DETERMINANTS OF REAL EXCHANGE RATE: REAL, MONETARY OR BOTH

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CERTIFICATE

This is to certify that this thesis entitled "***Real Exchange rate Determinants: Real, Monetary, or both***" submitted by Miss. Nimra Shahid is accepted in its present form by the Department of Economics, Pakistan Institute of Development Economics, Islamabad as satisfying the requirements for partial fulfillment of the degree of M.sc Economics.

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I, **Nimra Shahid** solemnly declare and affirm on oath that I myself have authored this M.Sc Thesis with my own work and means, and I have not used any further means except those I have explicitly mentioned in this document. All items copied from internet or other written sources have been properly mentioned in quotation marks and with references to the source of citation.

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DEDICATION

I would like to dedicate my work to my beloved parents for their endless love, support and encouragement.

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ABSTRACT

This study estimates ***the determinants of real exchange rate*** by further modifying the model presented by Sebastian Edward in the paper "*Real and Monetary Determinants of Real Exchange Rate Behavior*" (Edwards 1988). By adding new variables that are FDI (foreign direct investment), short term loans, and long term loans, along with the variables already given in the Edward (1988), this model is tested to find whether real, monetary or both variables effect the behavior of real exchange rate in Pakistan. Estimations are done by taking data from 1980-2013. The effect of real and monetary variables on real exchange rate is estimated by applying OLS and test for auto-correlation is done by applying Breusch-Godfrey Serial Correlation LM test the results obtained are generally in favor of the model proposed by Edward (1988), which implies that real variables are significantly affecting the real exchange rate behavior as compared to monetary variables.

Table of Contents

1. Introduction

Exchange rate is the price of traded goods in the international market. For maintaining competitiveness in the world market, adjustment in exchange rate is required in accordance to the changes in relative prices. If adjustments in exchange rates are made regularly, then purchasing power parity (PPP) holds continuously. Nevertheless, empirical evidence shows that PPP does not hold continuously especially in the short run specifically under floating exchange rate regime [(Bayoumi & MacDonald, 1999); (Obstfeld & Taylor, 1997) and (Kemal & Haider, 2004)]

Depreciation implies that the value of direct exchange rate in terms of rupee against other foreign currencies increases. Hence, the prices of domestic goods increase relative to those of foreign goods. If the rise in domestic prices is consistently more than the increase in the prices of foreign countries then the exchange rate keeps depreciating at regular intervals. When the depreciation rate is more than the increase in the rate of relative prices between two countries then the country's goods become cheaper internationally and vice versa. Consequently, the country's exports will rise and imports will decline considering the Marshal-Lerner conditions are satisfied. This phenomenon was discussed in Kemal and Qadir (2005) that exchange rate has a strong impact on a country's trade. Moreover, association between the real exchange rate and exports is 0.90, and the real exchange rate and imports is 0.88, that is quite high as well as significant.

Exchange rate has gained importance in economic debates in 1970s. Nevertheless in developing countries it gained importance in 1990s. More importantly, inappropriate exchange rate policies in developing countries have led to international debt crisis. For instance, the maintenance of

overvalued exchange rates in Africa for quite a longer period of time led to worsening agricultural sector and external position (Gulhati, Bose, & Atukorala, 1985) where as appropriate exchange rate policies have led to sustainable economic development in many countries, such as the economic success of Indonesia, Korea, Thailand, and Colombia (Dervis & Petri, 1987)

Recent studies show that over time problems have also emerged regarding the measurement of real exchange rate, equilibrium of real exchange rate, mean reverting real exchange rate, and choice of nominal exchange rate. In case of Pakistan exchange rate was remained fixed till 1981 and then managed it using the fundamentals for two decades. In 2000 the regime has changed to floating exchange rate system; however, State Bank of Pakistan has been continuously managing it using open market operations.

Determinants of real exchange rate respond in accordance with the changes in frequency of data, i.e., intra-day determinants, inter day determinants, weekly changes in exchange rates, monthly to month changes in exchange rates, and annual changes in the exchange rate. Concisely, determinants differ according to the movement in exchange rate i.e. short run and long run movements in exchange rate. Precisely on daily bases demand and supply of forex reserves is the most important variable which determines the value of exchange rate apart from Signals. To maintain commodities competitiveness exchange rate should be adjusted according to the changes in price level and when exchange rate is adjusted with the changes in relative prices (ratio of prices in home country and in foreign country) then the phenomenon is known as Purchasing Power Parity (PPP). Interest rate differentials in home and foreign country also effect the determination of exchange rate and even helps to stabilize exchange rate as a rise in (domestic) interest rate i.e. in home country leads to capital inflow in home country, due to which foreign exchange reserves would also increase hence result in appreciation in exchange

rate although it depends on the degree of capital controls in the country. This situation is known as the uncovered interest parity (UIP).

Although quite a number of studies are done to find the determinants of real exchange rate and equilibrium real exchange rate, but forecasting performance of these studies are different. (Meese & Rogoff, 1985) , suggested that in short run real exchange rate is random walk and we cannot predict the value of exchange rate in the short run using monetary variables. Edwards (1988, 1989b) measured the effect of real and monetary variables also known as fundamentals on real exchange rate, according to Edward in short run both real and monetary variables affect the behavior of equilibrium real exchange rate whereas in long run only real variables affect exchange rate.

However, monetary model and model with real variables are used in case of Pakistan and most of the studies has supported monetary model against the real variable model but monetary model has missed several important real variables such as budget deficit, external debt servicing, and changes in interest rate which are among the most important variables in the developing economies. Therefore, the behaviors of real exchange rate could be totally different than predicted by the monetary model. If we take PPP theory (monetary model) in case of Pakistan, the study of (Khan, M. A., & Qayyum, A., 2007) supports long run validity of PPP and they also introduce factors like money supply which would reduce balance of payment deficit, furthermore it was observed that in order to eliminate deviations from long run PPP, nominal exchange rate plays an important role, and PPP theory is not applicable in short run. (Afridi, 1995) used Edwards (1989a) theoretical framework model to estimate real, and monetary determinants of exchange rate both in short run as well as in long run for Pakistan, and found terms of trade to be insignificant, excess demand for domestic credit, capital flow to have an opposite that is negative

relation to exchange rate whereas government expenditure on non-tradable to move in same direction that is to have a positive relation to real exchange rate. The results of a study (Siddiqui, Afridi, and Mahmood 1996) show that both monetary, and real variables affect the behavior of real exchange rate, (equilibrium path of real exchange rate).

1.1 Objective

In the light of above discussion, proper understanding of the determinants of the real exchange rate is vital to manage the current account deficit. Therefore primary objective of this thesis is the estimation of the real and monetary determinants of real exchange rate which explains the maximum movements in the real exchange rate.

2. Literature Review

Exchange rate is essential to maintain economic growth and stability of every country. It plays a vital role when it comes to country's level of trade which is important for every developing country. There are numerous factors which determine exchange rate and contribute to the level of trade in any country. Countries with low level of inflation rate compared to its trading partners exhibit appreciation of their currency as their purchasing power rises as compared to other country's currency. Interest rate also plays a vital role as central bank influences both inflation and exchange rate by changing interest rate. A higher interest offers higher return on investment as compared to other countries. It attracts foreign capital and vice versa. (Wang, 2008), predicts what determines currency values. It was stated that economic fundamentals are sometimes not helpful in predicting exchange rate and there are reasons behind it. Economic fundamental offer little help but that doesn't mean that exchange rates are mainly driven by irrational factors.

Theoretically, the concept of purchasing power parity (PPP) theory implies that exchange rate should be adjusted according to the changes in relative price level of home and foreign country, and when such adjustments take place we say that PPP holds continuously. (Taylor & Taylor, 2004). The theory of PPP relies on several assumptions including the presence of the condition of Law of One Price, along with no transaction costs, and exchange rate moves freely.

Another theory which affects exchange rate in the short run is uncovered interest parity (UIP) where exchange rate is determined by interest differentials between the two countries. If UIP is greater than zero it means capital inflow would take place and if its value is less than zero it means capital outflow would take place.

Other models such as the monetary models are proposed to determine movement of exchange rate, due to changes in money, output, and interest rate. (Frenkel, 1976), following Chicago School proposes a model assuming prices are flexible. Whereas, Dornbusch (1976) following Keynesians School of thought proposes monetary model assuming prices are sticky. Monetary model for the determination of exchange rate is based on the assumption that PPP holds continuously as well as uncovered interest parity hold continuously. Due to flexible and sticky price assumption in the monetary model the effect of a change in interest rate on exchange rate is different. (Frenkel, 1981), states that under flexible price model any rise in interest rate, will lead to expected inflation due to which money demand would be less than the foreign currency demand and exchange rate will appreciate. On the other hand sticky price model states that a rise in interest rate with price being constant would lead capital inflow and foreign currency supply would increase leading to exchange rate depreciation.

(Dornbusch, 1976), model also known as overshooting model of exchange rate states that any change in interest rate, a rise in domestic interest rate instead of (compared to) foreign interest rate leads to capital inflow and appreciation of exchange rate, while fall in domestic interest rate compared to foreign interest rate leads to capital outflow, currency depreciated more than it would in the long run, this depreciation is enough so that it reduces expected rate of future appreciation and cancels out interest differentials. Though in short run the studies conclude that it is a random walk that is we cannot predict its value in short runs, however researchers are still interested in the long run determinants which we can observe in different studies.

Harrod–Balassa–Samuelson theory can also be used to determine the behavior of exchange rate, this theory basically states that in poor countries labor force is less productive than rich countries in tradable good sector, if prices of tradable in both countries are same, then marginal

productivity of labor (MPL) in poor country is less as compared to the marginal productivity of labor in rich country and hence the wages in poor country is also less relative to rich country due to which over all consumption and price levels are low as compared to rich countries and hence price of non-tradable in poor country is also low relative to rich country. In a rich country wages are high and overall price levels are high too hence prices of non-tradable are high.

In case of Pakistan (Jabeen, Malik, & Haider, 2008), worked for determination of exchange rate through PPP and Harrod–Balassa–Samuelson (HBS) in case of Pakistan, which are two alternative theories amplifying the long run relationship of the real exchange rate. Determinants of exchange rate based on PPP theory have shown unsatisfactory results for both absolute version as well as the relative version of PPP. Moreover, real exchange rate, when we take the case of Pakistan, is a non-stationary process, which implies that there are some other determinants related to non-tradable sector which are affecting real exchange rate significantly whereas, presence of HBS is inevitable when stationarity test is applied on it. Furthermore , the analysis of the Harrod–Balassa–Samuelson shows that relative productivity difference of a country has an opposite relationship with relative non-tradable sector prices in a country and for that reason with the real exchange rate of that country. The relationship among relative non-tradable sector prices and real exchange rate is much stronger and in accordance with the economic theory. Thus productivity difference, supply of money, government consumption expenditure, terms of trade, and world oil prices are among the important determinants of real exchange rate.

(Frankel, 1984), presents estimation associated to the competing monetary model (developed first five years after 1973) and another model known as portfolio balance models of exchange rate determination. The evidence favors the monetary model with sticky price over the flexible

price model. However, the results obtained were stated poor for both versions. Overall, due to opposite signs and low significance levels the results did not support either monetary model. Nevertheless, efficient coefficients can be obtained by adding new variables in the equations. The results in the paper state that a shift in the money demand(Md) function and the long run (LR) real exchange rate are equally accountable for the problems of the monetary model. On the other hand, the estimates of the portfolio balance model show that although holding personal asset and wealth variables are significant for some of the countries but the outcomes are as unsatisfactory, thus this model also failed to explain significant movements in real exchange rate.

(Edwards S. , 1988), proposed the "dynamic model of real exchange rate" behavior by taking data of 12 developing countries. The study assumes small open economy with multiple exchange rate system. The model includes both monetary and real variables to check the response of real exchange rate. The results support theoretical frame work in the paper that suggests that differences between actual and equilibrium real exchange rate value will be resolved by self-correcting mechanism. Theoretical framework suggests that macro disequilibria affect the real exchange rate in the short run where as in long run movements in real exchange rate follow changes in different fundamentals. The results show that real exchange rate is affected by both real as well as monetary variables while in long run they respond to real variables only.

(Edwards S. , 1989b), presents the aspects related to measurement of the real exchange rate in case of developing countries. This discussion highlights the importance of equilibrium real exchange rate and its importance relatively to disequilibrium changes in real exchange rate for which inter-temporal model is used. The empirical analysis shows that bilateral and multilateral real exchange rate exhibit different behavior. This implies that policy recommendation based on either bilateral or multilateral can give us totally biased results.

Parallel markets play significant role in adjusting the official exchange rate in the developing countries thus, parallel market premium is among the important determinant of the real exchange rate. Finally, real exchange rate variability effects the economic development through lower output growth and lower investment. However, higher variability in the real exchange rate is not associated with level of exports.

According to Ibid, only the real variables (fundamentals) affect real exchange rate behavior in the long run while in short run both real and monetary variables contribute to its movements. Among all the determinants the most important variables which affect the behavior of the real exchange rate in an economy are the terms of trade, technical progress, public spending, capital movement, the control of exchange rate, and capital accumulation.

(Drine & Rault, 2001), took 16 Middle East and North Africa countries into consideration and found determinants of real exchange rate by applying panel data unit root tests on the data of 1960-1998 years. The study wasn't able to find conclusive evidence in the support of HBS hypothesis for 12 countries out of 16. However, among several output per capita, government expenditures, real interest rate differentials and openness are the most significant determinants of the real exchange rate

(Drine & Rault, 2003), states that degree of misrepresentation of the real exchange rate is not as simple as shown with the concept of purchasing power parity. Exchange rate movement is also affected through the level of economic development taking place in a country.

The model of (Edward, 1989a) show that an improvement in terms of trade, GDP per capita and capital flow leads to real exchange rate appreciation over the long run. While, increase in domestic investment and openness lead to the real exchange rate depreciation over the long run.

(Siddique, Afridi, & Mahmood, 1996), discusses the determinants due to which real exchange rate value deviates from the equilibrium value in Pakistan. They found that in case of Pakistan variations in nominal exchange rate results in stable real exchange rate but in recent years this gap has widened as the inflation in the domestic country is higher as compared to the inflation in foreign country. The study further shows that both monetary and real variables effect determination of RER.

Afridi's (1995) displays that "excess domestic credit creation, openness and the net capital inflow to gross domestic product" are the significant variables to determine the equilibrium value of the real exchange rate while, terms of trade and technological change are found to be insignificant. Same results were obtained by estimations in this study as (Siddique, Afridi, & Mahmood, 1996) develop a small simultaneous equations model for estimations in case of Pakistan. Using simultaneous model results show that changes in the non-traded goods sector also affect the movement of the real exchange rate significantly, so optimal polices in this sector may also help to bring real exchange rate stability.

(Kemal & Haider, 2004), checked the short-run relationships of the exchange rate with different variables such as the relative prices of the two countries, the money differences among the two countries, the interest rate difference among the two countries, foreign exchange reserves in the country and the deviancies in exports and imports which govern the trade balance. Study finds that exchange rate instantly moves towards equilibrium in case of shock in forex reserves. For a developing country keeping reserves in dollars and yen was found to be safer than any other currency. Study shows withdrawal from PPP proposition in the short run. This implies that PPP does not hold continuously. The most central finding of this study is that

real exchange rate overshoots in reaction to exogenous shocks and then corrects back to reestablish the equilibrium, although the modification process varies by country.

(Choudhri & Khan, 2004), examines the HBS hypothesis for 16 developing economies using the data from 1976-1994. The results state that traded and non-traded productivity differential significantly affect the real exchange rate through effecting price in the non-tradable sector. Moreover, the terms of trade also has an impact on the real exchange rate. Additionally the findings suggest that difference in labor productivity also ensure a considerable effect on real exchange rate through influencing price on non-traded goods.

(Kemal & Qadir, 2005), examines trivariate analysis between exports, imports and exchange rates. The study finds that in short run both exports and imports tend to move towards equilibrium whereas adjustment in imports is greater than exports as they don't respond to a shock in real exchange rate instant than imports.

(Hyder & Mahboob, 2005), estimated the value of the equilibrium real effective exchange rate and checked the misalignments using Edwards (1988, 1989a). By using annual data results show that the "increase in current government expenditure on non-tradable (due to increase in consumption), trade openness, and net capital inflows" the real effective exchange rate depreciates, while, the "increase in workers' remittances and the total factor productivity" appreciates the real effective exchange rate. This study also states that the exchange rate misalignment and its instability are much lower under the flexible exchange rate system than fixed or managed exchange rate systems. Short run model shows that monetary policy is statistically insignificant.

(Khan & Qayyum, 2007), contribute to provide empirical evidence on validity of purchasing power parity (PPP) for Pak-rupee per US-dollar in case of Pakistan. Ibid finds that PPP doesn't holds in short run in case of Pakistan but supports the existence of long-run PPP was also found.

(Hussain, 2008), confirms that the movement of real exchange rate is based on real fundamentals. It finds that Capital inflows appreciate the real exchange rate. Unlike the HBS view that productivity takes place mostly in tradable that appreciates real exchange rate, the results in this study specify that in the long-run productivity allows depreciation of Real exchange rate, as shown by total factor productivity. Moreover, Government expenditure on non-tradable will lead to rise in its price and hence appreciation of the real exchange rate.

(Khan & Qayyum, 2008), estimate the speed of adjustment of purchasing power parity (PPP) by persistent profile based on the unrestricted Purchasing power parity. To check the adjustment towards the long-run equilibrium path they used quarterly data over the period 1982Q2-2005Q, and stated that the speed of adjustment is relatively slower than predicted by the theoretical model. Using cointegration framework, long run factors implies that specialists can use PPP as a long-term nominal broadcaster to alter to inflation differentials.

(Zakaria & Ahmad, 2009) finds that inconsistency in bilateral nominal exchange rates is clarified by "comparative productivity differentials in the tradable and non-tradable sectors in both the domestic country and in foreign country". The results of the study show strong association among "nominal exchange rates, relative price differentials and, domestic and foreign productivity differentials".

(Saeed, Awan, & Sial, 2012), examines both economical and non-economic factors that affect exchange rate. It finds that relative amount of money held, and debt is positively and

substantially related to exchange rate. Relative forex reserves has an opposite and significant relation with the exchange rate. Political volatility negatively affects the real exchange rate. Remarkably, variables in a monetary model such as "short term interest rate and relative real GDP" are not meaningfully associated with the exchange rate, nevertheless, sign of interest rate is negative which is in the line of monetary model with sticky prices.

(Abbasi & Safdar, 2014), determined the exchange rate behavior by using the modified monetary model. The study finds that the "domestic interest rate, foreign money, and domestic income" have negative impact on the exchange rate in the short run. With the same token, "foreign interest rate, domestic money supply, and foreign income" are positively related to the exchange rate.

2.1 Lessons Drawn from the Literature Review

There are numerous theories, models, factors, and method of estimations which were used in the empirical as well as theoretical literature in the estimation of exchange rate behavior in case of Pakistan. Most of the literature on exchange rate is established on monetary model, purchasing power parity, HBS, flexible and sticky price models of exchange rate, etc. Monetary model of exchange rate is among the earliest approaches for the determination of exchange rate.

Frenkel (1976, 1981, 1984) based on Chicago school of thought determines exchange rate through monetary models using Purchasing power parity (PPP), uncovered interest parity (UIP) and flexible price model, the results state that an rise in interest rate (domestic) would lead to expected inflation due to which domestic money demand would be less than the foreign money demand hence exchange rate would appreciate and vice versa.

On the other hand Dornbush (1976), based on the Keynesian school of thought and sticky price model stated that a rise in interest rate (prices being constant) would lead to capital inflow due to which foreign money supply would increase and exchange rate would depreciate. If we look at the latest studies based on monetary model we would find that many writers still use monetary model framework for exchange rate determination.

(Khan, M. A., & Qayyum, A., 2007), (Jabeen, Malik, & Haider, 2008), (Choudhri & Khan, 2004), (Khan & Qayyum, 2008), (Abbasi & Safdar, 2014), also used monetary models for exchange rate determination. The results obtained in most of their studies state that PPP doesn't exist in case of Pakistan specifically in the short run, where as it does in long run. (Kemal & Haider, 2004), used ADF tests which also stated that PPP doesn't holds continuously in short run, same results were obtained in this paper by applying OLS estimation technique. Harrod–Balassa–Samuelson (HBS) presence is detected in case of Pakistan, further more effect of HBS states that comparative productivity differences have an opposed relationship with comparative non-tradable sector prices and real exchange rate. Relationship between comparative non-tradable sector price and real exchange rate is much better and is according to the economic theory behind this concept.

In the literature we also find studies where Edward (1988, 1989a, 1989b), Afridi (1995) (Drine & Rault, 2001), (Drine & Rault, 2003), (Siddique, Afridi, & Mahmood, 1996) , (Hyder & Mahboob, 2005), based their research to find the real and monetary determinants of real exchange rate. The results state that the behavior of real exchange rate in some cases is based on real variables and in some cases on both real and monetary variables in the long run. Real variables are also known as fundamentals, (Hussain, 2008); confirm exchange rate theory being based on these fundamentals. According to ibid, equilibrium real exchange rate value is

influenced by capital inflow, terms of trade, government consumption, and GDP. Terms of trade has an ambiguous effect, capital inflow and government consumption of non-tradable lead to real exchange rate appreciation.

Apart from all these factors there are economic and non-economics factors which also affect the behavior of real exchange rate in case of Pakistan. (Saeed, Awan, & Sial, 2012), cover the period of managed and flexible exchange rate system using time series data to determine exchange rate by taking US dollars against Pakistani currency. The results state that relative amount of money held and debt are certainly related to exchange rate whereas relative foreign exchange reserves are adversely related to exchange rate, political volatility also negatively affects the value of currency in case of Pakistan, and all these variables were found to be significant in case of Pakistan. On the other hand short term interest rate, relative GDP were found not to be significant related to determination of "PAK/US$" exchange rate.

3. Model and Theoretical Framework

This section discusses various real and monetary determinants which can affect real exchange rate in the short run as well as in the long run. Real Variables are defined as those variables which are expressed in constant or physical monetary units such as tariffs, terms of trade, capital flows, loans (in dollars), FDI and government consumption of non-tradable in our case. Monetary variables can be categorized as those variables which are controlled by the Central Bank (State Bank in case of Pakistan). These variables can be nominal or real. Nevertheless, we have taken nominal monetary variables in our study such as domestic credit, which is the most important variable controlling money supply in the country. Other monetary variables are net foreign assets, net domestic assets which are included in the analysis.

The question before us is that how these fundamentals affect the real exchange rate. Monetary model of exchange rate determination does not account for most of the real variables. Therefore we chose the model of Edwards (1988), which shows different determinants of the real exchange rate especially in the case of developing countries. Afridi (1995) also estimated real and monetary determinants of real exchange rate in case of Pakistan by using Edwards (1989a) model, however not all the variables of Edwards (1989a) are used in the analysis. Nevertheless, the study overlooks the fact that in the existence of non-stationary variables in OLS might give unfair results.

Edwards (1988), took three goods markets into consideration which are exports, imports and non-tradable (X, M, NT). The model was based on the following assumptions; country creates export goods and non-tradable and country consumes imports and non-tradable, Nation holds

both domestic and foreign money "M and F", Initially the study assumes perfect capital immobility (full capital control), but this assumption was relaxed later, as according to Edward (1988) there is also a government sector which is not subject to capital control, government sector consumes importable and uses "non-distortionary taxes and domestic credit creation" to fund its expenditure, because as a private sector it cannot borrow from out of the country,(Edwards 1988, equation 12). Furthermore the assumption of multiple exchange rate system was made because in most emerging countries there is a black or grey market for financial transaction. There is a tariff on import goods, price of export goods is also fixed and equal to unity, and there is perfect foresight.

To get the final equation we first need to know that on which equations it was based, secondly how the final equation was derived by using these equations, and for this we need to explain all these equations one by one to develop a better understanding of their applicability in our case.

$$\boldsymbol{A = M + \delta F}\ldots\ldots \text{ E88}^{1} \text{ (1)}$$

$$\boldsymbol{a = m + \rho F}\ \ldots.. \text{ E88 (2)}$$

$$\boldsymbol{m = \sigma(\frac{\delta^{\circ}}{\delta})\rho F}\ \ldots\ldots \text{ E88 (3)}$$

$$\boldsymbol{F^{\circ} = 0}\ldots\ldots. \text{ E88 (4)}$$

Equation E88 (1) states that a countries "total assets (A) in domestic currency is the sum of domestic money (M) plus foreign money (F) times the free market nominal exchange rate ($\boldsymbol{\delta}$)."

Equation E88 (2) defined "real assets in term of exportable good ($\boldsymbol{a}$);" equation E88 (3) is a portfolio composition equation which states that "the desired ratio of real domestic money to real

[1] E88 represents Edward (1988)

foreign money is negatively related to expected rate of depreciation of free rate (exchange rate)." Due to the assumption of perfect foresight expected rate of depreciation was substituted by actual rate of depreciation. Equation E88 (4) states that there is perfect capital immobility however the economy has "a positive stock of foreign money so that ***F>0"***.

Demand Side

$$P_M = EP_M^* + \tau \; ; \; e_X = \frac{E}{P_N} \; ; \; e_M = \frac{P_M}{P_N} \; ; \; e_M^* = (P_M^* E)/P_N \quad \text{……. E88 (5)}$$

$$C_M = C_M(e_M, a); \qquad \frac{\partial C_M}{\partial e_M} < 0, \frac{\partial C_M}{\partial a} > 0 \text{ ……..…….. E88 (6)}$$

$$C_N = C_N(e_M, a); \; \frac{\partial C_N}{\partial e_M} > 0, \frac{\partial C_N}{\partial a} > 0 \text{ ……... E88 (7)}$$

Supply Side

$$Q_X = Q_X(e_X); \; \frac{\partial Q_X}{\partial e_X} > 0 \text{ …….. E88 (8)}$$

$$Q_N = Q_N(e_X); \; \frac{\partial Q_N}{\partial e_X} < 0 \text{…… E88 (9)}$$

Government Sector

$$G = P_N G_N + EP_M^* G_M \text{ ……E88 (10)}$$

$$\frac{EP_M^* G_M}{G} = \lambda \quad \text{…… E88 (11)}$$

$$G = t + D^{\circ} \quad \text{……... E88 (12)}$$

From *equation E88 (5) to E88 (9)* demand and supply sides were summarized, *equation E88 (10) to E88 (11)* summaries govt. sector where as *equation E88 (12)* represents "government budget

constraint". It says that government consumption is sponsored by "non-distortionary taxes and by issuing more money in the form of domestic credit creation." Stationary equilibrium is achieved when government expenditure is equal to the total tax revenues or domestic credit creation is equal to zero, however if "crawling peg" is assumed for commercial sector. It is possible to have positive growth of domestic credit (D).

External Sector

$$\boldsymbol{CA = Q_X(e_X) - P_M^* C_M(e_M, a) - P_M^* G_M} \text{ ……. E88 (13)}$$

$$\boldsymbol{R^\circ = CA} \text{ …… E88 (14)}$$

$$\boldsymbol{M^\circ = D^\circ + ER^\circ} \text{ ….. E88 (15)}$$

$$\boldsymbol{e = \alpha e_M^* + (1-\alpha) e_X = \frac{E[\alpha P_M^* + (1-\alpha) P_X^*]}{P_N}} \text{ ……. E88 (16)}$$

Equation E88 (13) till E88 (16) summarized external sector, equation E88 (13) stated "currents account in foreign currency as variance between output of export goods and total private plus public consumption of import goods", equation E88 (14) represents balance of payment capital immobility and market determined financial rate, 'R•' represents as "current account" initially "there is a positive stock of R•". It is measured by the "stock of international reserves held by central bank expressed in foreign currency" and Equation E88 (15) shows "change in domestic stock (m•) is equal to change in domestic credit creation plus change in international reserves multiplied by commercial rate". It offers a connection between "variations in international reserves and variations in domestic credit and variations in domestic stock of money". In E88 (16) equation real exchange rate has been summarized as relative price of tradable to non-tradable good (excluding the tariffs on imports).

$$\boldsymbol{C_N(e_M, a) + G_N = Q_N(e_X)} \text{ ……. E88 (17)}$$

$$\boldsymbol{P_N = v(a, g_N, P_M^*, \tau)} \text{…….. E88 (18)}$$

$$\boldsymbol{\rho^\circ = \rho L(\frac{m}{\rho F})} \text{ …….. E88 (19)}$$

Equation E88 (17, 18 19) state the relationships due to which we are able to understand the derivation of equation 20. According to equation E88 (17) non-tradable good markets clears if private and government consumption of non-tradable is equal to total quantity available of non-tradable goods. With equation E88 (17) equilibrium price of non-tradable ($\boldsymbol{P_N}$) in equation E88 (18) can be explained as the function of $\boldsymbol{a, g_N, P_M^*, \tau}$**.** **"**Nominal exchange rate for commercial transaction is fixed ($\frac{\delta^\circ}{\delta}$) in the portfolio equilibrium equation E88 (3) it can be replaced with the rate of change of spread ($\rho°/\rho$) which leads us to equation E88 (19) as we can write "m/ρF=$\sigma\left(\frac{\rho^\circ}{\rho}\right)$**",** reversing this equation and solving it for $\rho°$ leads to equation E88 (19)"**.**

By solving equation E88 (10, 12, 13, 14, and 15) simultaneously we get equation E88 (20) and equation E88 (21).

$$\boldsymbol{m^\circ = Q_X(e) - C_M(e, a) + g_N - \frac{t}{E}} \text{ ……. E88 (20)}$$

$$\boldsymbol{e_{LR} = v(m_\circ + \rho_\circ F_0, gN_\circ, {}^{r}0, P_{M^\circ}^*)} \text{ …….. E88 (21)}$$

Equation 21 explained that "the long run real equilibrium exchange rate is the function of real variables" only which means that whenever these variables change there is a change in equilibrium real exchange rate. However in short run changes in the monetary variables D (domestic credit creation), D• (change in domestic credit creation), and E (fixed commercial exchange rate) will also affect the real exchange rate. This explains that "in long run changes in

real variables i.e. fundamentals bring changes in equilibrium real exchange rate however in short changes run in monetary variables will also affect real exchange rate." Then equation E88 (12) and E88 (14) were further modifies for capital flow. In Equation 21 e_{LR} represents long run equilibrium real exchange rate, $m_\circ + \rho_\circ F_0$is real assets in terms of exportable, $g_n$is government consumption of non-tradable, $^{r}{}_0$ is tariffs on imports, $P^*_{M\circ}$is foreign price of imports.

It can be seen from equation E88 (21) that "long run equilibrium exchange rate is the function of real variables only so called ***fundamentals*.**" Any change in these variables will bring change in real exchange rate. Whereas in short run equilibrium exchange rate is determined by monetary variables too.

Now by considering the case of Pakistan as a developing country we take the same three goods into consideration (exports, imports and non-tradable) the economy involves consumers and the country is producing exports goods and non-tradable and is consuming import goods and non-tradable. Currently the country has a floating exchange rate system, "E" denoting "nominal exchange rate", P_x and P_N are prices of imports and non-tradable. The world price of import goods is denoted by Pm*. "World price of export goods is normalized to unity so the domestic price of export goods is. $\boldsymbol{P_x = EP_x = E}$" "Real exchange rate has been defined as the price of traded and non-traded goods i.e. $\boldsymbol{RER = e = \frac{(EP^*_T)}{P_N}}$ where E is nominal exchange rate, P^*_T is world price of tradable and P_N is price of non-tradable".

By using equation E88 (27) we will find the effect of real and monetary variables in short run and long run in case of Pakistan.

$$\Delta \boldsymbol{loge_t = \theta\{loge^*_t - loge_{t-1}\} - \lambda\{Z_t - Z^*_t\} + \phi\{logE_t - logE_{t-1}\} - \varphi[PMPR_t - PMPR_{t-1}]}$$ ….. E88 (27)

Here "e_t is actual real exchange rate", "e_t^* is equilibrium real exchange rate", "Z_t is an index of macroeconomic policies and here it represents rate of growth of domestic credit", "Z_t^* is rate of increase of demand for domestic money", "**Et** is nominal exchange rate", "PMPR is parallel market spread for foreign exchange" "**θ, λ, ϕ, φ** are positive parameters that capture the most important dynamic aspects of the adjustments process". This equation states that actual dynamics of real exchange rate depends on the four forces stated above. The actual real exchange rate will make adjustments to correct existing misalignments, by the term $\theta\{loge_t^* - loge_{t-1}\}$ this self-adjustment mechanism takes place with reduction in price of non-tradable or increase in world price of tradable; the parameter θ shows the speed with which adjustments take place.

The second term $\lambda\{Z_t - Z_t^*\}$states that "if macroeconomic policies are unmaintainable in the medium or long run and are inconsistent with pegged rate there would be pressure towards appreciation." The third term $\phi\{logE_t - logE_{t-1}\}$ refers to "changes in the nominal exchange rate which closely apprehensions the consequence of our model that is a nominal devaluation would have a positive effect on real exchange rate, causing short run devaluation". The fourth element $\varphi[PMPR_t - PMPR_{t-1}]$ is "the effect of changes in the parallel market premium on exchange rate, an increase in parallel market spread will be associated to a real exchange rate appreciation."

Our final equation after making all the calculations and by adding new variables is:

$$\boldsymbol{RER = f\ (\ PMPR, TOT, G(DC), TAR, FDI, STLOANS, LTLOANS, \frac{NFA}{NDA}, G_n)}$$

Where,

RER=real exchange rate

TOT= terms of trade

PMPR=parallel market spread,

G (DC) = growth of domestic credit,

TAR= tariffs

FDI= foreign direct investment

STLOAN = short term loans

LTLOAN = short term and long term loans,

NFA/NDA= net foreign assets divided by net domestic asset

$\mathbf{G_n}$**=** government consumption of non-tradable.

4. Data

The data for the model stated above was calculated from economics survey, by taking data from 1980-2013, FDI was taken as a proxy of capital flow, spread premium is calculated by taking the ration of official exchange rate to parallel market exchange rate. The data of government expenditure on non-tradable was used as a proxy for government consumption of non-tradable. The data on monetary variables such as domestic credit (D), net foreign assets, and net domestic assets is taken from economic survey. Furthermore loans, interest rate, and FDI are addition to our model. Afridi (1995) also used the theoretical framework from Edwards (1989) but didn't used spread premium and tariffs in the model, they would also be introduced in the model along with loans, net foreign assets, net domestic assets interest rate and FDI. In calculating RER US $ is used against Pakistan because now days it is a powerful currency same is the case with the remaining data taken for estimations, that US $ is used as foreign currency unit, as it is one of the dominating currencies.

Real exchange rate and tariffs were calculated by:

$$\boldsymbol{tariffs} = \frac{\boldsymbol{custom\ duties}}{\boldsymbol{imports}}$$

$$\boldsymbol{RER} = \frac{[\boldsymbol{ER} \times \boldsymbol{CPI}\ (\boldsymbol{US})]}{\boldsymbol{CPI}(\boldsymbol{Pakistan})}$$

4.1 Expected Signs and Descriptive Analysis

The most important fundamentals in determining the behavior of the real exchange rate are external terms of trade, government consumption of non-tradable, import tariffs and capital flows.

The appendix gives the full detail of the movement of different real and monetary variables, along with the comparison of the real and nominal exchange rate behavior over the time by graphical representation. By taking data from 1980-2013, as exchange rate in 1980's shifted to managed floating exchange rate regime, average and compound growth rates were calculated in case of Pakistan to check the behavior of real and monetary variables over the period. Exchange rate was seen to be depreciating and appreciation of rupee against dollar took place in 2002-03 only. 2002-07 real exchange rate appreciation took place then from 2009-10 again appreciation of real exchange rate took place against dollar which depreciated on 2011-12 then again appreciated in 2013. Over the period instability was observed in gold and foreign reserves.

If we look at the data from 1980-1990 we will observe that capital flows in the form of FDI is 22.6 due to which our exchange rate is -7.60 that is appreciation of exchange rate real exchange rate follows the same trend -5.46 with this appreciation the amount of gold and foreign reserves in our home country is negative (decreasing), as foreigners would find out exports expensive and hence less attractive, the value of spread premium being 1.46, our term of trade is deteriorating by -2.14.

During 1980-2000 nominal and real exchange rate were still appreciating due to which after a while FDI which is a source of capital flow fell to 8.07, and the value of spread premium also reduced to 0.49.

In 2000-2010 nominal exchange rate appreciated as a result of increase in foreign reserves in our country but real exchange rate depreciated by 0.77 due to which FDI increased (16.72) as foreigner found our exports cheaper, the value of short term and long term loans was maximum in this time period as spread premium was decreasing even further to 0.42. Government consumption of non-tradable is 13.03, which is less than the level of consumption in the previous years.

In the recent years from 2011-2013 real and nominal exchange rates both appreciated, the demand for our money increased due to which domestic credit increased too. As a result provision of short term loans was reduced as those loans are provided by IMF only when the currency depreciates.

4.1.1 Effects of a real variable on exchange rate

Capital Flow

Most developing countries have capital controls they are sometimes favorable and sometimes are hurdle in economic growth and development of a country. In case of Pakistan ambiguous results were obtained while reviewing the study of few authors. Initially in the model developed by Sebastian Edwards effective capital control were assumption was taken into consideration and later this assumption was relaxed as government sector is not subject to capital control some inflow and outflow of capital can take place in a country. Hence this model was modified and it was stated that due to (unanticipated) decline in capital flow, caused by the payment of foreign

debt, there would be real exchange rate depreciation which would last until all debt is retires and service payments are completed.

Foreign Direct Investment (FDI)

FDI is a source of capital funding in developing countries. It affects equilibrium real exchange rate in two ways. It does not affect equilibrium real exchange rate if it is used to finance expenditure on imports, however, when used for financing domestic non-tradable sector, it will lead to the appreciation of home currency. Most empirical studies suggest that the effect of FDI on real equilibrium exchange rate is positive which implies that increase in long-run capital inflows appreciates the real exchange rate. FDI is also an example of long term capital flows, thus, it also affect equilibrium real exchange rate through both supply and demand channels. Considering supply side, FDI passes spillover effects through technology transfers which results in increase in output and decrease in prices of non-tradable thus the real exchange rate depreciates at first place. However, latter on increase in output of non-tradable expands disposable income which then results in real exchange rate appreciation. Hence a FDI inflow in Pakistan while appreciating the value of equilibrium real exchange rate also reveals presence of 'Dutch Disease', i.e., "parallel effect through demand channel realized after FDI inflows, if they are not crowding out domestic investment" (Rehman, Jaffri, & Ahmed, 2010).

Foreign direct investment (FDI) taken as a proxy of capital flow showed negative capital flow 12 times, these negative capital flows can be states as capital outflow that would lead to depreciation of real exchange rate, if we look at the data from 1996-2013 one can conclude that negative value of FDI was associated with exchange rate depreciation. Correlation between FDI

and real exchange rate was 0.42 whereas with nominal exchange rate the correlation was observed to be 0.59.

Terms of Trade

Now let's consider the case of worsening in the international term of trade due to increase in foreign price of importable Pm*. The effect would be same as above that real exchange rate appreciation would take place. As price of import increases, imports become more expensive, with export price unchanged, so foreign price goes up with domestic price being the same.

Terms of trade explains that how much amount of imports an economy can purchase per unit of exports. While studying the data of terms of trade showing negative values over the period which means Pakistan can have less of import against its exports, its exports are not sufficient to finance its imports. Only in 1983-84, 1987, 1992, 1994-95, 1997-98, 2009, 2011 positive values for term of trade were observed. Terms of trade is negatively correlated with nominal (0.67) and real exchange rate (0.41).

Tariffs

An increase in tariff (import tariff) can lead to both appreciation and depreciation of real exchange rate. A higher tariff leads to substitution in demand away from importable to non-tradable as an increase in domestic money and p leads to a higher value of real assets and thus an increase in demand for non-tradable. If this process continues that current account may turn into surplus and forex reserves goes up. In this case, the effect of increase in tariffs would be real exchange rate appreciation.

Tariffs are restriction on trade of goods and services as well as capital flow, there is much variability in the data over the time period, the positive values over the years indicate that trade was not liberalized in those years, whereas the negative values from 1991 onwards represent trade liberalization, but there is instability in trade liberalization over the period. Whereas while looking at the latest figures in 2012-13 trade liberalization cannot be observed. An increase in tariff will lead to a rise in import price at home thus a reduction demand of imports, demand for non-tradable increases, to maintain equilibrium price of non-tradable increases and hence real exchange rate appreciation takes place (less devaluation of exchange rate).

Government Consumption of Non-Tradable

An increase in government consumption of non-tradable would lead to real exchange rate appreciation. As increase in consumption would lead to increase in demand for non-tradable goods and this would lead to a rise in price of non-tradable and hence real exchange rate would appreciate and vice versa. Government consumption of non-tradable was less correlated with real exchange rate (0.56) and highly correlated with nominal exchange rate (0.89). This implies that increase in government's roles lead to overvaluation of the real exchange rate, while nominal exchange rate is unchanged.

Long Terms and Short Term Loans

Short term foreign bank loans, also known as "hot money," are the movement of funds or capital from one country to another in order to get short term gains on either due to the gap between domestic and foreign interest rate or due to changes in exchange rate. Since this kind of capital can move in and out very quickly therefore it has great potential to make market instable.

Loans also show negative growth over the period, which implies that piling up leads to overvalued exchange rate because SBP has enough forex reserves in their hands to do ample open market operations. Government consumption of non-tradable are increasing over time which leads to appreciation in real exchange rate due to increase in demand for non-tradable and hence price of non-tradable will also increase.

Parallel Market Premium (PMPR)

Parallel markets were developed in developing countries as a result of excess demand for a commodity subject to legal restriction on forex trading at official market price. Under fixed rate regime an expansionary fiscal and monetary policy leads to depreciation of parallel exchange rate, real appreciation of official exchange rate and a decline in prices of goods for which exports are surrendered through official market rate relative to parallel rate hence proportion of exports proceeds repatriated at official ER rate fall and official reserves decline [Edward (1989)].

Moreover, in case of managed floating exchange rate regimes, since SBP is eager to control the rate by open market operations, therefore, parallel market is a good indicator to identify the power of official value of exchange rate, i.e., how much it is overvalued.

Finally the data of spread premium shows "the difference between actual and equilibrium real exchange rate", any increase in the spread premium value would lead to real exchange rate appreciation, over the period 2002-07 shows increase in spread premium value which was also associated with real exchange rate appreciation in Pakistan, 1982-85 also show increase in spread but they were not associated with real exchange rate appreciation, in 1995 increase in spread was again associated with real exchange rate appreciation same association was also observed in 2009-10. Spread premium was highly correlated with real exchange rate (0.78)

4.1.2 Effect of Monetary Variables on Real Exchange Rate

After discussing the effect of fundamentals on real exchange rate in short run, in this section we move to check the effect of change in monetary variable on real exchange rate.

Commercial Rate

The movement towards equilibrium depends on many things one is by "implementing an unexpected nominal depreciation of commercial rate (E)", a higher value of E leads to fall in the real stock of money, ($\boldsymbol{m = \frac{M}{E} = R + \frac{D}{E}}$). Unanticipated nominal devaluation would have short run effect only. With this devaluation there would also be total loss of reserves.

Domestic Credit

Expansion in Money stock due to unanticipated increase in domestic credit leads to higher spread premium which results in higher real exchange rate appreciation in the short run. This appreciation would be short lived because of the elf-correcting mechanism in the long run towards equilibrium. Self-correcting mechanism is any decrease in price of non-tradable or increase in world price of tradable. During this mechanism excess money holdings will go away and stock of international reserves will decline which results in continuous real exchange rate depreciation due to reduction in price of non-tradable moving back to long run equilibrium. But the actual short run equilibrium would still be overvalued it would be below long run equilibrium.

Domestic credit creation shows positive growth, only 10 times the domestic credit creation has shown negative growth; similarly over the time net foreign exhibits positive growth in 1982, 1985, 1988-89, 1992, 2001-03, 2005-2007, then in 2013 which shows foreign capital inflow.

Domestic credit creation was found to be highly correlated with nominal exchange rate from 1980-2013 i.e. 0.88 and correlation was found to be less with real exchange rate that is 0.58.

Domestic and Foreign Assets

Net domestic and foreign assets also show variability when we have a look at the trend they follow over the period as the correlation was low with real exchange rate. The correlation between foreign exchange reserve and real exchange rate was recorded to be 0.59 whereas the correlation was 0.82 with nominal exchange rate. The correlation of Net domestic assets was higher (0.81) with nominal exchange rate, and less with real exchange rate, whereas correlation of both real and nominal exchange rate was low with net foreign assets.

5. Empirical Findings and Results

Although stationarity test is vital to check the unit root of time series data, nevertheless, we have not used it since the scope of thesis is not to use sophisticated econometrics techniques. This would be among the major limitations of the thesis.

We have used *Ordinary Least Square (OLS)* method to estimate the parameters of the determinants affecting real exchange rate. The equation can be taken as a long run equation but we haven't checked either the unit root test or apply error correction mechanism to check short run adjustments in the real exchange rate.

By taking data from 1980-2013 we estimate the effect of real and monetary variables on real exchange rate in case of Pakistan, where Real exchange rate (RER) is taken as dependent variable and terms of trade (TOT), tariffs (TAR), government consumption of non-tradable (GN), domestic credit creation (DC), short term (STLOAN) and long term loans (LTLOANS), FDI, net domestic assets (NDA), net foreign assets (NFA), and parallel market spread premium (PREM) are taken as independent variable. By running OLS following results are obtained, our level of significance being 5% (0.05) and following are the interpretation from estimations. Two models are used here which will be discussed one by one.

5.1 Model 1

Dependent Variables is Real Exchange Rate

Variables	Coefficient	t-values	Prob.
Constant	6.61	0.46	0.6527
Exchange rate premium	50.18	3.31	0.0030
Long term loan	0.0027	1.35	0.1879
Short term loan	0.0027	0.52	0.6096
FDI	-0.0024	-2.27	0.0327
D(Terms of trade)	-0.086	-0.71	0.4875
Tariff	-0.644	-3.58	0.0016
Government consumption of non-tradable	-1.67E-06	-1.13	0.2706
D(log(Domestic Credit))	1.087	0.42	0.6786
NFA/NDA	0.065	0.43	0.6716

$\boldsymbol{R^2}$	0.817684	**F-statistic**	11.46165
$\overline{R}^2$	0.746343	**Prob (F-statistic)**	0.000001
Sum of Squared Residual	553.5768	**Durbin-Watson stat**	1.468061

The value of R square is 0.81 which states that this model explains 81% of the variation in real exchange rate (Dependent variable). The value of the co-efficient being positive suggests that there is a positive relationship of real exchange rate with all explanatory variables and vice versa.

5.1.1 Real Variables

Foreign Direct Investment (FDI)

With one hundred million increase in FDI (holding all other variables constant), real exchange rate appreciates by 0.23 Rupees, as it improves productivity of tradable sector in a country. It is also a form of capital inflow. FDI is significant at 5% level of significance. Therefore we can say that the impact of FDI on real exchange rate is significant at 5 percent level of significance.

Terms of Trade (TOT)

With hundred million increase in term of trade (holding all other variables constant), real exchange rate appreciates by 8 rupees. A rise in the terms of trade leads equilibrium real exchange rate to appreciate to the extent that it improves the trade balance. But term of trade is insignificant at 5% level of significance. If terms of trade were significant their deterioration would lead to real exchange rate depreciation as suggested in empirical evidence.

Tariffs (TAR)

With one percent increase in tariffs (holding all other variables constant), real exchange rate appreciates. Increase in tariffs lead to a rise in domestic price of import goods due to which its demand falls, and demand for non-tradable increases to maintain equilibrium price of non-tradable also increases and hence real exchange rate appreciates. More constraints on trade have a negative effect on the prices of tradable (Edwards, 1988). It is thus expected that limiting trade will push down the price of tradable relative to non-tradable; leading to appreciation of the equilibrium real exchange rate. It is significant at 5% level of significance. Since it is significant at five percent level of significance therefore we can confidently say that it impacts real exchange rate significantly.

Government Consumption of Non-Tradable (GN)

With one percent increase in government consumption of non-tradable (holding all other variables constant), real exchange rate appreciates. It is insignificant at 5% level of significance. As consumption of non-tradable increases, its demand also increases to meet this excess demand price of non-tradable increases due to which real exchange rate appreciates.

Long Term Loans

Holding all other variables constant, with one hundred million, increase in long term loans, real exchange rate depreciates by 0. 27 or Rs2/$. It is insignificant at 5% level of significance.

Short Term Loans

With hundred million increase in short term loans (holding all other variables constant); real exchange rate depreciates by Rs.2/$. As due to increase in short term loans production in the non-tradable sector improves. When foreign aid utlised to improve productive capacity in the non-tradable sector, real exchange rate depreciates. Moreover, it is also possible that short term loans are given when exchange rate depreciates first. But here it is insignificant at 5% level of significance.

Parallel Market Spread Premium (PREM)

One percent increase in spread premium (all other variables held constant), the real exchange rate depreciates by 5.01, and with one percent decrease in premium real exchange rate appreciates. If the gap is near one premium is less and if the gap between official and parallel is far from one premium is more. It is significant at 5% level of significance

5.1.2 Monetary Variables

Growth of Domestic Credit

With one percent increase in domestic credit growth (holding all other variables constant), real exchange rate depreciates by Rs.1.08/$, as there is an increase in real stock of domestic money which might lead to inflation. But domestic credit growth is insignificant at 5% level of significance.

Net Foreign Assets/ Net Domestic Assets (NFA/NDA)

With one percent increase in NFA/NDA (holding all other variables constant), real exchange rate depreciates by Rs.0.06/$. This implies that when state bank purchases more foreign assets relative to domestic assets real exchange rate depreciate. The depreciation in real exchange rate could be due to the depreciation in nominal exchange rate due to decline in the supply of foreign assets in the market, although the value of parameter is insignificant at 5% level of significance.

5.2 Model 2

Dependent Variables is Real Exchange Rate

Variable	Coefficient	t-values	Prob.
Constant	3.17	0.21	0.8351
Exchange rate premium	58.58	3.87	0.0007
Long term flows	-0.0008	-1.27	0.2171
Short term loan	0.0068	1.34	0.1901
D(terms of trade)	-0.028	-0.23	0.8224
Tariff	-0.568	-3.09	0.0049
Government consumption of non-tradable	-1.42E-06	-0.92	0.3673
D(log(Domestic Credit))	0.332	0.12	0.9024
NFA/NDA	0.0596	0.38	0.7086

$\boldsymbol{R^2}$	0.790747	**F-statistic**	11.33672
$\overline{R}^2$	0.720996	**Prob(F-statistic)**	0.000002
Sum of Squared Residual	635.3681	**Durbin-Watson stat**	0.999830

In Model II, we add Foreign Direct Investment and Long term loans together to make one variable so that we can check the combined impact of long term flows which is absent when we use both the variables separately. Nonetheless, results are very similar to the Model 1, and there is no change in the sign and significance of the variables. But as the value of R-square appears to be better in model I we will take into consideration that model only.

5.3 Testing the Problem of Auto Correlation

As the value of Durbin Watson in model 1 lies in inconclusive region i.e. between the lower and upper bound, at 5% level of significance, so we need to check that the problem of auto correlation exists or not. For that purpose we are applying Breusch-Godfrey LM-ARCH test. As we can see from the results stated in the table residual 1 and residual 2 both are insignificant hence there is no problem of auto correlation

Breusch-Godfrey Serial Correlation LM Test

Variables	Coefficient	t-values	Prob.
C	1.23	0.08	0.9337
Exchange rate premium	0.22	0.01	0.9885
Long term loan	-0.0017	-0.69	0.4961
Short term loan	0.0005	0.09	0.9315
FDI	0.0007	0.59	0.5647
D(terms of trade)	0.07	0.51	0.6143
Tariff	0.07	0.37	0.7138
Government consumption of non-tradable	1.08E-06	0.62	0.5411
D(log(Domestic Dredit))	-0.40	-0.16	0.8779
NFA/NDA	-0.01	-0.05	0.9612
Resid(-1)	0.36	1.44	0.1657
Resid(-2)	0.10	0.34	0.7382

$\boldsymbol{R^2}$	0.091103	**F-statistic**	0.191358
$\overline{R}^2$	0.384985	**Prob(F-statistic)**	0.996431
Sum of Squared Residual	503.1441	**Durbin-Watson stat**	1.820706

6. Conclusions

Beside finding the determinants of real and monetary variables, and estimating there effect on real exchange rate in case of Pakistan, this study is a further improvement of Edwards (1988) model as new variables like short term and long term loans, FDI, net domestic assets and net foreign assets are introduced in this model. These variables were not introduced before in any study in case of Pakistan, even though Afridi (1995) tried to modify this model but he didn't use all the variables. By modification of Edward (1988) model and estimating the model by OLS, results state that in the long run real variables are more significant (tariffs, FDI) and hence they have effect on real exchange rate, along with them premium rate was also found to be significant for determination of behavior of real exchange rate in case of Pakistan. Monetary variables (domestic credit, net foreign assets, and net domestic asset) do not affect real exchange rate in the long run and they were found to be insignificant.

FDI and Tariffs lead to real exchange rate appreciation, as FDI improves productivity in the tradable sector it is also a form of capital flow, s capital flow and foreign borrowing in current increases, expenditure on all goods including non-tradable increases, to maintain equilibrium price of non-tradable increases and hence real exchange rate appreciates. If we have a look at the other significant variable, tariffs leads to rise in domestic price of importable due to which demand for imports falls as a result demand for non-tradable increases, to maintain equilibrium price of non-tradable increases and hence real exchange rate appreciates. Spread Premium is also significant and it leads to real exchange rate depreciation.

6.1 Policy Implications

Relaxation of capital control is beneficial for a developing country like Pakistan, as capital flow is a form of technological development in case of developing countries like Pakistan. Aid transfer from the rest of the world leads to real exchange rate appreciation which leads to reduction in degree of international competitiveness and hence country's export becomes less competitive internationally. Tariffs are bad for the competitiveness, therefore lesser the tariffs implies more competition, so tariffs should be reduced.

6.2 Limitations

The limitation in this study is that for estimations OLS is used only, there are other methods too which can be used for estimations (co-integration, ARDL approach etc.). No disturbance is checked in our study. Further research could try to make comparison by taking different country case into consideration and by applying new techniques for estimations. Hence there is a scope for further study.

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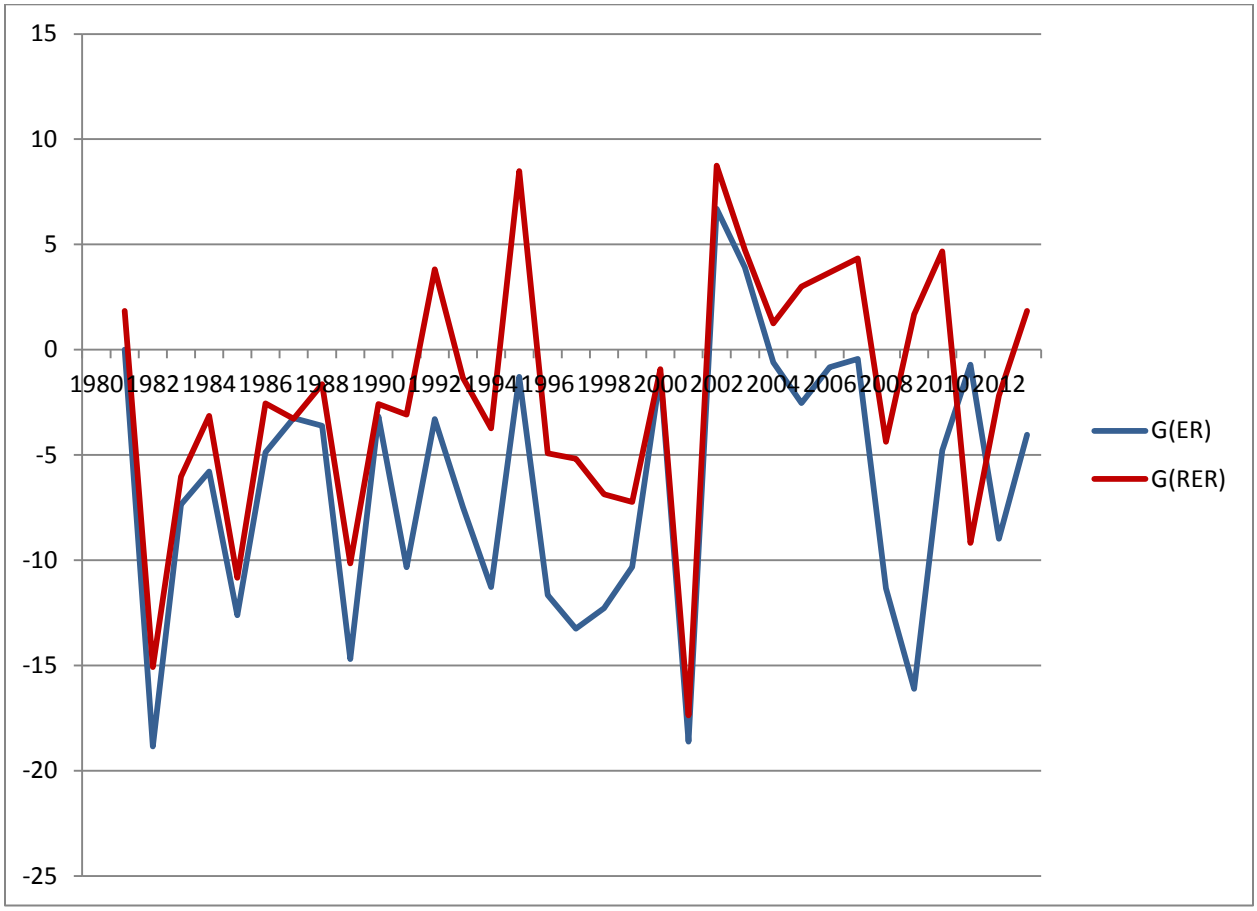
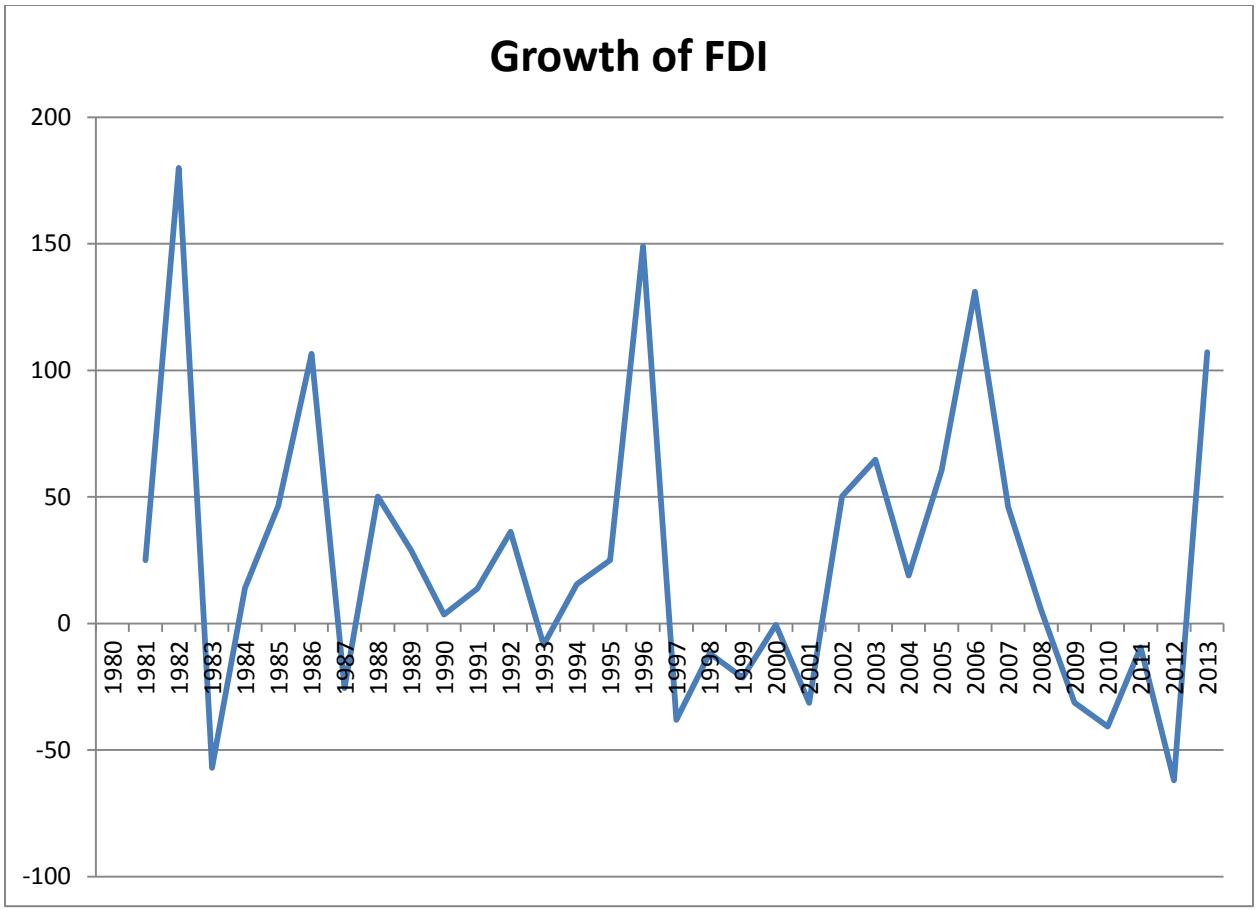
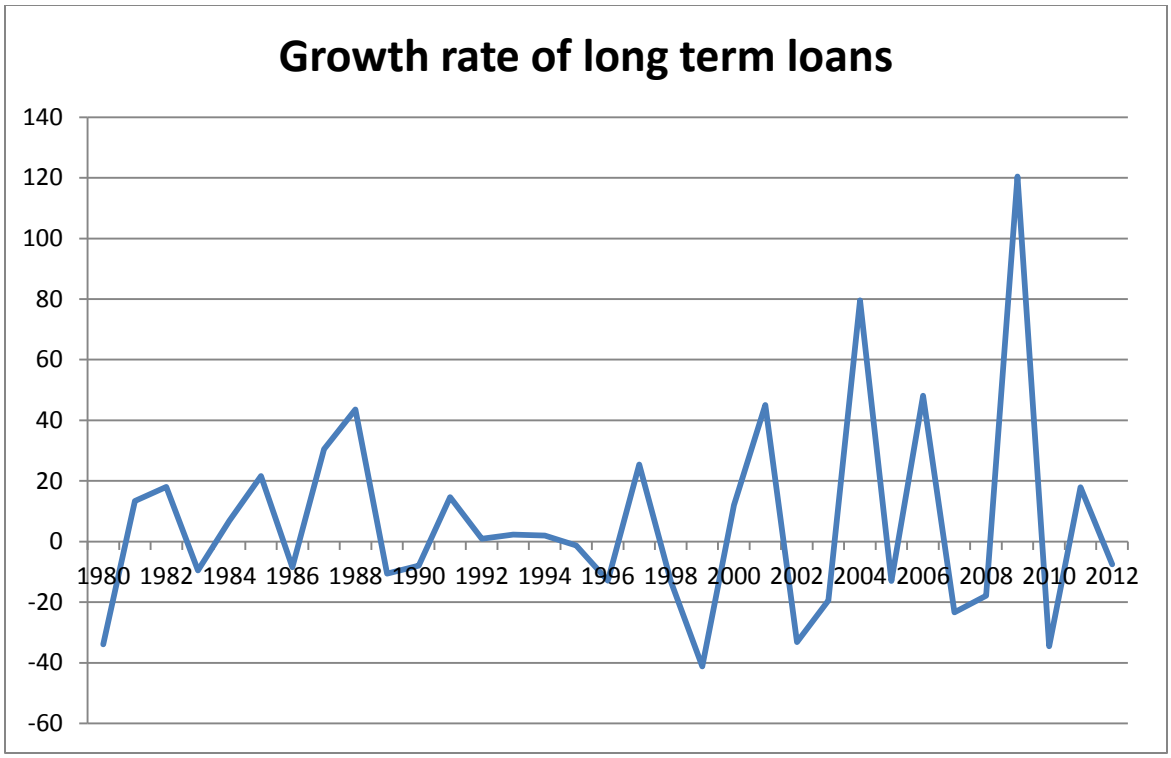
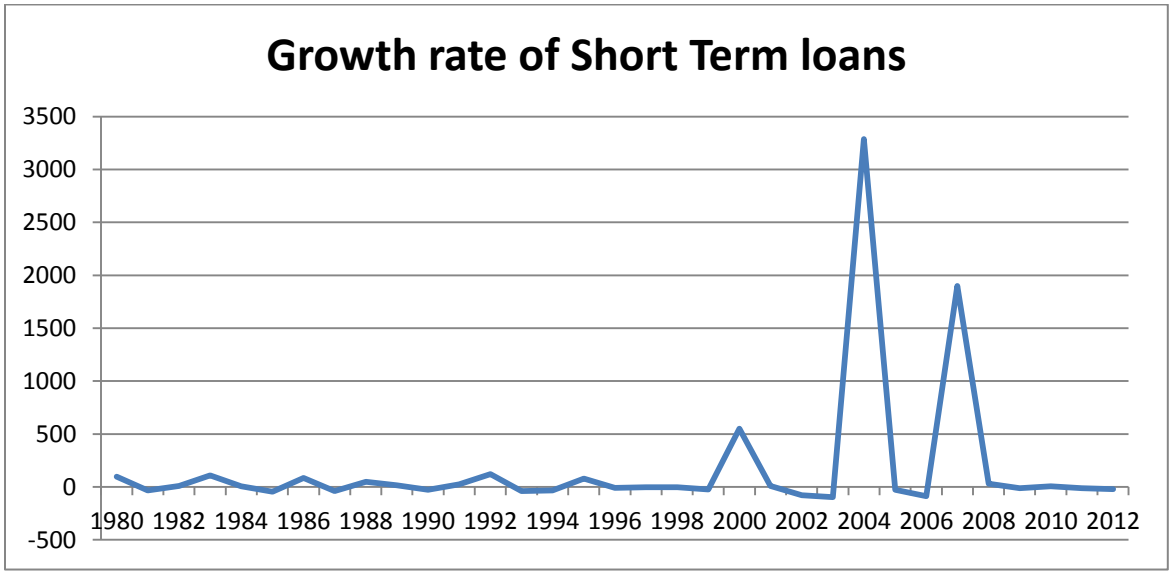
Appendix

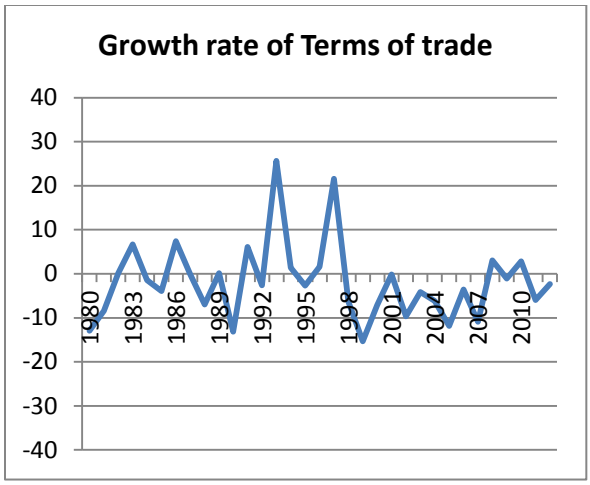
Comparison of Nominal and Real Exchange Rate

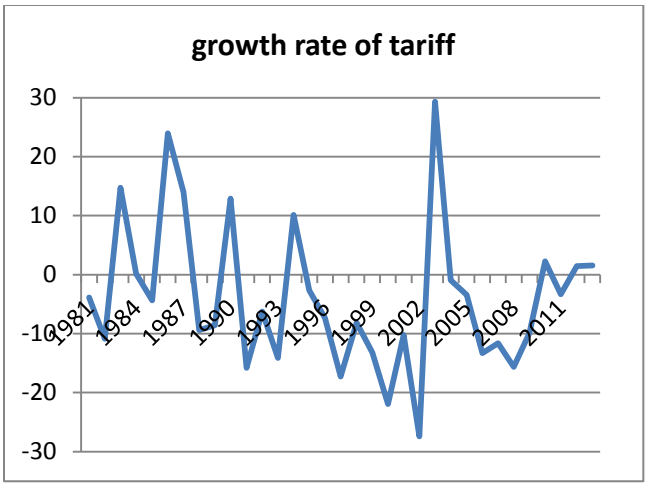


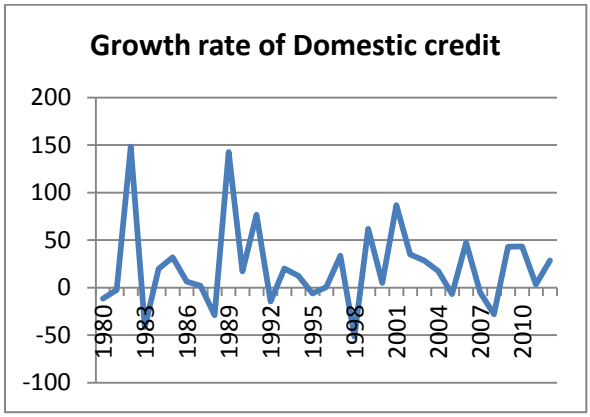

Growth of FDI
200
150
100
50
0
-50
-100
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013

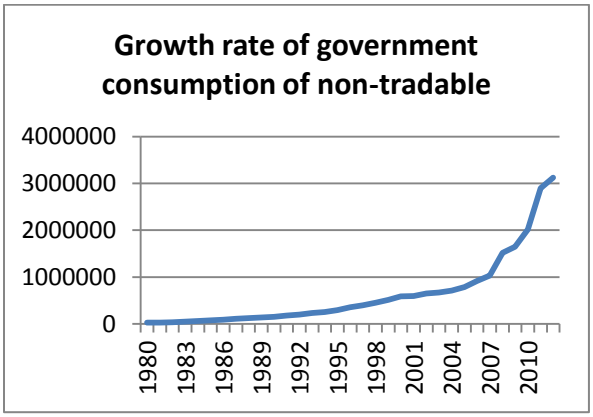

Growth rate of long term loans
140
120
100
80
60
40
20
0
-20
-40
-60
1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012


Growth rate of Short Term loans
3500
3000
2500
2000
1500
1000
500
0
-500
1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012


Growth rate of Terms of trade
40
30
20
10
0
-10
-20
-30
-40
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010


growth rate of tariff
30
20
10
0
-10
-20
-30
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
2011


Growth rate of Domestic credit
200
150
100
50
0
-50
-100
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010


Growth rate of government consumption of non-tradable
4000000
3000000
2000000
1000000
0
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010