}	0.824647*** (0.262542)	0.832545*** (0.193420)
π^{*}_{t-3pk}	-0.322134*(0.164032)	-0.395448*** (0.150420)
π^{*}_{t-4pk}	0.657441***(0.128270)	0.669502*** (0.097005)
i^{*}_{t-1pk}	-0.810312*(0.401611)	-0.652078*(0.375838)
tb^{*}_{t-1pk}	-8.88E-06*(4.61E-06)	-8.92E-06** (2.90E-06)
rem^{*}_{t-1pk}	--------	-0.045773*(-2.020483)
i^{*}_{t-1}	0.806831** (0.217760)	0.693351*** (0.164366)
π^{*}_{t-1}	1.909419** (2.959391)	1.951935*** (4.494408)
D_{togal}	--------	-2.817979** (0.792681)
q^{g}_{t-1pk}	-0.307195*(0.1675712)	-0.434699**(0.139841)
q^{g}_{t-2pk}	-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 results of both the regressions i.e. Regression-1 and Regression-2 are given in table.5.1.

The results of the Regression-1 show that all the variables turned out significant according tothe theoretical expectations. It is found that domestic inflation (π^g_{tpk})showed a lag influence on q^g_{tpk}. It affects the q^g_{tpk} 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_{gtpk}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_{tpk} 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^g_{tpk} 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_{tpk} i.e.-8.88E-06. This result shows that an improvement in the tb^g_{tpk}will put a negative effect on q^g_{tpk} 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_{tpk}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_thas 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 (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_{tpk}. π^g_{tus} has also been included in the model and it remained significant according to expectations. Similarly, lags of q^g_{tpk} are included in the model which also turned out significant at lag-1 and 2 i.e. q^g_{t-1pk} and q^g_{t-2pk}. 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_{tpk}. 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 tests (i.e. CUSUM and CUSUM squares) which are given in Appendix A.

Similarly, in Regression-2, two dummy variables represent the two regime shifts i.e. D_{Regm1} =0 and D_{Regm2} =0have also been introduced for investigating its impact on q_{gt} afterrelaxing the restrictionsD_{Regm1} =0 and D_{Regm2} =0is 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, $D_{Regm3}$is included in the model so that it take the value of "1" for the period of floating exchange rate system (2000-2008) and "0" otherwise. The main purpose here is to find out whether regime shifts are neutral or not in respect to the behavior of q^{g}_{tpk} in the presence of other explanatory variables. Both the dummy variables are included in the model. However, the coefficient of D_{Regm1} is turned out significant with a negative sign. Whereas, D_{Regm1}no influence on q^{g}_{t}. The negative sign of the D_{Regm1}remained insignificant and showing shows that a shift towards a more floating regime against fixed regime although increased the variability in q^{g}_{tpk}. However, it decreases the q^{g}_{tpk} 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}, $i^{g}_{tus}$and $\pi^{g}_{tus}$are still significant with the expected signs, and showing almost the similar impact on q^{g}_{tpk} in terms of level of significance and magnitudes. The results show that $\pi^{g}_{tpk}$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}_{tpk3} and π^{g}_{tpk-4} like Regression-1. However, here the overall impact of π^{g}_{tpk}on q^{g}_{tpk}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 $q^{g}_{tpk}$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}_{tp}decreased i.e. 0.693351 < 0.806831. This decrease effect of $i^{g}_{tus}$is justified in the sense kthat 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. $\pi^g_{tus}$is also still significant however it shows a larger impact on q^g_{pk} both in terms of weight and significance i.e. (1.951935 >1.909419). 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 A.

Overall, the results show that although the coefficient ofremained insignificant,however the significance of D_{Regm1}clearly shows that regime shifts are not neural and affect the RER (q^g_{tpk}) of Pakistan. F-statistic is used, which confirmed the overall significance of all the explanatory variables in Regression-1 and 2.

Table.5.2: Wald test Results for table. 5.1 Dependent Variable: q^g_{tpk}

Results	Explanatory Variables	F-statisic
Reg-1:	π^g_{t-1pk}, π^g_{t-2pk}, π^g_{t-3pk}, π^g_{t-4pk}, π^g_{tus} i^g_{t-1pk}, tb^g_{tpk}, i^g_{tus}, q^g_{t-1}, q^g_{t-2}	13.16**
Reg-2:	π^g_{t-1pk}, π^g_{t-2pk}, π^g_{t-3pk}, π^g_{t-4pk}, π^g_{tus} i^g_{t-1pk}, tb^g_{tpk}, rem^g_{tpk}, i^g_{tus}, D_{Regm1} D_{Regm2} , q^g_{t-1pk}, q^g_{t-2pk}	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. 5.1, F test has been used. The results computed are given in table.5.2. It is found that all the variables in both the regressions are also significant altogether.

5.2.2 Results for the Backward Looking Restricted and Unrestricted Models with Differential Variables

Section 5.2.2, shows two more regressions obtained for equations (3.9) and (3.10). First, Regression-1 results have been computed for investigating the role of the differential variables (DVs) i.e. $\pi^g_d$and i^g_d in the determination of q^g_t after imposing the restrictions(DRegm1 = 0, DRegm2 = 0) after that Regression-2 is computed and the restrictions have been relaxed. The purpose here is to find out that whether regime shifts affect the q^g_{tpk} or they are neutral. The results for both the regressions are given in table. 5.3 are as follows:

Table.5.3: Estimation Results for the Real Exchange Rate Models with the Differential variables. Dependent Variable: q^{g}_{tpk}

Method: Least Squares

Sample Size/s (1975-2010)	**Adj: 1979-2010** Regression: 1	**Adj: 1979-2010** Regression: 2
Independent Variables	Coefficient (S.E.)	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}		0.796352*** (0.142917)
i^{g}_{td-1}	0.759628*** (0.164626)	-0.940872** (0.330274)
D_{Rgm1}	-0.797667** (0.449293)	-2.382353*** (0.503364)
q^{g}_{t-1}	--------	-0.396669*** (0.086148)
q^{g}_{t-1}	-0.237703(0.130650)	-0.545540** (0.086546)
	-0.405737(0.123161)	
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 AIC criterion, Q-statistic, LM test and CUSUM stability tests.
- Other variables D_{Rgm1}, 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 out 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 atπ^g_{d-2}(+1.001340) and π^g_{d-4}(+0.759628) it shows a positive relationship with q^g_{tpk}respectively. However, its overall impact on $q^g_{tpk}$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 q^g_{tpk} via channels of exports etc. Similarly, i^g_dalso negatively influence q^g_{tpk} 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_{tpk}via channels of foreign investment inflows etc. The results further show that $q^g_{tpk}$is still influence by its lags and turned significant up to lag-2 i.e. q^g_{t-1pk} and q^g_{t2pk}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 A.After that for examining the role of the two regime shifts, Regression-2 is computed. Two dummy variables i.e. (D_{Regm1} = 0 and D_{Regm2} = 0)have been included in it. The main aimis to find out that whether regime shifts play any role in the determinationq^g_{tpk}if instead of including both domestic and foreign variables separately their differential has been included. The results show that D_{Regm1} turned negatively significant. However, D_{Regm2} remained insignificant. This result shows that regime shifts are not neutral and show its influence on q^g_{tpk}. 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_{tpk}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_{tpk} at π^g_{d-2}(+1.003640)and π^g_{d-4}(+0.796352). However, its overall impact on $q^g_{tpk}$is positive and increased as compared to the results of Regression-1 i.e. (1.123814 > 0.955393).

Similarly, the coefficient of i^g_dalso turned negative like Regression-1.

However, it shows a greater impact on q^{g}_{tpk}comparatively i.e. 0.940872 >0.797667. Like Regression-1 both the lags of the dependent variable (q^{g}_{tpk}) 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 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 A.

Overall, the results of both Part-1 and Part-2 show that both the domestic and foreign factors play an important role in the determination of RER (q^{g}_{tpk}). 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}_{tpk} in both the parts.

Table. 5.4: Wald test Results for table. 5.3 Dependent Variable: q^{g}_{tpk}

Results	Explanatory Variables	F-Statistic
Regression: 1	π^{gt}_{d-1}, π^{g}_{td-2}, π^{gt}_{d-3}, π^{gt}_{d-3}, i^{g}_{td-1}, q^{g}_{t-1}, q^{g}_{t-2}	10.26**
Regression: 2	π^{gt}_{d-1}, π^{g}_{td-2}, π^{g}_{td-3}, π^{g}_{td-3}, i^{g}_{td-1}, D_{Regm1}, D_{Regm2}, q^{g}_{t-1}, q^{g}_{t-2}	21.6**

Asterisks "**" stands for 95% confidence level

Table.5.4 shows the results of the F-statistic obtained for the significance of all the variables of Regression-1 and 2 given in table.5.3. The results show that overall all the variables are also significant in both the regressions.

5.2.3 Summary

Overall the results show that both the domestic and foreign variables i.e. domestic inflation, domestic interest rate, trade balance, remittances, US interest rate and US inflation determine the RER of Pakistan. Moreover it has been

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 with the differential variables (DVs).

5.3 Results for the Monetary Policy Rules Models

Section 5.3 is based on two objectives. First to find out whether SBP reacts to real exchange rate or not in its TR based monetary policy. Second, to know whether SBP monetary policy is affected by exchange rate systems or not. For this purpose, results for both the full and sub sample have been computed which are given in table.5.5, 5.6 and 5.7 respectively. First, in table.5.5 simple Taylor rule results both for the full and sub sample periods are derived for equations (3.12), (3.13) and (3.14) with different constraints i.e. ($\gamma_{ypk}>0$, $\gamma_{\pi pk}>0$, $z_{pk=0}$, $=0$) and ($_{y} \neq 0$, $_{\pi} \neq 0$, $z_{pk}=0$, $q^{g}_{t}= 0$). After that to analyze whether SBP responds to real exchange rate (q^{g}_{tpk})in its TR based monetary strategy or not, some more results are derived both for the full and sub sample periods where q^{g}_{tpk} has also been included in the model. These results have been in table. 5.6, which are estimated for equations (3.15), (3.16) and (3.17) with new constraints i.e. ($\gamma_{ypk}>$ 0, $\gamma_{\pi pyk}>$ 0, $z_{pk=0}$) and ($\gamma_{ypk} \neq 0$, $\gamma_{\pi pk} \neq 0$, $z_{pk=0}$). At the final stage, in table. 5.7 lags of the explanatory variables $\pi^{g}_{tpk}$and q^{g}_{tpk}have also been included in the model. Here, two additional variables $m^{g}_{tpk}$and tb^{g}_{tpk} have also been incorporated in the model. The purpose here is to analyze whether q^{g}_{tpk}play any role in the monetary policy of SBP in the framework of a backward looking model or not. These results have been computed for equation (3.18) and are showed in table. 5.7. Here, the results have been derived only for the full sample period with only constraint i.e. ($\gamma_{ypk}> 0$, $\gamma_{\pi pk}> 0$).

5.3.1 Results for the Simple Taylor Rule Models

Section. 5.3.1 Presents the results computed for the simple Taylor both for the full sample period and for the sub-sample periods. The details are as follows:

Table. 5.5: Simple Taylor Rule Results

Dependent variable: i^{g}_{tpk}

Sample Size/s	**1975-2010**	**1975-1983**	**1984-2001**	**2002-2010**
	Regression-1	Regression-2	Regression-3	Regression-4
Independent Variables	Coefficient (S.E.)	Coefficient (S.E.)	Coefficient (S.E.)	Coefficient (S.E.)
π^{g}_{tpk}	0.100408* (0.051557)	0.050951 (0.043115)	0.094838 (0.140330)	0.642373** (0.076222)
y^{g}_{tpk}	0.232530** (0.070003)	0.144606** (0.051461)	0.211821* (0.104691)	0.361946** (0.079901)
R^2	0.42	0.63	0.32	0.83
Adj R^2	0.38	0.51	0.23	0.77
F-Stat	11.90	5.19	3.54	14.67
Prob (F-Stat)	0.000	0.05	0.05	0.004
DW	1.23	2.01	1.64	1.56

- Asterisks "*", "**", "***" stands for 90%, 95%, and 99% confidence level.
- Figures in parenthesis show the SEs (Standard Errors) of the estimates.
- Intercept is dropped from all the regressions after founding it insignificant.
- Here all the explanatory variables are used only contemporaneously.

In table.5.5 Regression. 1, 2, 3 & 4 show the regression results computed for the simple TR. the results of the full sample period show that both π^{g}_{tpk} and y^{g}_{tpk} turned significant and showed a positive relationship with i^{g}_{t}. However, the weights of the coefficients of both the variables output gap and inflation gap are different as indicated by Taylor, i.e. 0.100408 and 0.232530. This shows that for a developing economy like Pakistan, a 1% increase in both π^{g}_{tpk} and $^{g}_{tpk}$ put a greater influence on i^{g}_{tpk}. However, the R^2 value shows that only 42% variation in i^{g}_{tpk} is explained by both the explanatory variables. The

Durbin Watson (DW) statistic value is only 1.23 which shows that the residuals are serially correlated. The values of both the R^2 and DW statistic show that the explanatory power of the variables is weak and there might be some missing variables in the model.

After that, results are computed for the sub sample periods. The results obtained for the fixed (1975-1983) and managed float (1984-2001) periods show that π^g_{tpk}remained insignificant. However, y^g_{tpk}turned significant for both the periods. The result of the $y^g_{tpk}$for the fixed exchange rate period is against the prior expectations, as for keeping exchange rate fixed, the SBP will not change the i^g_{tpk}in case of deviations (up or downward movements) of both y^g_{tpk} and $\pi^g_{tpk}$from their targets. However, one reason for this result of the y^g_{tpk} might be that if the g_{tpk} deviate too much from their target the SBP might bring changes in i^g_{tpk} to save the economy from its negative effects. In contrast, the results of the floating (2002-2010) period show that both the π^g_{tpk} and $^g_{tpk}$ turned significant. These results of both the π^g_{tpk} and y^g_{tpk}isaccording to expectations as under floating exchange rate system if π^g_{tpk} and y^g_{tpk}deviate from their targets, the SBP will change i^g_{tpk} in reaction for bringing both π^g_{tpk} andy^g_{tpk} at equilibrium position. Here, the R^2 value is 0.83 and the DW statistic value is 1.56 which show that the results might not be reliable as the explanatory power of the variables is weak and the residuals might be serially correlated is showing by the low value of the DW statistic. Overall, the results of the full sample period shows that SBP does not follow a simple TR in its monetary policy strategy. Also the results of the sub sample periods show that the SBP monetary policy is affected by change in regimes.

5.3.2.Results for the Taylor Rule Models with Real Exchange Rate

Section. 5.3.2 Shows the results for the Taylor rule models with real exchange rate both for the full and sub-sample periods. The details are as below:

Table.5.6: Taylor Rule Results with Real Exchange Rate

Dependent Variable: i^{g}_{tpk}

Sample Size/s	1975-2010 Regression-1	1975-1983 Regression-2	1984-2001 Regression-3	2002-2010 Regression-4
Independent Variables	Coefficient (S.E.)	Coefficient (S.E.)	Coefficient (S.E.)	Coefficient (S.E.)
	0.142579** (0.059423)	0.090586 (0.091928)	0.051735 (0.168679)	0.621865*** (0.085465)
y^{g}_{tpk} 0.225575*** (0.070403)	0.147402**	0.256488** (0.052642)	0.393833** (0.097919)	(0.125635)
q^{g}_{tpk} 0.101824* (0.050829)	0.078050	0.103590 (0.113785)	-0.097109 (0.062068)	(0.136093)
R^2 0.46	0.65	0.43	0.84	
Adj R^2 0.41	0.43	0.31	0.74	
F-Stat	9.40	3.07	3.63	8.69
Prob (F-Stat)	0.000	0.13	0.04	0.01
DW	1.21	2.04	1.48	1.58

- Asterisks "*", "**", "***" stands for 90%, 95%, and 99% confidence level.
- Figures in parenthesis show the SEs (Standard Errors) of the estimates.
- Intercept is dropped from all the regressions after founding it insignificant.
- Here all the explanatory variables are used only contemporaneously.

It has been found that following a TR based monetary policy strategy, SBP does not limit its policy to only two objectives i.e. π^{g}_{t} ,y^{g}_{t}. For this purpose an additional variable q^{g}_{t} has also been included in the model and results are computed again. The main aim here is to find out whether SBP reacts to q^{g}_{t}or not in its TR based monetary policy mandate. Similarly, the results for the sub sample periods have also been obtained again. The purpose here is that if the SBP reacts to q^{g}_{tpk}in that casewhether its monetary policy is constant on exchange rate systems or not. The results of both the full and sub sample periods is shown by Regression 1, 2, 3 and 4 respectively.

The results of the full sample period show that all the variables π^{g}_{tpk} ,y^{g}_{tpk} and

q^{g}_{tpk} turned significant with the expected signs.

The results further show that with the inclusion of the q^{g}_{t} in the model the weight of the coefficient of π^{g}_{tpk} increased both in terms of significance and magnitudes as compared to table.1 i.e. ($0.142579^{**} > 0.100408^{*}$).

Similarly, although the coefficient of $^{g}_{t}$ decreased however it showed improvement in terms of significance i.e. ($0.225575^{***} < 0.232530^{*}$). These results clearly show that SBP reacts to q^{g}_{tpk} in its monetary policy. However, the R^2 is still low i.e. 0.46 and DW statistic value is also only 1.21 which shows that these results might be not reliable.

Similarly, the results of the sub sample periods show that q^{g}_{tpk} remained insignificant under all the exchange rate periods i.e. fixed, managed float and floating. For the fixed sample period this result is according to expectations. However, for the managed float and floating periods the result is quite surprising in the sense that under both the periods the SBP reacts to changes q^{g}_{tpk}. However, the DW statistic value is low for both the periods i.e. 1.48 and 1.58 which makes these results doubtful. The other variable π^{g}_{tpk} like table.1 remained insignificant under the fixed and managed float periods. However under the floating regime it is still significant and although its coefficient value decreased it shows improvement in terms of significance i.e. ($0.621865^{***} < 0.642373^{**}$). In contrast y^{g}_{tpk} is still significant under all the sub sample periods. Under the managed float period its coefficient showed improvement both in terms of magnitudes and significance ($0.256488^{**} > 0.211821^{*}$). However, under the floating regime its coefficient value improved only in terms of magnitudes ($0.393833^{**} > 0.361946^{**}$). Overall, the results of the full sample periods shows that SBP in its TR based monetary policy reacts to q^{g}_{tpk} in addition with π^{g}_{tpk} and y^{g}_{tpk}. Also the results of the sub sample period show that change in exchange rate system affect SBP monetary policy mandate.

5.3.3.Results for the Taylor Rule Models with Real Exchange Rate for the Backward Looking Models

In section. 5.3.3. Results for the backward looking models has been given. These results have been computed only for the full sample period. The details are as under:

Table.5.7: **Taylor Rule Results with Real Exchange Rate for the Backward Looking** ModelDependent Variable: i^{g}_{tpk}

Sample Size/s (1975-2010)	Adj: 1978-2010	Adj: 1978-2010	Adj: 1977-2010
	Regression-1	Regression-2	Regression-3
Independent Variables	Coefficient (S.E.)	Coefficient (S.E.)	Coefficient (S.E.)
π^{g}_{tpk}	0.231054*	0.251154**	0.131664*
	(0.113202)	(0.118047)	(0.066244)
π^{g}_{t-1pk}	0.249520*	0.184376**	0.103659*
	(0.082657)	(0.084466)	(0.060486)
π^{g}_{t-2pk}	0.113816**	0.091813**	0.135778**
	(0.041047)	(0.031595)	(0.049187)
π^{g}_{t-3pk}	0.173636**	0.133803***	
	(0.041350)	(0.038305)	
y^{g}_{tpk}	0.101093***	0.085940**	0.104000***
	(0.054535)	(0.039008)	(0.026322)
q^{g}_{tpk}	0.178207**	0.166111**	0.114960**
	(0.068691)	(0.072300)	(0.049152)
q^{g}_{t-1pk}	0.117591*		0.108078**
	(0.060293)		(0.042812)
q^{g}_{t-2pk}	0.161092**	0.129639**	0.127683***
	(0.047176)	(0.049245)	(0.041925)
i^{g}_{t-1pk}		0.242366**	
		(0.098244)	
tb^{g}_{tpk}			-7.60E-06***
			(1.49E-06)
m^{g}_{tpk}			0.082478***
			(0.018119)
R^2	0.73	0.76	0.84
Adj R^2	0.65	0.67	0.75
F-Stat	8.44	8.37	10.73
Prob (F-Stat)	0.000	0.000	0.000
DW	1.33	1.70	2.01

- Asterisks "*", "**", "***" stands for 90%, 95%, and 99% confidence level
- Figures in parenthesis show the SEs (Standard Errors) of the estimates
- The results given here are the best regressions results obtained by using the Q statistic, LM test and CUSUM stability tests.
- Different variables i.e. US interest rate, US GDP and domestic foreign exchange reserves are also included in the model in addition with money gap (tb^{g}_{t}) and trade balance(m^{g}_{t}), however, it is dropped from the model after turning insignificant. Intercept is also dropped from the model after turning insignificant.
- Backward looking framework is used only for the full sample open economy models.

The above results for the full sample period showed that although all the variables turned significant including q^g_{tpk}however, the values of the R^2 and DW statistic show that the explanatory power of the variables is weak and there are still some missing variables in the model. Hence, the TR is further modified and a backward looking model is constructed where lags of the variables π^g_{tpk} and q^g_{tpk}have also been included. However, y^g_{tpk} is included in the model only contemporaneously. The purpose here is to find out whether SBP reacts to q^g_{tpk}in its TR based monetary policy strategy or not in the framework of a backward looking model. All the results is shown by Regression-1, 2 & 3 respectively of table.5.7. The results in Regression-1 show that all the variables π^g_{tpk}, y^g_{tpk} and q^g_{tpk} remained significant with the expected signs. π^g_{tpk} turned significant contemporaneously and also from lag-1 to lag-3. Similarly, q^g_{tpk} also remained significant contemporaneously and from lag-1 to lag-2.However, y^g_{tpk}showed only a contemporaneous relationship with i^g_{tpk}. Overall, the results show that SBP reacts to q^g_{tpk}in addition with $\pi^g_{tpk}$and y^g_{tpk}. The R^2 shows that 73% of the variation in i^g_{tpk} is explained by the explanatory variables. However, the DW statistic value is only 1.33 which shows that the residuals are serially correlated and there are still some missing variables in the model. These results are confirmed by using the diagnostic tests i.e. Q-statistic, LM test and CUSUM square stability test. Although the LM statistic showed that there is no auto correlation problem in the residuals, however, both the Q-statistic and CUSUM test confirmed the non-reliability of the results as suggested by the DW statistic. For getting reliable results, another regression is derived where lag of the dependent variable (i^g_{tpk}) has also been included in the model.

The results are given in Regressions-2. It is found that ^{gt} is still positively significant contemporaneously. Similarly, π^g_{tpk}shows similar pattern as in column-1. However, q^g_{tpk}although significant contemporaneously and lag-2, however it remained insignificant at lag-1. Also lag of the i^g_{tpk} turned positively significant. With the inclusion of the lag of i^g_tin the model, the R^2 value improved (0.76 > 0.73). Also the DW statistic value increased (1.70 > 1.33). The Q-statistic shows that there is serial correlation problem in the residuals. However, the LM-statistic and CUSUM test show that the results are reliable

and stable (See Appendix A). For getting more reliable results two additional variables i.e. money supply gap (m^g_{tpk}) and trade balance gap (tb^g_{tpk}) have also been included in the model which turned significant with the expected signs. Both the variables i.e. $tb^g_{tpk}$and m^g_{tpk} turned significant contemporaneously. The coefficient of the $tb^g_{tpk}$is negative, which shows that an increase in it will improve terms of trade, which will increase output growth and reduce inflation which will ultimately reduce i^g_{tpk}.

Similarly, the positive sign of m^g_{tpk}shows that an increase in it via channel of inflation will bring increase in i^g_{tpk}. Other variables y^g_{tpk}, $q^g_{tpk}$and $\pi^g_{tpk}$are also significant with the expected signs. Like Regression-1 and 2 y^g_{tpk}remained significant contemporaneously. Similarly, q^g_{tpk}turned significant at level and from lag-1 to lag-3. Also, π^g_{tpk} remained significant contemporaneously and from lag-1to lag-2. The value of the R^2 (0.84 > 0.76 > 0.73) increased as compared to the column-1 and 2. Also the DW statistic value is 2.01. The post diagnostic tests i.e. Q-statistic, LM-statistic and CUSUM-square test showed that these results are reliable. For detail see Appendix A. Overall, these results show that SBP reacts to q^g_{tpk}in its TR based monetary policy mandate.

Table.5.8 Wald test results for table. 5.7

Independent Variables	F-Statistic
$\pi^g_{tpk}, \pi^g_{t\text{-}1pk}, \pi^g_{t\text{-}2pk}, \pi^g_{t\text{-}3pk}, y^g_{tpk}, q^g_{tpk}, q^g_{t\text{-}1pk}, q^g_{t2pk}$	17.33**
$\pi^g_{tpk}, \pi^g_{t\text{-}1pk}, \pi^g_{t\text{-}2pk}, \pi^g_{t\text{-}3pk}, y^g_{tpk}, q^g_{tpk}, q^g_{t\text{-}1pk}, q^g_{t\text{-}2pk}, i^g_{t1}$	14.60**
$\pi^g_{tpk}, \pi^g_{t\text{-}1pk}, \pi^g_{t\text{-}2pk}, y^g_{tpk}, q^g_{tpk}, q^g_{t\text{-}1pk}, q^g_{t\text{-}2pk}, tb^g_{tpk}, m^g_{tpk}$	25.04**

- F-Test is used only for the models with backward looking frameworks
- Asterisks "**" stands for 95% confidence level

Wald/F-statistic is computed for all the regressions given in column-1, 2 and 3 of table.5.7 are given in table. 5.8. The results obtained show that overall all the variables are also significant.

5.3.4. Summary

Overall the full sample results showed that SBP responds to real exchange rate in addition with the output and inflation gaps. Similarly results of the sub-sample periods showed that SBP monetary policy remained constant on the exchange rate systems during the period. The results showed that across systems differences are present irrespective of the monetary policy mandate of SBP. The output gap showed a positive relationship with the interest rate and remained significant under all the systems, however, inflation turned out significant only for the floating period. Whereas, the coefficient of the RER remained insignificant across all the systems.

5.4 Results for the Output Models

To compute the results for investigating the impact of the RER on output, a three version IS curve modeling approach has been used. First, results for a closed economy model representing by equation (3.19) have been constructed and placed in table.5.9. After that results for an open economy model showed by equation (3.20) have been derived which are given in table. 5.10.

Finally, results for the open economy model has been re-computed and the role of the two regime switches have also been accounted. These results are represented by equation (3.21) and are given in table. 5.12. The detail of all the results are as follows.

5.4.1. Results for the Closed Economy IS-curve Model

Section. 5.4.1. Show the results for the closed economy IS curve model. These results are given in table. 5.9, which are as follows.

Table. 5.9: Closed Economy IS-curve Model Results

Dependent Variable: y^g_{tpk}
Method: Least Squares
Sample Period: 1975-2010

(Adjusted Sample: 1979-2010)

Parameter	Estimates	Standard Error (S.E)
i^g_{tpk}	1.333887***	(0.249445)
π^g_{t-1pk}	0.159575	(0.193852)
π^g_{t-2pk}	-0.410692**	(0.157169)
π^g_{t-3pk}	0.261726*	(0.140168)
π^g_{t-4pk}	0.338245***	(0.064448)
y^g_{t-1pk}	0.269455*	(0.130396)
y^g_{t-2pk}	-0.278724**	(0.102516)
y^g_{t-3pk}	0.280000**	(0.114479)
R^2	0.59	
Adj: R^2	0.45	
DW	1.59	

- The asterisks "*", "**", "***" stand for 90%, 95%, and 99% confidence level.
- The best results are obtained on the basis of Q-statistic, LM test and CUSUM stability tests.
- Newy-West HAC is used for obtaining heteroskedsticity and autocorrelation consistent S.Es.
- Insignificant variables including the intercept are dropped from the model.

Table. 5.9 show the closed economy model economy results. The main purpose here is to find out whether output gap for Pakistan can be determined in a closed economy setup or not. Here, only two domestic factors i.e. interest rate (i^g_{tpk}) and (π^g_{tpk}) have been included in the model. The $i^g_{tpk}$is included in the model by assuming that the State Bank of Pakistan uses it as a monetary policy instrument by the following the Taylor rule (1993). Bernhardsen and Gerdrup (2007) mentioned that interest rate (i^g_{tpk}) is an important monetary policy instrument and it can result in the contraction or expansion of output in an economy.

The results showed that i^{g}_{tpk} has a significant contemporaneous relationship with the y^{g}_{t}, however with unexpected positive sign. This positive sign of the i^{g}_{tpk}shows that if the monetary authority brings increase in the i^{g}_{tpk}without any prior macroeconomic adjustments this can results in the expansion of the y^{g}_{tpk}via domestic channels of consumption and investment etc. Another, variable included in the model is the inflation rate (π^{g}_{tpk}). The results show a significant positive and lagged relationship of the $\pi^{g}_{tpk}$with the y^{g}_{tpk}. At π^{g}_{t2pk}it showed a negative relationship with the y^{g}_{tpk}, but at π^{g}_{t-1pk}, π^{g}_{t-3pk} and π^{g}_{t-4pk} its sign is positive. Although at π^{gt-1pk} it remained insignificant yet it has been included in the model for handling model specification problems. Overall, it has been found that π^{g}_{tpk}has a positive relationship with the y^{g}_{tpk}. This result is in line with the Barro (2001); Gylfason and Herbertsson (2001) and Guerrero (2006) who concluded that inflation put contractionary effects on the output in an economy. Similarly lag of the dependent variables have also been incorporated in the model to know that whether $y^{g}_{tpk}$is also determined by its past values or not. The results show that at y^{g}_{t-1pk} and y^{g}_{t-3pk}it showed a positive whereas at y^{g}_{t-2pk}it showed a negative relationship with the y^{g}_{tpk}. However, overall it put positive effects on the y^{g}_{tpk}. Although the adjusted R^2 value show that the explanatory power of our regressors in the model is reasonable, however, the wrong sign of the i^{g}_{tpk} and the small value of the Durbin Watson value is 1.59 which shows that there might be some missing values in the model, which are require to be considered. These results have been confirmed with the post diagnostic i.e. Q-statistic, LM statistic and CUSUM stability tests.

5.4.2. Results for the IS-curve Model without Regime shifts

Section. 5.4.2 Presents the results computed for the open economy IS-curve model without regime shifts. These results are given in table. 5.10, which are as follows.

Table. 5.10: Open Economy IS-curve Model Results without Regime Shifts

Dependent Variable: y^{g}_{tpk}

Sample Period: 1975-2010

(Adjusted Sample: 1980-2010)

Parameter	Estimates	Standard Error (S.E)
i^{g}_{tpk}	-2.160768**	(0.555379)
i^{g}_{t-1pk}	1.327435*	(0.604548)
i^{g}_{t-2pk}	1.326249**	(0.323743)
i^{g}_{t-3pk}	-1.249717***	(0.292507)
i^{g}_{t-4pk}	-1.001293**	(0.327678)
i^{g}_{t-5pk}	0.916754**	(0.368092)
π^{g}_{t-1pk}	0.472093	(0.376331)
π^{g}_{t-2pk}	1.020856**	(0.262219)
π^{g}_{t-3pk}	0.829516**	(0.302096)
π^{g}_{t-4pk}	-0.742159***	(0.156731)
q^{g}_{t-1pk}	0.364413*	(0.177082)
q^{g}_{t-2pk}	0.424787**	(0.122177)
tb^{g}_{tpk}	-3.47E-05**	(1.03E-05)
fr^{g}_{t-1pk}	0.079241***	(0.018047)
fr^{g}_{t-2pk}	-0.044001**	(0.015958)
fr^{g}_{t-3pk}	-0.124219***	(0.013413)
y^{g}_{t-1pk}	0.209367*	(0.141786)
y^{g}_{t-2pk}	0.890570***	(0.172931)
y^{g}_{t-3pk}	1.081885**	(0.311672)
R^2	0.91	
Adj: R^2	0.70	
DW	1.84	

- The asterisks "*", "**", "***" stand for 90%, 95%, and 99% confidence level.
- The best results are obtained on the basis of Q-statistic, LM test and CUSUM stability test.
- Newy-West HAC is used for obtaining heteroskedsticity and autocorrelation consistent S.Es.
- Insignificant variables including the intercept are dropped from the model.

Table.5.10 presents results for the open economy model. Here, q^{g}_{tpk}has also been included in the model with additional variables i.e. tb^{g}_{tpk} and fr^{g}_{tpk}. The main

purpose here is to find out whether real exchange rate (q^g_{tpk}) has a positive or negative relationship with the y^g_{tpk}.

The results show that with the inclusion of the additional variables i^g_{tpk}showed a negatively significant relationship with the y^g_{tpk} which is according to our expectations. This clearly support the previous argument of model mis-specification which resulted in the unexpected sign of the i^g_{tpk}. Here, i^g_{tpk} showed both a contemporaneous and lagged relationship with the y^g_{tpk}. However at i^g_{tpk}, i^g_{t-3pk}, i^g_{t-4pk} it showed a significant and negative impact on y^g_{tpk}, and at i^g_{t-1pk}, i^g_{t-2pk}it showed a positive relationship with the y^g_{tpk}. However, overall its overall impact on the y^g_{tpk} is negative. One possible explanation for this negative impact of i^g_{tpk}on $y^g_{tpk}$is that when the monetary authority following the Taylor rule increases the i^g_{tpk}, it attracts the foreign capital inflow in the country which helps in the contraction of the i^g_{tpk} through different channels i.e. growth in the domestic investment activities etc. Similarly overall $\pi^g_{tpk}$is still having a positive relationship with the y^g_{tpk}. However, its impact in terms of quantity and significance is slightly higher than before. Similarly our interest variable q^g_{tpk}also showed a positively significant relationship with the y^g_{tpk}at $q^g_{t-1pk}$and q^g_{t-2pk}. This positive relationship of the $q^g_{tpk}$with the y^g_{tpk} justify our hypothesis that a real depreciation put expansionary effects on the output gap. This result is also similar to the theoretical and empirical conclusions of i.e. Alejendro (1963, 1965), Lizondo and Montiel (1989). However, here the overall impact of the q^g_{tpk}on the y^g_{tpk} have been investigated without focusing on any particular channel i.e. demand or supply side. However for a developing country like Pakistan this expansionary effect of the q^g_{tpk}on the y^g_{tpk}might be come from the aggregate supply channel and particularly because of the bottlenecks in the imported inputs which are using by the manufacturing sector. The main reason for this is that there are no domestic closed substitutes are available for this and the country is highly dependent on imported goods. Also the country exports are mostly consist on the agricultural goods whose supply is very price inelastic specifically in the short and medium time periods.

However, here the impact overall devaluation on output without focusing on

any particular channel i.e. demand or supply will be examined. However, for a developing country like Pakistan this contractionary effect of the real depreciation on the output can be via supply channel of imported inputs using by the manufacturing sector where the range of the domestic substitutes for these goods is narrow and country is highly dependent on imports and having weak export structure mostly consist on the agricultural goods whose supply is very price inelastic in the short and medium run. This argument is also supported by Solimano (1986) who in his study for Chile mentioned that in developing countries the supply side resource constraints can dominantly affect the economic activities as a result of the real devaluations.

Moreover, we have also included two additional variables i.e. tb^{g}_{tpk} and fr^{g}_{tpk}in our model which also turned significant with the expected signs. The tb^{g}_{tpk}showed a negative relationship with y^{g}_{tpk}which shows that an improvement in the tb^{g}_{tpk} put contractionary effects on y^{g}_{tpk}. Whereas, the fr^{g}_{tpk}remained positively significant at fr^{gt-1pk} and negatively significant at $fr^{g}_{t-2pk}$and fr^{g}_{t-3pk}. This result of the fr^{g}_{tpk} is also supported by the Polterovich and Popov (2003) who mentioned that an increase in the foreign exchange reserves positively affect the output level in an economy as it helps in the increase of investment and capital productivity in an economy. $y^{g}_{tpk}$is also influenced by its own lags i.e. y^{g}_{t-1pk}, y^{g}_{t-2pk}, y^{g}_{t-3pk}. However, its overall impact on $y^{g}_{tpk}$is still positive like table. 5.9. With the inclusion of the additional variables in the model, the adjusted R^2 value increased i.e. 0.70 > 0.45 showing that most of the variation in $y^{g}_{tpk}$is explained by the explanatory variables.

The DW statistic value is raised to 1.84 showing the results are reliable. The post diagnostic tests i.e. Q-statistic, LM-test and the CUSUM stability test also supported these results (The post diagnostic tests are given in Appendix A).

Table. 5.11 Wald test Results for table. 5.10 Dependent Variable: y^g_{tpk}

Explanatory Variables	F-Statistic
i^g_{tpk}, i^g_{t-1pk}, i^g_{t-2pk}, i^g_{t-3pk}, i^g_{t-4pk}, i^g_{t-5pk}, π^g_{t-1pk}, π^g_{t-2pk}, π^g_{t-3pk}, π^g_{t-5pk}, q^g_{t-1pk}, q^g_{t-2pk}, tb^g_{tpk}, fr^g_{t-1pk}, fr^g_{t-2pk}, fr^g_{t-3pk}, y^g_{t-1pk}, y^g_{t-2pk}, y^g_{t-4pk}, y^g_{t-5pk}	497.7757**

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

For the overall significance of the model we used the F/ Wald statistic. The results are given in table. 5.11. It is found that overall all the variables in the model are also significant altogether.

5.4.3. Results for the IS-curve Model with Regime shifts

Section. 5.4.3. Shows the results estimated for the open economy IS-curve models with regime shifts. These results are placed in table. 5.12, which are given as below.

Table. 5.12: Open Economy IS-curve Model Results with Regime Shifts Dependent Variable: y^g_{tpk}

Sample Period: 1975-2010

	(Adjusted Sample: 1980-2010)	
Parameter	Estimates	Standard Error (S.E)
i^g_{tpk}	-1.974180***	(0.432543)
i^g_{t-1pk}	1.383463**	(0.472624)
i^g_{t-2pk}	1.356247**	(0.364560)
i^g_{t-3pk}	-1.068252***	(0.182819)
i^g_{t-4pk}	-0.785406*	(0.378973)
i^g_{t-5pk}	-0.913732*	(0.458990)
π^g_{t-1pk}	0.451527	(0.292995)
π^g_{t-2pk}	1.013660**	(0.330259)
π^g_{t-3pk}	0.676829***	(0.141861)
π^g_{t-4pk}	-0.697273***	(0.110406)
q^g_{t-1pk}	0.268078**	(0.112831)
q^g_{t-2pk}	0.334657**	(0.091582)
tb^g_{tpk}	-3.27E-05**	(9.88E-06)
fr^g_{t-1pk}	0.0742214***	(0.016606)
fr^g_{t-2pk}	-0.0415753*	(0.019175)
fr^g_{t-3pk}	-0.0118594***	(0.010014)
y^g_{t-1pk}	0.191383	(0.134707)
y^g_{t-2pk}	-0.225765*	(0.112150)
y^g_{t-3pk}	0.844096**	(0.228291)
D_{Regm2}	1.692790**	(0.425135)
R^2	0.93	
Adj: R^2	0.78	
DW	2.46	

- The asterisks "*", "**", "***" stand for 90%, 95%, and 99% confidence level.
- The best results are obtained on the basis of Q-statistic, LM test and CUSUM stability test.
- Newy-West HAC is used for obtaining heteroskedsticity and autocorrelation consistent S.Es.
- Insignificant variables including the intercept are dropped from the model.

Two dummy variables i.e. ($D_{Regm1} = 0$, $D_{Regm2} = 0$) andoccurred during 1982 and 2000 have alsobeen included in the open economy IS curve model to find out whether regime shifts play anyrole in the determination of they^{g}_{tpk} or not. The computed results are placed in table. 5.12. It has been found that all the variables are still significant almost with the same magnitudesand significant levels. i^{g}_{tpk} turned significant contemporaneously and also at i^{g}_{t-1pk}, i^{g}_{t-2pk}, i^{g}_{t-3pk}, i^{g}_{t-4pk} and i^{g}_{t-5pk}. At i^{g}_{tpk}, i^{g}_{t-3pk}, i^{g}_{t-4pk}, and i^{g}_{t-5pk} it showed a negative and at i^{g}_{t-1pk}, i^{g}_{t-2pk} it showed a positive relationship with the y^{g}_{tpk}. However, its overall impact on $y^{g}_{tpk}$is still negative. Similarly, π^{g}_{tpk}turned significant at π^{g}_{t-1pk}, π^{g}_{t-2pk}, π^{g}_{t-3pk}, and π^{g}_{t-4pk} and showed an overall positive relationship with y^{g}_{tpk}. q^{g}_{tpk} is still significant at $q^{g}_{tpk}$and q^{g}_{tpk} and showed similar relationship with the y^{g}_{tpk}. The additional variables i.e. tb^{g}_{tpk} and fr^{g}_{tpk}also showed similar relationship with y^{g}_{tpk}. Also the overall influence of y^{g}_{t-1pk}, y^{g}_{t-2pk}, y^{g}_{t-3pk}on the y^{g}_{tpk} is also remained positive. Although D_{Regm1}remained insignificant in our model, however, D_{Regm2} turned positively significant which shows that a shift towards the more floating regime increased the y^{g}_{tpk}in Pakistan. The adjusted R^2 value show that with the consideration for the regime shifts the R^2 value increased (i.e. 0.78 > 0.70 > 0.45). The DW statistic value (2.46) shows that these results are reliable, which is also checked by using the post diagnostic test i.e. Q-statistic, LM-test and the CUSUM stability test (For detail see appendix. A.)

Table.5.13: Wald test results for table. 5.12

Dependent Variable: y^{g}_{tpk}

Explanatory Variables	F-Statistic
i^{g}_{tpk},i^{g}_{t-1pk} i^{g}_{t-2pk},i^{g}_{t-3pk}, i^{g}_{t-4pk},i^{g}_{t-5pk}, i^{g}_{t-6pk},π^{g}_{t-1pk}, π^{g}_{t-2pk},π^{g}_{t-3pk},π^{g}_{t-5pk}, q^{g}_{t-1pk},q^{g}_{t-2pk},tb^{g}_{tpk},fr^{g}_{t-1pk},fr^{g}_{t-2pk},fr^{g}_{t-3pk},y^{g}_{t-1pk}, $^{g}_{t-2pk}$, y^{g}_{t-4pk},y^{g}_{t-5pk} , $^{D}_{Regm2}$	370.9727**

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

Table.5.13 shows results of F test obtained for table.5.12. The results show that overall all the variables are also significant in the model.

5.4.4. Summary

In sum, overall the results show that real exchange rate depreciations put expansionary effects on output gap, supporting our contractionary hypothesis of the real depreciations. It has also been found that output gap is dependent on the historical exchange rate systems in Pakistan.

5.5. Results for the Inflation Models

This section is based on the results computed for examining the impact of RER on inflation. The estimation procedure is carried out so that first in table 5.14, results are computed for the closed economy Phillips-curve model showed by equation (3.22). After that real exchange rate (q^{g}_{tpk}) has been included in the model and results are derived for the open economy Phillips-curve model represented by equation (3.23) and placed in table. 5.15. Finally, both the dummy variables ($D_{Regm1} = 0$, $D_{Regm2} = 0$) represents the two regimes shift are also included in the model for examining its role in the determination of inflation. This open economy Phillips-curve model with regime shifts is showed by equation (3.24) and its results are given in table. 5.17.

5.5.1. Results for the Closed Economy Phillips curve model

Section 5.5.1 shows the results computed for the closed economy Phillips curve model. The details are as follows.

This result is similar to Chen (2009) who for Chinese economy found that money supply affects inflation with a time lag. Similarly, $\pi^g_{tpk}$is also influenced by its own lags i.e. $\pi^g_{t\text{-}1pk}$ and π^g_{t2pk}.However, at $\pi^g_{t\text{-}1pk}$it shows a positive relationship with $\pi^g_{tpk}$and at $\pi^g_{t\text{-}2pk}$it remained negative. However, its overall impact on $\pi^g_{tpk}$is positive. i.e. 0.333084 and - 0.191623. This past effect of inflation can be useful for setting monetary policy as mentioned by Rangasamy (2009).

Furthermore, $D_{Inf2}$is a dummy variable for the high inflation period, 1974. It also shows a positively significant relationship with π. However, the dummy variable for the first high inflation period i.e. D_{Inf2}(1975) is dropped from the model after founding it insignificant. The value of the adjusted R^2 shows that 45% of the variation in $\pi^g_{tpk}$is explained by all the explanatory variables included in the model. However, the Durbin Watson (DW) statistic value is only 1.62 which shows that there might be some missing variables in the data. This result is also supported by the Q-statistic and CUSUM stability test. However, the LM test shows that these results are reliable.

5.5.2. Results for the Open Economy Phillips curve model without Regime Shifts

Section. 5.5.2 shows the results for the open economy Phillips curve model without regime shifts. The results are given in table. 5.15, which are as follows.

Table. 5.15: Results for the Open Economy Phillips-curve model without Regime Shifts

Dependent Variable:

Adjusted Sample: 1977-2010

Parameters	Estimates	(Standard Error)
y^g_{tpk}	0.207597**	(0.098265)
$m^g_{t\text{-}1pk}$	0.308495***	(0.094078)
$m^g_{t\text{-}2pk}$	-0.219889**	(0.112765)
$q^g_{t\text{-}1pk}$	0.098904	(0.092627)
$q^g_{t\text{-}2pk}$	0.145868*	(0.076404)
$\pi^g_{t\text{-}1pk}$	0.321538*	(0.186362)
D_{Inf2}	4.394152**	(1.767120)
R^2	0.67	
$AdjR^2$	0.53	
DW	1.76	

- The asterisks "*", "**", "***" stand for 90%, 95%, and 99% confidence level
- The regressions results given in the table are the best obtained results on the basis of post diagnostic tests i.e. Q-statistic, LM test and CUSUM stability tests.
- Insignificant variables including the intercept are dropped from the model.

The results given in table. 5.14 for the closed form specification of the Phillips-curve model show that there might be some missing variables in the model. Hence, for this purpose the closed economy model is transformed into an open economy model where an additional variable $q^g_{tpk}$is also included in the model. The purpose here is to find out that whether q^g_{tpk}play any role in the determination of π^g_{tpk}or not.The results are given in table.5.15. Theresults show that $y^g_t$is still positively significant and with the inclusion of the q^g_{tpk}in the model its influence on π^g_{tpk}increased as compared to table. 5.14 i.e. 0.207597 > 0.197717. Similarly, $m^g_{tpk}$is also significant both at $m^g_{t\text{-}1}$ and$m^g_{t\text{-}2pk}$ and its overall impact on $\pi^g_{tpk}$is positive. However, as compared to table 5.15 its overall impact on π^g_{tpk}increased i.e. 0.088606 > 0.069505.

The real exchange rate (q^g_{tpk})turned significant with the expected sign in the

model but only at lag-2 i.e. q^g_{t-2pk}. However, $q^g_{t-1pk}$is also included in the model for avoiding the model misspecification problem. The results show that a rise of q^g_{tpk}also brings increase in π^g_{tpk}via imports channel. The dummy variable (D_{Inf2}) for the second high inflation period i.e. 1974 is also still significant with the expected sign, however, like table 5.14 D_{Inf1} is still insignificant.

The value of the adjusted R^2 value shows that the model is improved with the inclusion of q^g_tin the model as compared to table.5.14 i.e. 0.53 > 0.45. Similarly, the DW statistic value is 1.76. The reliability of the results is confirmed by the post diagnostic tests i.e. Q-statistic, LM test and CUSUM stability tests which are given in Appendix A.

Table. 5.16: Wald test Results for table. 5.15

Dependent Variable: π^g_{tpk}

Explanatory Variables	F-Statistic
y^g_{tpk}, m^g_{t-1pk}, m^g_{t-2pk}, q^g_{t-1pk}, q^g_{t-2pk}, π^g_{t-1pk},	43.16**

Asterisks "** "stands for 95% confidence level

For the overall significance of the model the F/ Wald statistic has been used. The results are given in table. 5.16. It is found that overall all the variables in the model are also significant altogether.

5.5.3. Results for the Open Economy Phillips curve model with Regime Shifts

Section. 5.5.3 shows the results computed for the open economy Phillips curve model with regime shifts. These results are given in table. 5.17 which are as below.

Table. 5.17: Results for the Open Economy Phillips-curve model with Regime Shifts

[OLS Estimation, 1975-2010]: Dependent Variable: π^{g}_{tpk}

	Adjusted Sample: 1977-2010	
Parameters	Estimates	(Standard Error)
y^{g}_{tpk}	0.337629**	(0.100329)
y^{g}_{t-1pk}	-0.326660**	(0.109354)
m^{g}_{t-1pk}	0.291045***	(0.066516)
m^{g}_{t-2pk}	-0.280448**	(0.105832)
q^{g}_{t-1pk}	0.146702**	(0.069324)
q^{g}_{t-2pk}	0.192017***	(0.057707)
π^{g}_{t-1pk}	0.330177**	(0.132275)
D_{Inf1}	6.385769***	(1.381957)
D_{Regm1}	1.994410**	(0.615235)
R^2	0.73	
$AdjR^2$	0.63	
DW	1.84	

- The asterisks "*", "**", "***" stand for 90%, 95%, and 99% confidence level.
- The regressions results given in the table are the best obtained results on the basis of post diagnostic tests i.e. Q statistic, LM test and CUSUM stability tests.
- Insignificant variables including the intercept are dropped from the model.

Similarly, for examining the impact of two regimes shifts on inflation two dummy variables i.e. ($D_{Regm1} = 0$, $D_{Regm2} = 0$) are also included in the open economy model. The results are shown by table.5.17. The results show thaty^{g}_{tpk} is significant not only contemporaneously but also at first lag i.e. y^{g}_{t-1pk}.

However, its overall impact on $\pi^{g}_{tpk}$is still positive i.e. 0.291045 and -0.280448. This result is consistent with the Coe and McDermott (1996) who obtained the same results for Japan and Philippines. m^{g}_{tpk}also remained significant at both lags i.e. $m^{g}_{t-1pk}$and m^{g}_{t-2pk}. Also its overall impact on π^{g}_{tpk} is still positive i.e. 0.291045 and - 0.280448.

However, with the inclusion of the dummy variable for the regime shifts q^g_{tpk} become significant both at $q^g_{t-1pk}$and q^g_{t-2pk} with the expected signs. $\pi^g_{tpk}$is also positively significant but only at first lag i.e π^g_{t-1pk}.

Similarly, D_{Inf2} is still expectedly significant whereas and remained insignificant like table5.14 and 5.15. The dummy variables i.e. $D_{Regm1}$and $D_{Regm2}$are also included in the model. However, D_{Regm1} turned significant and D_{Regm2}remained insignificant and dropped from the model. The results show that a shift from fixed to managed float exchange rate system also influence inflation. The adjusted R^2 value is also comparatively greater i.e. 0.63 > 0.53 > 0.45 which showed that the results are improved. The DW statistic value is 1.84. The reliability of the results is confirmed by using the Q-statistic, LM statistic and CUSUM stability tests which are given in appendix A.

Table 5.18 Wald test Results for table. 5.17

Dependent Variable: π^g_{tpk}

Explanatory Variables	F-Statistic
y^g_{tpk}, y^g_{t-1pk}, m^g_{t-1pk}, m^g_{t-2pk}, q^g_{t-1pk}, q^g_{t-2pk}, π^g_{t-1pk}, D_{Inf2}, D_{Inf1}	85.31**

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

For the overall significance of the model the F/ Wald statistic has been used. The results are given in table. 5.18. It is found that overall all the variables in the model are also significant altogether.

5.5.4. Summary

Overall the econometric estimations show that real exchange depreciations raised inflation in Pakistan. Moreover, it is found that domestic output and money supply gaps also showed positive relationship with the inflation. Also, inflation is found to be dependent on its past performance. Finally, the interaction between the exchange rate regime switches of the SBP and inflation is also found to be positive.

5.6 Results for the Foreign Exchange Reserves Models

Finally for examining the role of the RER in the determination of the FER in Pakistan some more result has been computed which are reported in table.5.19. First, some regressions have been run for investigating the relationship between the real exchange rate and the foreign exchange reserves of Pakistan. These results are based on the backward looking model showed by equation (3.25). After that the two dummy variables representing the two regimes shifts i.e. ($D_{Regm1} = 0$, $D_{Regm2} = 0$) have been included in the model for examiningwhether exchange rate systems shifts have any relationship with the foreign exchange reserves holdings in Pakistan or not. These results have been estimated on the basis of equation (3.26). The results are given as under:

Table.5.19: Results for the Foreign Exchange Reserves Models

Dependent Variable: fr^{g}_{tpk} Method: Least Squares

Sample Size: 1975-2010

Adj:Sample/s1975-2010	1975-2010	1975-2010	1975-2010	1975-2010	1975-2010	1975-2010
	Regression-1	Regression-2	Regression-3	Regression-4	Regression-5	Regresion-6
Independent Variables	Coefficient (S.E)	Coefficient (S.E)	Coefficient (S.E)	Coefficient (S.E)	Coefficient (S.E)	Coefficient (S.E)
q^{g}_{t-1pk}	--------	-1.41(1.48)	-0.41(1.37)	-0.11(1.44)	0.87(1.86)	0.89(1.88)
q^{g}_{t-2pk}	--------	-0.74(1.20)	-0.84 (1.07)	-0.07(0.90)	0.69(1.53)	0.79(1.47)
q^{g}_{t-3pk}	--------	1.49(1.16)	1.51(0.94)	2.27***(0.70)	2.62**(0.96)	2.74***(0.87)
q^{g}_{t-4pk}	--------	2.07**(0.94)	1.84**(0.84)	2.86**(0.93)	3.16**(1.09)	3.24**(1.10)
q^{g}_{t-5pk}	--------	1.26*(0.61)	1.05(0.65)	1.56**(0.74)	1.65*(0.86)	1.70*(0.87)
rgr^{g}_{tpk}	2.40***(0.77)	2.86***(0.72)	2.32***(0.56)	2.69***(0.55)	2.89***(0.69)	2.92***(0.65)
$rrrr^{g}_{tpk}$	0.54**(0.18)	--------	0.56***(0.14)	0.58***(0.15)	0.68***(0.14)	0.70***(0.13)
F_{tpk-1}	-0.27(2.61)	--------	--------	3.61*(2.02)	3.46*(1.88)	4.02*(1.93)
D_{bgtpk}	--------	--------	--------	--------	17.76**(8.36)	18.32**(8.13)
D_{bgtpk2}	--------	--------	--------	--------	--------	7.29**(2.67)
R^2	0.34	0.39	0.51	0.56	0.56	0.57
Adj R^2	0.21	0.26	0.36	0.40	0.40	0.40
DW	1.49	1.60	1.71	1.81	1.80	1.88
F test for $\sum q^{g}_{tpk}$	5.73***	7.44***	12.91***	15.86***	13.70***	19.88***

- Asterisks "*", "**", "***" stands for 90%, 95%, and 99% confidence level.
- Figures in parenthesis show the SEs (Standard Errors) of the estimates.
- A rise in real exchange rate refers to devaluation/depreciation.

5.6.1 Results without Regime Shifts

In table.5.19, columns 1, 2, 3, 4, 5 and 6 show the different versions of our computed results. First, results have been derived without accounting for the regimes switches which is showing by the two constraints i.e. ($D_{Regm1} = 0$, $D_{Regm2} = 0$).

These results are given in column-1, 2, 3 and 4. The results given in column-4 show the results for our complete model where we included all the mercantilist and precautionary measures. Whereas, columns-1, 2 and 3 reports the results with different modifications.

These results have been derived under the constraint of zero (0) constant. This zero (0) restriction has been imposed on the model because the intercept term remained insignificant in all the regressions. From the results, in column-4 it can be seen that q^g_{tpk} is statistically significant at lag 3, 4 and 5 but at lag 1 and 2 q^g_{tpk} remained insignificant with the unexpected negative signs However, it is included in the model avoid the problem of any specification bias. F/Wald test has been run for the overall significance, which confirmed that all the variables i.e. $\sum q^g_{tpki}$ (i.e. q^g_{t-1pk}, q^g_{t-2pk}, q^g_{t-3pk}, $q^g_{t-4pk}$and q^g_{t-5pk}) belong to the model and can be included in the model. The sign of the q^g_{tpk}isposition which is according to the expectations showing the importance of the exportchannel in tracking the fer^g_{tpk} holdings in Pakistan. This result is in line with the mercantilist approach that a rise in q^g_{tpk}(devaluation/depreciation) via improvement in the export competitiveness increases the fer^g_{tpk} inflow in a country and oppose to Wei (2010) who for Chinese economy found that the appreciation RMB against the dollar increases the demand for its exported goods, thus bring increase in the holdings of the foreign exchange reserves in the country. However, the Wei (2010) results cannot be generalized to Pakistan economy as China has a large national and international demand for its exported goods. However Pakistan is a dependent country for its imports and its exports structure is very weak like other developing countries, hence a decrease

in the q^g_{tpk} (an appreciation of the rupee value together with a rise in the inflation) can reduce the inflow of the foreign currency in the country via channels of export demand, foreign capital flows etc. This result for the q^g_{tpk}has also supported by the Delatte and Fouquav (2009) who pointed out that in the emerging countries, the central banks value more a country's international competitiveness and the exchange rate play a key role in their export led growth strategies. In the model, two measures $api^g_{tpk}$and i^g_{td-1}have also been incorporated for investigating whether, the fer^g_{tpk} is also determined by the precautionary measures in Pakistan or not. It has been found that both the variables api^g_{tpk} and the i^g_{td-1}showed a significant impact on the fer^g_{tpk}. However, the sign of the resulted sign of the api^g_{tpk} is positive which is according to the expectations and consistent with the theoretical prediction of the traditional buffer-stock model. However, i^g_{td-1}showed an unexpected positive sign. This positive sign of the i^g_{td-1}show that the opportunity cost channel might be of minimum importance for a developing country like Pakistan where a greater stock of FER can be used for multiple purposes i.e. stabilization of the rupee value in the foreign exchange market, imports payments, debt payments and inflation control etc. Edison (2003) and Aizenman and Marion (2004) mentioned that the opportunity cost of capital has little importance for most of the countries, because most of the studies found it insignificant or significant with wrong sign. Similarly, the variable rem^g_{tpk} turned significant but with the expected positive sign. This positive sign of the rem^g_{tpk} show that as remittances is the main source of capital inflow in the country, hence an increase in it will also rise the foreign exchange reserves holdings in Pakistan. Also they considered the relationship between the remittances and foreign exchange reserves significant although its t- value is only 1.27 etc.

Furthermore it has been found that the R^2 of the model is 0.56 which show that most of the variations in the fer^g_{tpk} is explained by our explanatory variables. However, it can be seen that the R^2 value obtained from this model is comparatively greater i.e. $0.56 > 0.51 > 0.39 > 0.34$. Also the Durbin Watson statistic value is 1.81

which showed these results are reliable. For further confirmation Q-statistic, LM-statistic and CUSUM stability tests are applied which verified the reliability of these results (See, Appendix. A for detail).

On the other hand, results for the different versions of the model have also been computed to show the importance of the different measures in our model. These results have been placed in column-1, 2 and 3 of table.5.19. In column-1 those results are kept where q^g_{tpk} have not been not included. The main purpose here is to analyze the relationship of the precautionary measures with the fer^g_{tpk} in the absence of q^g_{tpk}. Here rem^g_{tpk} has also been included as an additional variable. Here, these results are almost the same in terms of significance and magnitudes apart from i^g_{td-1}, which this time remained insignificant but with negative sign. However, the R^2 value here is only 0.34 which shows that the explanatory power of the model become weak with the exclusion of the q^g_{tpk} from the model. This result clearly show that the fer^g_{tpk} holdings in Pakistan cannot be determined by only the precautionary measures. These results are further supported by the low value of the DW statistic i.e. 1.49. Similarly, the results in the other two columns i.e. 2 and 3 show that when we account for the q^g_{tpk} in our model, the explanatory power of the model increases in comparison to the column-1 results i.e. $0.51 > 0.39 > 0.34$. Also, the DW values showed improvement i.e. $1.71 > 1.60 > 1.49$. Another striking result which has been received here is that is the consistent significance and positive sign of the api^g_{tpk} in all the models. Similarly, another important result is the significance of the rem^g_{tpk} in the model. This positive significance relationship of the rem^g_{tpk} with the fer^g_{tpk} in column-3 show that the explanatory power of the model increased only when we also consider the rem^g_t in the model besides the q^g_{tpk}. The q^g_{tpk} remained insignificant at lag-1, 2 and 3 in the first two columns and also borderline[41] significant at lag-5 in column-3. However, in the complete model reported in column-4, q^g_t remained insignificant at lag-1 and lag-2 only. F-test has been run for the overall significance of all the results which supported the inclusion of these variables in the model.

5.6.2 Results with Regime Shifts

After the computation of the above results following the second objective of this study here, accounting for the role of the two regime shifts the constraints i.e. ($D_{Regm1} = 0$, $D_{Regm2} = 0$) have been relaxed. These results are given in columns 5 and 6 of table. 5.19. The main purpose here is to find out whether the exchange rate policies of the State Bank of Pakistan are relevant to the foreign exchange reserves holdings in Pakistan or not. Column-6 shows the complete results. The results show that both the dummy variables i.e. ($D_{Regm1} = 0$, $D_{Regm2} = 0$) are significant but with positive signs. Although these results are opposed to the theoretical expectations and some empirical conclusions derived for the developedcountries,however, these positive signs of both the ($D_{Regm1} = 0$, $D_{Regm2} = 0$)seems plausible specifically in the context of a developing country like Pakistan. Where the $fer^{g}_{tpk}$is required for many purposes. These results are also squared with the historical experience of Pakistan. These results show that with the shifts towards the more floating regime, the stock of fer^{g}_{tpk}in the country increased over time. All the other variables i.e. q^{g}_{t-3pk}, q^{g}_{t-4pk}, q^{g}_{t-5pk}, api^{g}_{tpk}, rem^{g}_{tpk}, i^{g}_{td-1} are still significant with the same signs and significance levels. Although i^{gtd-1} turned significant in our model however, its coefficient sign never become negative. The F/Wald test has been run for the overall significance which shows that all the explanatory variables can be kept in the model. With the inclusion of the dummy variables in the model the R^2 value is increased to 0. 57. The Durbin Watson statistic value also raised to 1.88 which is given in column-6 supporting that our results are reliable. Further these results have been confirmed with the post diagnostic results i.e. Q-statistic, LM-statistic and CUSUM stability test (For detail see Appendix. A). Summing up, overall a significant positive relationship between the q^{g}_{tpk} and the fer^{g}_{tpk}, which shows that the benchmark mercantilist approach has applications in the historical experience of Pakistan. Similarly the significance of the other variables i.e. api^{g}_{tpk} and i^{g}_{td-1} also pointing out that fer^{g}_{tpk} holdings in the country are also subject to the precautionary measures. Moreover, the results about the exchange rate systems show that exchange

rate systems shifts towards the more floating regime positively influence the fer^{δ}_{tpk}holdings in Pakistan.

5.6.3.Summary

The econometric estimates show that large reserves holdings in Pakistan is the by-product of the export led growth strategies of the State Bank of Pakistan. Also the significance of the trade openness pointed out that precautionary motives also explain these reserves accumulations. Similarly, remittances also remained significant with the expected positive sign. Also contrary to the theoretical arguments that under the fixed exchange rate systems the central banks reduce the demand for the reserves, the floating regimes switches policies of the State Bank of Pakistan boost up reserves holdings in Pakistan. These findings are in equality with empirical outcomes of many studies for other Asian countries.

CHAPTER – 6

CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1 Introduction

This chapter summarizes the entire work of the study. First, the major findings and contributions of the study have been briefly discussed. After that in the light of the empirical results, some policy recommendations have been suggested. Finally, keeping in view the importance of the real exchange rate for the monetary policy and macroeconomic performance, some guidelines for the future research work have also been presented.

6.2 Major Findings and Conclusions

The breakdown of Bretton Woods in 1970s, led most of the world economies towards the adoption of flexible exchange rate system. This new progress raised the importance of exchange rate (nominal & real) in the overall macroeconomic performance and it became the central focus of both the researcher and policy makers. Exchange rate in nominal shows the price of one currency in terms of another currency.

In contrast, the RER measures the proportionality between the purchasing power of two countries' currencies by also taking into account the price levels. A stable RER plays a significant role in an economy and instability of it not only destabilizes the key macro-economic indicators, but it also results in the failure of the monetary policy. It works as standard parameter for the countries in the judgment of their trade competitiveness in the international exports and imports markets.

This study has been carried out with several objectives. First the factor causing fluctuations in the RER of Pakistan have been uncovered. After that, an attempt has been made to find out whether the State Bank of Pakistan (SBP) reacts to

the RER (RER) movements in its monetary policy. Further, it has been analyzed whether the RER the impact of the RER devaluations put contractionary or expansionary effects on the output of Pakistan. Then the impact of the RER on the inflation of Pakistan has also been investigated. Likewise, the influence of the real depreciations on the foreign exchange reserves of Pakistan has also been studied. Finally, the impact of the exchange rate systems on RER, monetary policy, output, and price level and foreign exchange reserves of Pakistan have been explored.

The literature is still subject to disagreement on these relationships. Some studies concluded that real demand and supply factors, whereas, others mentioned that monetary factors affect the RER. Similarly, a few studies undertaken so far on Pakistan focused only on the domestic determinants of RER. Second, concerning with the role of the RER in the monetary policy, the literate shows that despite large number of studies conducted both for the developed and developing countries, no work has been carried out so far on Pakistan. Third, previous studies tested the contractionary hypothesis of real devaluations, provided contradictory results. The followers of the conventional theories (i.e. elasticities, absorption, Keynesian) claimed that real devaluations increase the output. However, the recent evidences of the new structuralisteconomists showed that real depreciations results in the contraction of output level in an economy.

Moreover, no study before, examined the relationship between the RER and output for Pakistan. Fourth, the literature about the RER and inflation shows that previous studies limited their focus on the conventional and micro founded Phillips curve modeling of inflation in Pakistan. No study before used a backward looking Phillips curve approach for examining the inflationary effects of real devaluations for Pakistan. Fifth, investigating theimpact of the RER on foreign exchange reserves, some studies used the buffer stock model by arguing that reserves holdings in these countries are increased by the precautionary motives. In contrast, others claimed that the mercantilist motives triggered these huge

reserves stocks. Also earlier studies for Pakistan adopted only a buffer stock approach for modeling foreign exchange reserves holdings in Pakistan and no study used a mercantilist framework so far. Sixth, the literature indicates that studies for Pakistan also never analyze the links of the exchange rate systems with the RER, monetary policy and macroeconomic aggregates i.e. output, price level and foreign exchange reserves. The present study has been conducted to make these additions to the literature.

For modeling the relationships between the dependent and explanatory variables to accomplish the study objectives, different approaches like Taylor rule, IS curve, Phillips Curve and Mercantilist having solid theoretical backgrounds have been used. For the empirical investigation, annual data over the period 1975 to 2010 collected from different sources including international financial statistics, fifty years statistics of SBP and World Development Indicators have been used. The time period of the study covering the period, 1975-2010 is selected so that it also consist of the three exchange rate systems i.e. Fixed (1975-1981) Managed Float (1982-1999) and Floating (2000-2010) adopted by the SBP during the study period. For checking the unit in the data Augmented Dickey Fuller (ADF) test is used which showed that all the variables are non-stationary at level and showing trend. Hence, Hodrick-Prescott (HP) filter method has been applied for the decomposition of the observed series into cyclical and trend components to avoid the problem of spurious regression. Ordinary Least squares technique has been utilized for the estimation of the regression models. Wald test is used for the overall significance of the models. Diagnostic tools like, Q-statistic, LM test, Newy-West test and CUSUM stability tests are used for getting reliable and stable regressions results.

First concerning with the factors causing fluctuations in the RER of Pakistan, the results showed that both domestic and foreign variables i.e. domestic trade balance, domestic remittances, domestic inflation, domestic interest rate, foreign interest

rate and inflation affected the real exchange of Pakistan during the study period. Moreover, the dummy variable represents the shift from fixed to managed float regime also turned significant, showing that exchange rate policies of the State Bank of Pakistan also affected the rupee RER.

Similarly, examining the role of the RER in the monetary the results for the full sample period showed that SBP reacts to RER fluctuations in its Taylor rule based monetary policy in addition to output and inflation gaps. Similarly, analyzing whether the monetary policy of Pakistan is constant on the exchange rate regimes, the results showed that the monetary policy in Pakistan has remained constant on the different exchange rate systems followed by the SBP during the study period. The output gap showed a positive relationship with the interest rate and remained significant under all the systems, whereas inflation turned out significant only for the floating period. However, the coefficient of RER never showed a significant relationship with the interest rate under any exchange rate system.

Answering the question "are real depreciations expansionary or contractionary in Pakistan in the framework of an open economy IS curve framework, the main findings of the study were that RER depreciations put expansionary effects on the output gap in Pakistan.

In other words, it decreased the output level. The results also showed that exchange rate systems movements are related to the output gap in Pakistan.

Dealing with the impact of real depreciations on the RER in an open economy, Phillips curve framework and the econometric estimations showed that RER depreciation raised inflation in Pakistan. It has also been found that domestic output and money supply gaps showed relationship with inflation. Finally, the interaction between the exchange rate regime switches of the State Bank of Pakistan and inflation has also been found to be positive.

The relationship between the RER and foreign exchange reserves holdings in Pakistan has also been analyzed in the framework of the mercantilist approach. The results showed that large reserves holdings in Pakistan are the by-product of the export led growth strategies of the State Bank of Pakistan. Moreover, the significance of the trade openness pointed out that precautionary motives also explain these reserves accumulations. Similarly, remittances also remained significant with the expected positive sign. Also contrary to the theoretical arguments that under a fixed exchange rate system, the central banks reduce the demand for the reserves, it has been found that the floating regimes switches policies of the State Bank of Pakistan boosted reserves holdings in Pakistan.

6.3 Policy Recommendations

The following policy recommendations have been suggested on the basis of the main findings of the study.

- High and persistent inflation remained one of the major characteristics of the economy of Pakistan. The economy experienced high and low inflationary episodes since independence. These up and downward trends in inflation contributed significantly to the devaluation of real exchange rate of rupee. For this purpose, it is required for the monetary authorities to implement proper policies for keeping inflation at a reasonable level.
- The worse trade balance of Pakistan is also one of the major factors contributed to the devaluation of Pakistan rupee. If the government wants to stabilize the exchange rate of rupee, steps for the reduction of trade deficit should be taken. However, in this regard the appropriate policy for the government can be to focus on the import substitution policies, improvement of Labor skills and usage of modern technology instead of evaluation of rupee.
- Another finding from the study is that nominal factors (domestic and

foreign) have greater influence on the real exchange rate as compared to real shocks. Hence, it is suggested that only a stable monetary policy can help in making exchange rate stable. However instead of following a discretionary policy by targeting the monetary aggregates, a timely and rule based monetary policy can be more helpful in this regard.

- The exports of Pakistan are heavily dependent on imports. Hence, for this purpose the best policy option for the government is to find new markets for its imports and exports. Especially, the trades negotiations with the neighboring countries will not only save the transportation cost but will also provide broader market for exports.
- Money supply also turned positively significant in the inflation model. This shows that the State Bank of Pakistan should control the excess of the supply of money for bringing inflation under control and for making the rupee value stable.
- A large stock of foreign exchange reserves shows the financial strength of a country. In developing economy like Pakistan, a large quantity of foreign exchange reserves can be helpful not only for the management of exchange rate policies but also for the overall macroeconomic policies such as repayment of external debts, boosting exports, funding developmental projects, defending capital flights, employment and financial sector development.
- Therefore, the authorities should try to minimize the imbalances in the balance of payments account by taking measures such as enhancing exports by ensuring quality and competitiveness and attracting foreign direct investment by providing good-looking and friendly domestic investment environment.

- The significance of the exchange rate in the foreign exchange model shows that following the export competitiveness policies

throughdevaluations is not the solution of the problem. Because, its impact on the overall economy is negative. The government should revise its policies with focus on the real side of the economy.

- The results also showed that workers' remittances are also one of the most important sources of increase of foreign exchange reserves holdings in the country. Hence, the government should also take steps for the workers employment in foreign countries for increasing the inflow of remittances in Pakistan.
- Although the study showed that a more flexible regime is inflationary and widens the output gap in Pakistan. However, if properly plan, a floating exchange rate system can help the State Bank of Pakistan to follow an independent monetary policy by using real exchange rate as a nominal anchor.

6.4 Guidelines for Future Research

Keeping in view the limitations of the study and the significance of the real exchange rate for the monetary policy and macroeconomic variables, the following areas have been identified for the future research work:

This study has been conducted for a single developing country Pakistan. Although the study made some important contributions to the literature, however a cross countries analysis for Pakistan against its major trading partners, Asian countries or other developing countries where the issues like fluctuations in the nominal or real exchange rate and its linkages with the monetary policy and macroeconomic aggregates are discussed can produce some better policy implications which can be more helpful for the government in the implementation of macroeconomic policies in the future.

This study was limited to the short term analysis of the real exchange rate and its relationship with the monetary policy and output, price level and foreign exchange

reserves holdings. However, a more interesting research work in this regard can be to discuss these issues in the long run or carrying out a comparative analysis of it both in the short and long run. This type of study is required for Pakistan for the management of its long run strategies.

Moreover, this research work was based on annual data. However, to know about the relationships between study variables it will be more interesting to convert this annual data into monthly or quarterly series through different interpolation techniques for the analysis of these issues. A study based on monthly or quarterly data will enable the researcher to undertake a full and sub-sample analysis for the discussion of all these issues which can be helpful in the proper understanding of the role of different exchange rate policies in the macro-economic performance and monetary policy of the country.

Furthermore, instead of using a single equation approach a system approach for examining the interrelationship between the real exchange rate, monetary policy and macro-economic aggregates with the application of some econometric techniques i.e. co-integration, VAR and 2SLS as another challenging issue, has never been examined for Pakistan.

Also the focus of this study was only on the determinants of real devaluations, depreciation and its implication for the monetary policy and economic performance of Pakistan. However, conducting this study by focusing on both depreciations and appreciations is another interesting area for future research work.

In this study, backward looking theoretical frameworks have been used for examining the impact of contemporaneous and past variables on real exchange rate, interest variables and output, inflation and foreign exchange reserves. However, with the growing importance of future expectations in policy formulations, a forward looking approach can also be adopted for investigating these issues in Pakistan.

Another area for the future research work is to analyze the role of nominal or real exchange rate in the monetary policy of State Bank of Pakistan when it follows a number of policy rules.

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APPENDICES

Appendix-A

Figure. A1: Q-Statistics Results for Regression-1 of Table.5.1

Corrlelogram-Q-Statistics
Sample: 1979-2010

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

Table.A1:Breusch-Godfrey Serial Correlation LM Test Results for Regression-1 of Table.5.1

LM Test	Estimated Values	P-Values
F-statistic	0.427012	0.7871
Obs*R-squared	2.921603	0.5710

Figure.A2: CUSUM Stability Test for Regression-1of Table.5.1

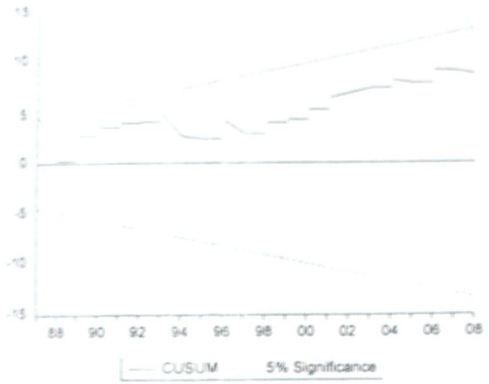


Figure.A3: CUSUM Squares Stability Test for Regression-1 of Table.5.1

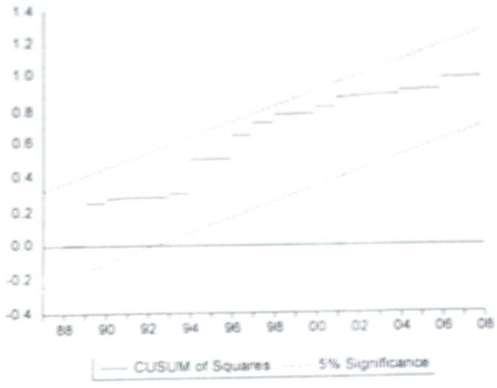


Figure. A4: Q-Statistics Results for Regression-2 of Table.5.1

Corrlelogram-Q-Statistics
Sample: 1979-2010

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

Table.A2:Breusch-Godfrey Serial Correlation LM Test Results for Regression-2 of Table.5.1

LM Test	Estimated Values	P-Values
F-statistic	1.798067	0.1758
Obs*R-squared	9.479954	0.0502

Figure.A5: CUSUM Stability Test for Regression-2of Table.5.1

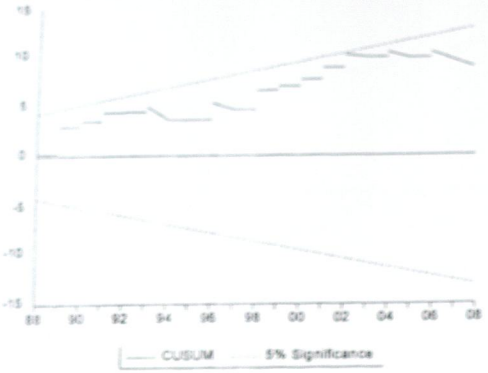


Figure.A6: CUSUM Squares Stability Test for Regression-2 of Table.5.1

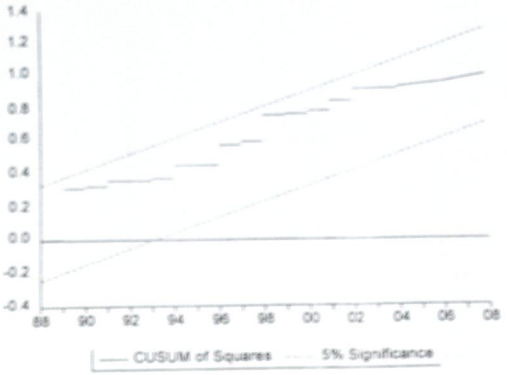


Figure. A7: Q-Statistics Results for Regression-1 of Table.5.3

Corrlelogram-Q-Statistics
Sample: 1979-2010

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

Table.A3: Breusch-Godfrey Serial Correlation LM Test Results for Regression-1 of Table.5.3

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

Figure.A8: CUSUM Stability Test for Regression-1of Table.5.3

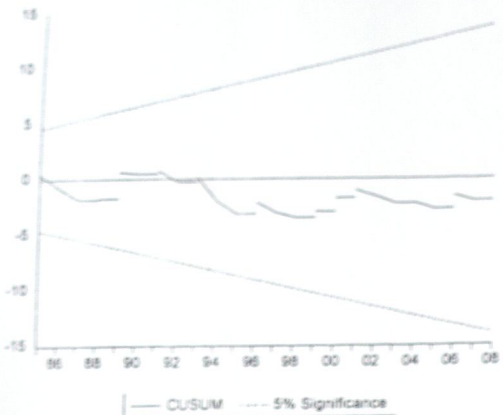


Figure.A9: CUSUM Squares Stability Test for Regression-1 of Table.5.3

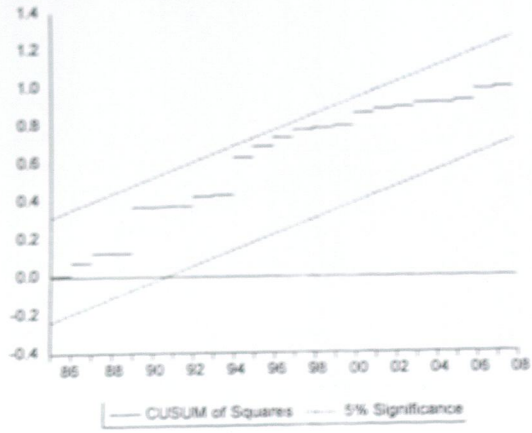


Figure. A10: Q-Statistics Results for Regression-2 of Table.5.3

Correlogram-Q-Statistics
Sample: 1979-2010

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

Table.A4: Breusch-Godfrey Serial Correlation LM Test Results for Regression-2 of Table.5.3

LM Test	Estimated Values	P-Values
F-statistic	1.191709	0.3464
Obs*R-squared	6.303930	0.1776

Figure.A11: CUSUM Stability Test for Regression-2of Table.5.3

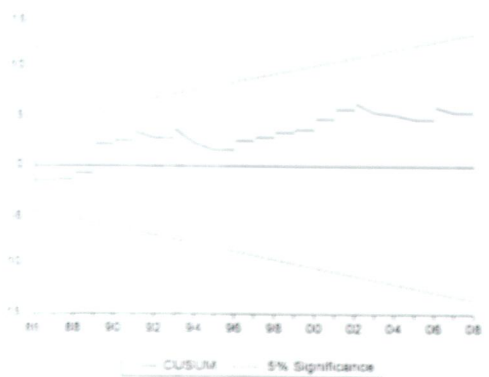


Figure.A12: CUSUM Squares Stability Test for Regression-2 of Table.5.3

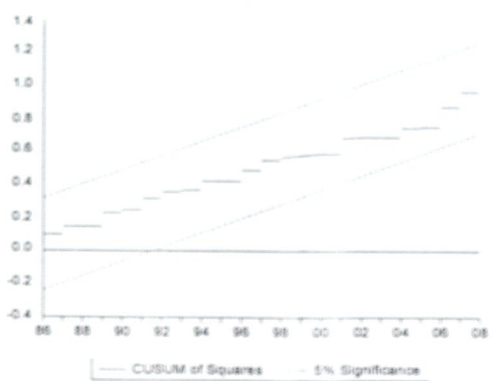


Figure. A13: Q-Statistics Results for Regression-2 of Table.5.7

Correlogram-Q-statistics
Sample: 1978-2010

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
|*. |	|*. |	1	0.119	0.119	0.5151	0.473
|*. |	|. |	2	0.085	0.072	0.7840	0.676
|*. |	|*. |	3	0.194	0.180	2.2398	0.524
**| . |	***| . |	4	-0.309	-0.373	6.0472	0.196
| . |	| . |	5	-0.025	0.047	6.0733	0.299
| . |	| . |	6	-0.031	-0.027	6.1132	0.411
*| . |	| . |	7	-0.165	-0.022	7.3174	0.397
|*. |	| . |	8	0.076	-0.010	7.5845	0.475
| . |	| . |	9	0.032	0.059	7.6350	0.571
| . |	| . |	10	0.004	0.009	7.6357	0.664
| . |	. *| . |	11	0.017	-0.089	7.6503	0.744
| . |	|*. |	12	0.068	0.115	7.9031	0.793
| . |	. *| . |	13	-0.055	-0.082	8.0807	0.838
*| . |	. *| . |	14	-0.133	-0.135	9.1485	0.821
*| . |	. *| . |	15	-0.069	-0.081	9.4528	0.853
**| . |	. *| . |	16	-0.273	-0.184	14.523	0.560

Table.A5: Breusch-Godfrey Serial Correlation LM Test Results for Regression-2 of Table.5.7

LM Test	Estimated Values	P-Values
F-statistic	0.601337	0.6217
Obs*R-squared	2.730339	0.4351

Figure.A14: CUSUM Stability Test for Regression-2of Table.5.7

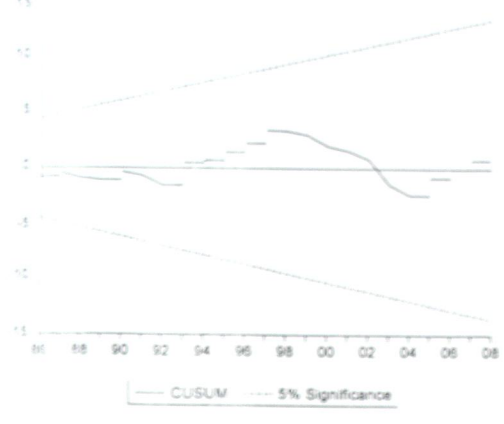


Figure.A15: CUSUM Squares Stability Test for Regression-2 of Table.5.7

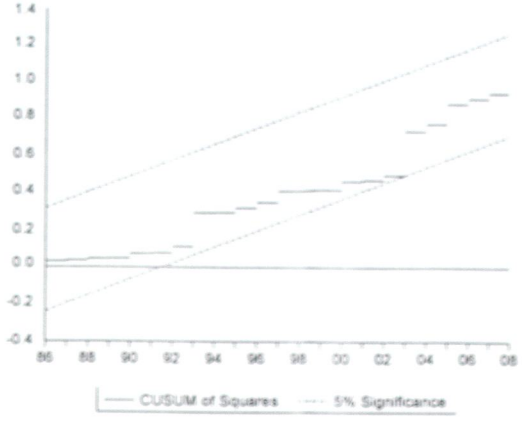


Figure. A16: Q-Statistics Results for Regression-3 of Table.5.7

Correlogram-Q-statistics
Sample: 1977-2010

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.010	0.010	0.0036	0.952
.*| . |	.*| . |	2	-0.067	-0.068	0.1777	0.915
. |*. |	. |*. |	3	0.087	0.089	0.4747	0.924
. | . |	. | . |	4	-0.057	-0.065	0.6096	0.962
. |*. |	. |*. |	5	0.130	0.146	1.3199	0.933
. | . |	. | . |	6	-0.008	-0.034	1.3230	0.970
.*| . |	.*| . |	7	-0.170	-0.141	2.6342	0.917
.*| . |	.*| . |	8	-0.105	-0.136	3.1538	0.924
**| . |	**| . |	9	-0.219	-0.235	5.5120	0.788
. | . |	. | . |	10	0.049	0.045	5.6327	0.845
. | . |	. | . |	11	-0.027	-0.061	5.6720	0.894
. | . |	. |*. |	12	0.024	0.123	5.7038	0.930
. | . |	. | . |	13	0.072	0.071	6.0035	0.946
. | . |	. |*. |	14	0.062	0.142	6.2405	0.960
. | . |	.*| . |	15	-0.022	-0.093	6.2720	0.975
.*| . |	.*| . |	16	-0.086	-0.189	6.7744	0.977

Table.A6: Breusch-Godfrey Serial Correlation LM Test Results for Regression-3 of Table.5.7

Test Statistics	Estimated Values	P-Values
F-statistic	0.073095	0.9297
Obs*R-squared	0.224438	0.8938

Figure.A17: CUSUM Stability Test for Regression-3of Table.5.7

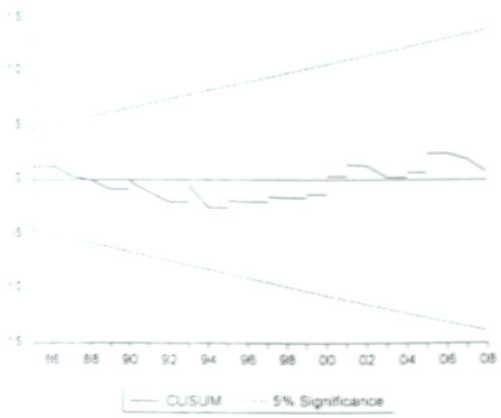


Figure.A18: CUSUM Squares Stability Test for Regression-3 of Table.5.7

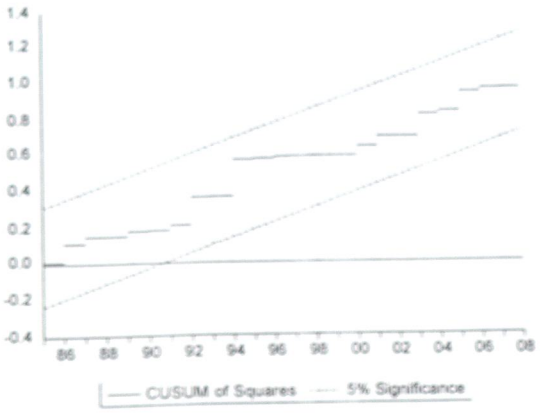


Figure. A19: Q-Statistics Results for Table.5.10

Correlogram-Q-Statistics
Sample: 1980 - 2010

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
| . |	| . |	1	0.047	0.047	0.0724	0.788
|* . |	|* . |	2	0.208	0.207	1.5616	0.458
|** . |	|** . |	3	0.344	0.342	5.7731	0.123
.*| . |	.*| . |	4	-0.091	-0.161	6.0790	0.193
|* . |	| . |	5	0.179	0.049	7.3067	0.199
| . |	| . |	6	0.023	-0.054	7.3272	0.292
**| . |	.**| . |	7	-0.221	-0.224	9.3740	0.227
|* . |	| . |	8	0.121	0.058	10.008	0.264
.*| . |	| . |	9	-0.142	-0.028	10.936	0.280
.*| . |	| . |	10	-0.112	-0.023	11.541	0.317
| . |	| . |	11	0.011	-0.044	11.546	0.399
.*| . |	| . |	12	-0.154	-0.004	12.818	0.382
| . |	| . |	13	0.034	0.059	12.884	0.457
| . |	.*| . |	14	-0.064	-0.081	13.128	0.516
.*| . |	.*| . |	15	-0.143	-0.081	14.429	0.493
.*| . |	.**| . |	16	-0.175	-0.291	16.538	0.416

Table.A7: Breusch-Godfrey Serial Correlation LM Test Results for Table.5.10

LM Test	Estimated Values	P-Values
F-statistic	0.599206	0.5844
Obs*R-squared	5.800250	0.0550

Figure.A20: CUSUM Stability Test for Table.5.10

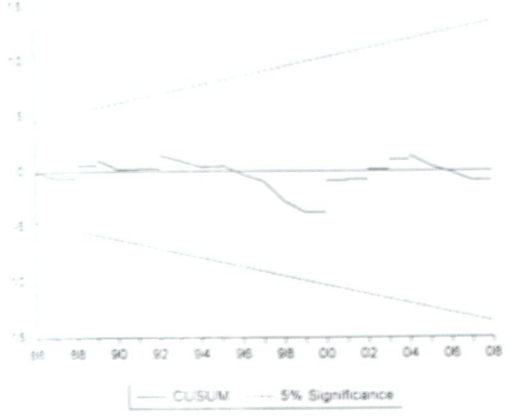


Figure.A21: CUSUM Squares Stability Test for Table.5.10

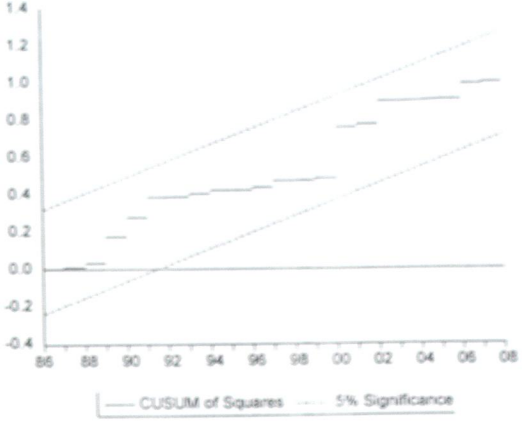


Figure. A22: Q-Statistics Results for Table.5.12

Correlogram-Q-Statistics
Sample: 1981 - 2010

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.**| . |	.**| . |	1	-0.238	-0.238	1.8755	0.171
.|* . |	.| . |	2	0.079	0.024	2.0917	0.351
.|** . |	.|** . |	3	0.321	0.366	5.7485	0.125
.**| . |	.**| . |	4	-0.374	-0.267	10.911	0.028
.| . |	.**| . |	5	-0.006	-0.252	10.913	0.053
.| . |	.*| . |	6	-0.059	-0.174	11.051	0.087
.**| . |	.*| . |	7	-0.323	-0.178	15.401	0.031
.|* . |	.| . |	8	0.107	0.013	15.898	0.044
.*| . |	.*| . |	9	-0.119	-0.067	16.550	0.056
.| . |	.| . |	10	-0.046	-0.048	16.651	0.082
.|* . |	.*| . |	11	0.129	-0.087	17.486	0.094
.*| . |	.*| . |	12	-0.086	-0.116	17.879	0.119
.|* . |	.| . |	13	0.100	-0.033	18.440	0.142
.| . |	.| . |	14	0.044	-0.046	18.557	0.183
.|* . |	.|** . |	15	0.137	0.246	19.761	0.181
.*| . |	.**| . |	16	-0.117	-0.208	20.701	0.190

Table.A8: Breusch-Godfrey Serial Correlation LM Test Results for Table.5.12

LM Test	Estimated Values	P-Values
F-statistic	0.902729	0.4627
Obs*R-squared	7.931807	0.0190

Figure.A23: CUSUM Stability Test for Table.5.12

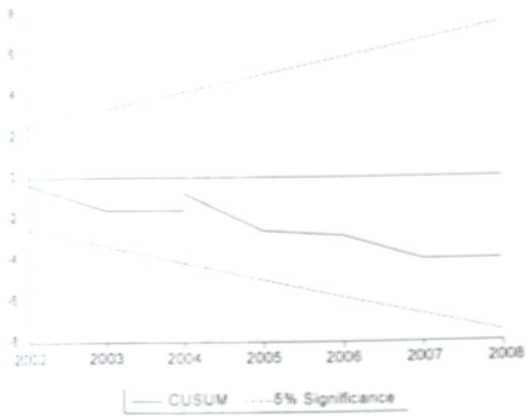


Figure.A24: CUSUM Squares Stability Test for Table.5.12

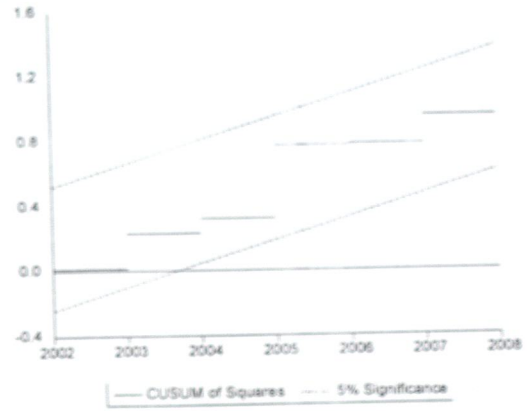


Figure.A25: Q-Statistics Results for Table.5.15

Correlogram-Q-Statistics
Sample: 1977-2010

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
|*. |	|*. |	1	0.117	0.117	0.5093	0.475
|*. |	|*. |	2	0.088	0.075	0.8067	0.668
*| . |	*| . |	3	-0.099	-0.120	1.1958	0.754
**| . |	**| . |	4	-0.311	-0.303	5.1423	0.273
. | . |	. |*. |	5	-0.001	0.089	5.1424	0.399
|*. |	. |** |	6	0.140	0.214	6.0033	0.423
|*. |	. |*. |	7	0.209	0.132	7.9921	0.333
|*. |	. | . |	8	0.151	-0.022	9.0667	0.337
. | . |	. *| . |	9	-0.045	-0.080	9.1639	0.422
**| . |	**| . |	10	-0.313	-0.249	14.155	0.166
*| . |	. |*. |	11	-0.101	0.075	14.693	0.197
*| . |	. | . |	12	-0.111	-0.003	15.384	0.221
. | . |	. *| . |	13	-0.004	-0.117	15.385	0.284
|*. |	. | . |	14	0.191	0.004	17.627	0.224
*| . |	**| . |	15	-0.157	-0.222	19.211	0.204
*| . |	. | . |	16	-0.069	-0.036	19.532	0.242

Table.A9: Breusch-Godfrey Serial Correlation LM Test Results for Table.5.15

LM Test	Estimated Values	P-Values
F-statistic	0.447720	0.6450
Obs*R-squared	1.390471	0.4990

Figure.A26: CUSUM Stability Test for Table.5.15

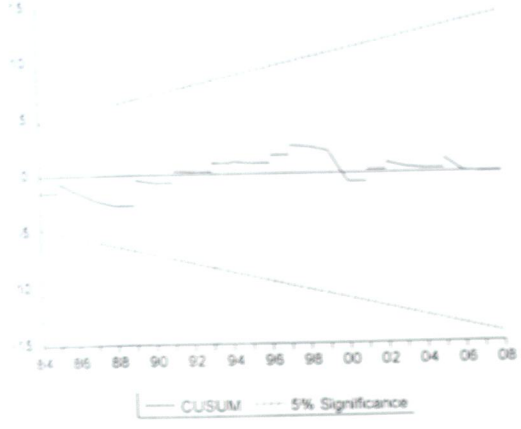


Figure.A27: CUSUM Squares Stability Test for Table.5.15

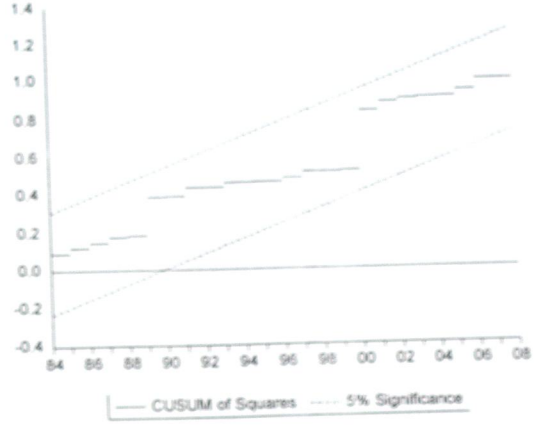


Figure.A28: Q-Statistics Results for Table.5.17

Correlogram-Q-Statistics
Sample: 1977-2010

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
| . |	. | . |	1	0.073	0.073	0.1999	0.655
| . |	. | . |	2	-0.012	-0.017	0.2054	0.902
**| . |	**| . |	3	-0.261	-0.261	2.8998	0.407
**| . |	**| . |	4	-0.348	-0.335	7.8450	0.097
*| . |	*| . |	5	-0.105	-0.107	8.3059	0.140
|* . |	. |* . |	6	0.140	0.084	9.1570	0.165
|** . |	. |* . |	7	0.227	0.079	11.497	0.118
|** . |	. |* . |	8	0.232	0.098	14.024	0.081
| . |	. | . |	9	0.002	-0.005	14.024	0.121
**| . |	*| . |	10	-0.207	-0.105	16.218	0.094
*| . |	. | . |	11	-0.201	-0.045	18.364	0.074
. | . |	. |* . |	12	-0.025	0.101	18.400	0.104
|* . |	. | . |	13	0.084	0.046	18.809	0.129
|** . |	. |* . |	14	0.257	0.111	22.865	0.062
. | . |	*| . |	15	0.022	-0.107	22.897	0.086
|* . |	. |* . |	16	0.144	0.200	24.310	0.083

Table.A10: Breusch-Godfrey Serial Correlation LM Test Results for Table.5.17

LM Test	Estimated Values	P-Values
F-statistic	0.095252	0.9095
Obs*R-squared	0.291889	0.8642

Figure.A29: CUSUM Stability Test for Table.5.17

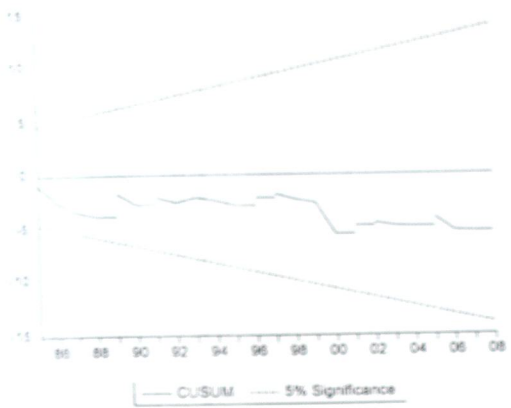


Figure.A30: CUSUM Squares Stability Test for Table.5.17

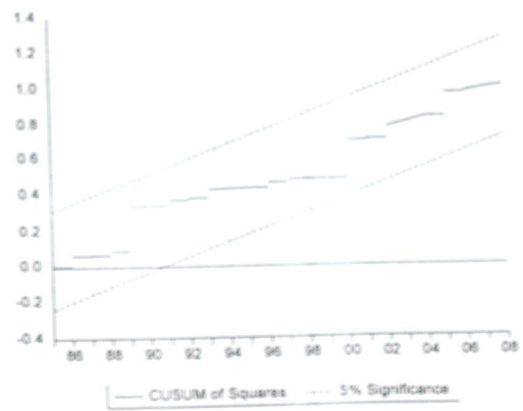


Figure. A31: Q-Statistics Results for Regression-4 of Table.5.19

Correlogram-Q-Statistics
Sample: 1980-2010

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
|* |	|* |	1	0.086	0.086	0.2493	0.618
**| |	**| |	2	-0.232	-0.241	2.1533	0.341
*| |	*| |	3	-0.122	-0.082	2.6990	0.440
*| |	*| |	4	-0.066	-0.110	2.8632	0.581
*| |	*| |	5	-0.088	-0.133	3.1695	0.674
| |	| |	6	-0.017	-0.060	3.1814	0.786
| |	*| |	7	-0.029	-0.110	3.2179	0.864
*| |	*| |	8	-0.120	-0.187	3.8592	0.870
| |	| |	9	0.010	-0.051	3.8642	0.920
| |	*| |	10	0.040	-0.095	3.9434	0.950
|* |	| |	11	0.087	0.012	4.3294	0.959
| |	| |	12	0.035	-0.041	4.3950	0.975
*| |	*| |	13	-0.142	-0.198	5.5478	0.961
|* |	|* |	14	0.164	0.196	7.1586	0.928
|* |	| |	15	0.106	-0.011	7.8787	0.929
*| |	*| |	16	-0.117	-0.093	8.8112	0.921

Table.A11: Breusch-Godfrey Serial Correlation LM Test Results for Regression-4 of Table.5.19

LM Test	Estimated Values	P-Values
F-statistic	0.547523	0.7381
Obs*R-squared	4.299713	0.5701

Figure.A32: CUSUM Stability Test for Regression-4of Table.5.19

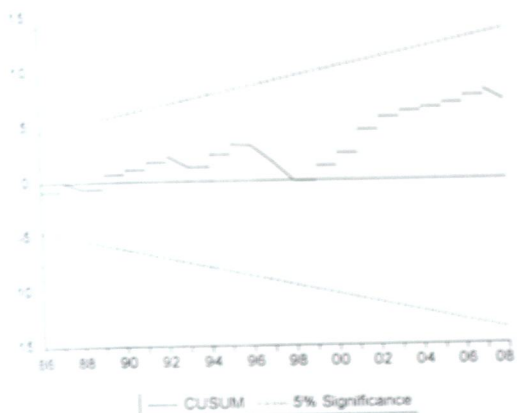


Figure.A33: CUSUM Squares Stability Test for Regression-4 of Table.5.19

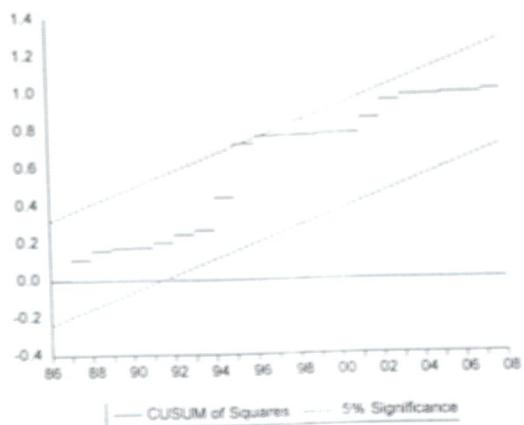


Figure. A34: Q-Statistics Results for Regression-6 of Table.5.19

Corrlelogram-Q-Statistics
Sample: 1980-2010

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
| . |	| . |	1	0.055	0.055	0.1027	0.749
.**| . |	.**| . |	2	-0.278	-0.282	2.8229	0.244
.*| . |	.*| . |	3	-0.144	-0.118	3.5764	0.311
.*| . |	.*| . |	4	-0.072	-0.151	3.7743	0.437
| . |	.*| . |	5	-0.013	-0.090	3.7807	0.581
| . |	| . |	6	0.048	-0.036	3.8764	0.693
| . |	.*| . |	7	-0.062	-0.140	4.0389	0.775
.*| . |	.**| . |	8	-0.158	-0.208	5.1523	0.741
| . |	| . |	9	0.032	-0.053	5.1991	0.817
| . |	.*| . |	10	0.003	-0.174	5.1994	0.877
| . |	| . |	11	0.041	-0.062	5.2874	0.916
| . |	.*| . |	12	0.024	-0.117	5.3188	0.946
.*| . |	.**| . |	13	-0.134	-0.258	6.3374	0.933
|* . |	|* . |	14	0.162	0.099	7.9084	0.894
|* . |	| . |	15	0.145	-0.040	9.2528	0.864
| . |	.*| . |	16	-0.045	-0.069	9.3937	0.896

Table.A12: Breusch-Godfrey Serial Correlation LM Test Results for Regression-6 of Table.5.19

LM Test	Estimated Values	P-Values
F-statistic	0.495044	0.7754
Obs*R-squared	4.134449	0.5710

Figure.A35: CUSUM Stability Test for Regression-6 of Table.5.19

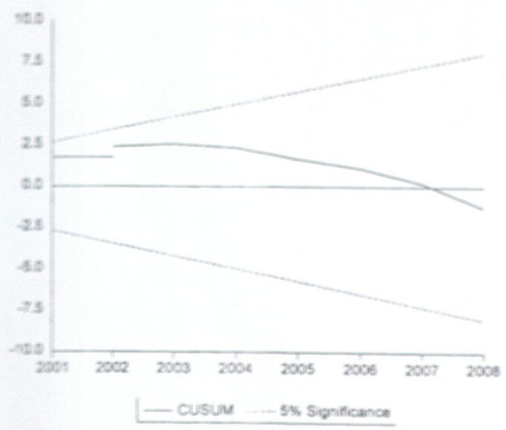
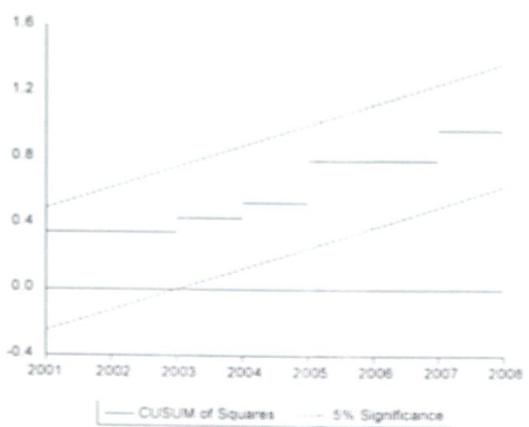


Figure.A36: CUSUM Squares Stability Test for Regression-6 of Table.5.19



Appendix -B

Table 3.2: Augmented Dickey Fuller test Results

Variables	ADF Test		Results at Level
	Intercept	*Intercept with Trend*	
Real Exchange Rate of Pakistan	-2.43	-3.18	Non-Stationary
Interest Rate of Pakistan	-2.28	-2.26	Non-Stationary
Real GDP of Pakistan	3.33	3.63	Non-Stationary
GDP Growth Rate of Pakistan	-4.61**	-4.65**	Stationary
Inflation Rate of Pakistan	-2.92	-3.22	Non-Stationary
Real Foreign Exchange Reserves of Pakistan	-0.51	-2.86	Non-Stationary
Real Money Supply of Pakistan	-0.98	-1.82	Non-Stationary
Real Remittances of Pakistan	-1.88	-3.22	Non-Stationary
Real Trade Balance of Pakistan	3.57	4.93	Non-Stationary
Average Propensity to Imports of Pakistan	-2.85	-3.54	Non-Stationary
Inflation Rate of United States	-1.83	-2.62	Non-Stationary
Interest Rate of United States	-1.54	-2.47	Non-Stationary

- All the variables are at log level except Interest rate of USA, Inflation rate of USA, Inflation rate of Pakistan, Interest rate of Pakistan, Real GDP of Pakistan and Real trade balance of Pakistan
- Critical values of the ADF test for the intercept and intercept & trend are -2.92 and -3.54

Appendix -C

Table.C1: Data for Pakistan Exchange Rate, Interest Rate, Trade Balance and GDP (1975-2010)

Years	Nominal Exchange Rate of Pakistan	Nominal Interest Rate of Pakistan	Nominal Gross Domestic Product of Pakistan (in Millions of Pak-rupees)	Trade Balance of Pakistan (in Millions of Pak-rupees)
1975	9.90	6.51	66870	153
1976	9.90	10.33	86850	-3318
1977	9.90	9.87	111180	-10639
1978	9.90	9.37	130360	-9212
1979	9.90	10.87	149750	-11718
1980	9.90	10.41	176330	-14835
1981	9.90	8.83	194920	-19463
1982	9.90	8.63	234180	-23519
1983	9.90	9.27	278200	-24264
1984	12.84	9.51	324160	-33212
1985	13.50	8.15	364390	-33709
1986	15.36	8.97	419800	-39368
1987	15.98	8.13	472160	-51799
1988	17.25	6.59	514530	-41354
1989	17.45	6.25	572480	-29076
1990	18.65	6.32	675390	-34106
1991	21.42	6.30	768800	-45658
1992	21.90	7.29	853800	-42384
1993	24.72	7.64	1016700	-32832
1994	25.70	7.51	1205200	-58161
1995	30.12	11	1332800	-81615
1996	30.80	8.36	1561101	-52751
1997	34.25	11.52	1865900	-69719
1998	40.25	11.40	2120200	-102834
1999	44.05	12.1	2428300	-139688
2000	45.89	10.76	2677700	-63178
2001	51.78	9.04	2938400	-75622
2002	58.03	8.57	3826110	-90114
2003	60.86	8.49	4209870	-87930
2004	58.53	5.53	4452650	-73683
2005	57.22	2.14	4875650	-62078
2006	59.12	2.70	5640580	-188789
2007	59.83	6.83	6499780	-369621
2008	60.92	8.89	7593850	-726317
2009	61.22	9.30	8706920	-822494
2010	62.55	12	12084380	-1315434

Data Sources: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan and International Financial Statistics, IMF

Table.C2: Data for Pakistan Inflation Rate, Foreign Exchange Reserves, Money Supply and US Inflation Rate (1975-2010)

Years	US Inflation Rate	Foreign Exchange Reserves of Pakistan (in Millions of Pak-rupees)	Money Supply of Pakistan (M2) (in Millions of Pak-rupees)	Nominal Inflation rate of Pakistan
1975	6.22	4583.7	27068	9.68
1976	11.04	4257	30679	30
1977	9.13	4811.4	33074	26.71
1978	5.74	6078.6	41651	11.67
1979	6.49	4266.9	51773	10.66
1980	7.65	9999	63659	9.08
1981	11.27	8949.6	78612	5.52
1982	13.51	19988.1	92424	10.48
1983	10.32	18473.4	104621	10.82
1984	6.16	18746.4	116510	11.12
1985	3.21	37233	146025	5.61
1986	4.32	38231.4	163267	7.29
1987	3.56	19016.2	183905	5.66
1988	1.86	28255.5	211111	4.35
1989	3.74	31130.8	240024	3.59
1990	4.01	24729.9	269514	6.29
1991	4.83	26282.34	290457	10.39
1992	5.4	31776.9	341251	6.04
1993	4.23	34360.8	400644	12.66
1994	3.03	45257.7	505569	10.58
1995	2.95	41234.28	595390	9.83
1996	2.61	102779.6	703399	11.27
1997	2.81	127752.5	824733	13.02
1998	2.93	130852.8	938680	10.79
1999	2.34	87086.85	1053234	11.8
2000	1.55	79710.93	1206320	7.81
2001	2.19	122770.4	1280546	5.74
2002	3.38	124706.5	1400632	3.58
2003	2.83	162252.8	1526044	4.41
2004	1.59	318346.7	1761370	3.54
2005	2.27	612254	2078705	3.1
2006	2.68	702523	2486556	4.57
2007	3.39	671711.4	2960640	9.28
2008	3.23	780385.2	3406910	7.92
2009	2.85	1004865	4065160	7.77
2010	3.80	717135.8	4689140	12

Data Sources: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan and International Financial Statistics, IMF

Table.C3: Data for Pakistan Remittances, GDP growth, Exports and Imports (1975-2010)

Years	Remittances of Pakistan (in Millions of Pak-rupees)	Exports of Pakistan (in Millions of Pak-rupees)	Imports of Pakistan (in Millions of Pak-rupees)
1975	1346.4	8551	8398
1976	1377.4	10161	13479
1977	2089.89	10286	20925
1978	3356.29	11253	20465
1979	5719.43	11294	23012
1980	11447.67	12980	27815
1981	13839.51	16925	36388
1982	17266.99	23410	46929
1983	20947.21	29280	53544
1984	28567.59	26270	59482
1985	38956.54	34442	68151
1986	42047.08	37339	76707
1987	39085.8	37979	89778
1988	44769.09	49592	90946
1989	39760.87	63355	92431
1990	37534.99	78445	112551
1991	40633.53	90183	135841
1992	42537.47	106469	148853
1993	45689.73	138282	171114
1994	37714.24	171728	229889
1995	47054.67	177028	257643
1996	44523.25	205499	258250
1997	63913.93	251173	320892
1998	586622.1	294741	797575
1999	62087.15	325313	465001
2000	68355.45	373160	436338
2001	54896.64	390342	465964
2002	57085.85	443678	533792
2003	66152.99	539070	627000
2004	139831.1	560947	634630
2005	237520.2	652294	714372
2006	228887.8	709036	897825
2007	249418.7	854088	1223079
2008	280239.3	984841	1711158
2009	336382.5	1029312	1851806
2010	403525.1	1196638	2512072

Data Sources: Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan and International Financial Statistics, IMF

Figure.C1: HP filter Series for Pakistan Remittances

Figure.C2: HP filter Series for Pakistan Inflation Rate

Figure.C3: HP filter Series for Pakistan Exchange Rate

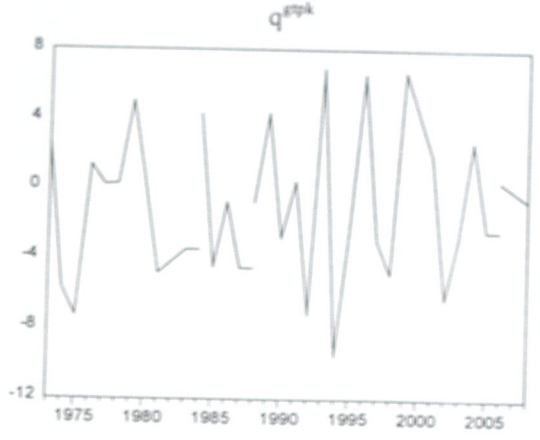


Figure.C4: HP filter Series for Pakistan foreign Exchange Reserves

Figure.C5: HP filter Series for US Inflation Rate

Figure.C6: HP filter Series for Pakistan Interest Rate

Figure.C7: HP filter Series for US Interest Rate

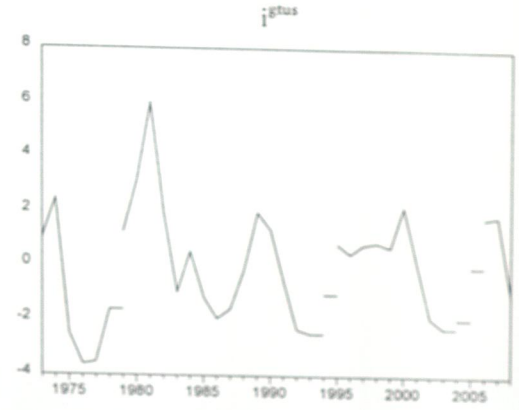


Figure.C8: HP filter Series for Pakistan Trade Balance

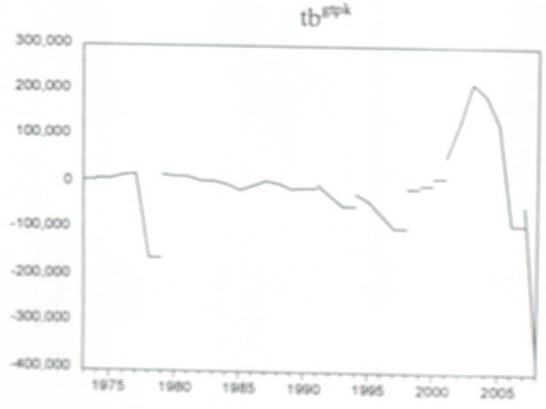


Figure.B9: HP filter Series for Pakistan Money Supply