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EXCHANGE RATE AS A DETERMINANT OF FLUCTUATION IN FOREIGN EXCHANGE RESERVES: EVIDENCE FROM ECONOMY OF PAKISTAN

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ABSTRACT

This study Models the relationship and causality link between Foreign exchange reserves and Exchange rate (nominal and real exchange rate) for economy of Pakistan using annually data series started from 1983 to 2009. The empirical Methodology usesCo integration analysis. TheCo integration result point out that there is a long run relationship exists between Foreign exchange reserves and Exchange rate. This study also examine causality relationship and also suggest that the causality direction goes from Nominal effective exchange rate and Real effective exchange rate towards foreign exchange reserves, it means that in Pakistan both Nominal effective exchange rate and Real effective exchange rate effect the Foreign exchange reserves.

Keywords: Foreign exchange reserves, nominal effective exchange rate, real effective exchange rate, cointegration

INTRODUCTION

Foreign Reserves is deposit in the form of foreign currencies or foreign financial instrument held by central bank, which allows Government to make their Exchange Rate stable, and reduce the unexpected emergencies and Economic shocks, the basic components of foreign exchange reserves involves gold assets, foreign securities or financial derivatives, domestic reserves in the form of bank reserves and special drawing rights (SDR) (Prasad and Raju 2010); (Prabheesh 2007), The demand for large amount of holding international reserves increased after the break down of Bretton wood agreement in (1973) and accelerated in recent years, Most of theories suggest that a country which have fixed or managed floating exchange rate system should have more reserves accumulation as compare to a country which have freely flexible exchange rate system, because in fixed or manage floating exchange rate system state bank interfere in international market for necessary arrangement to make stable the exchange rate (Choi, Gwan et al. 2004). Foreign exchange reserves will raise when there is a high demand of home currency in an international market, and conversely Foreign exchange reserves will decrease when in an international market the supply of home currency increased, thus according to this approach foreign exchange reserves are a residual holding by country (Prabheesh 2007); (Edwards 1984). Foreign reserves of a country's are an external assets which is controlled by monitory authorities, the main purposes of foreign reserves are,

1. Financing for imbalances of balance of payment,
2. Protecting the home currency from unexpected shocks by interference of state bank in international market to make stable the domestic currency through demand and supply.
3. Similarly the other main reasons for holding foreign reserves are
4. Foreign reserves are hold as Backing for home currency, under the Bretton woods agreement gold is used as a reserves it is most conventional use of reserves,

5. Foreign reserves is used as tool of exchange rate or monitory policy, In fixed exchange rate system and managed exchange rate system it allows the monitory authority to intervene in international market to maintain exchange rate,
6. Foreign reserves are used for payment of foreign liabilities and external debt, it is also used as self insurance against unexpected and emergencies shocks and as investment fund.

After the collapse the Bretton wood system (1973) a flexible exchange rate system adopt by many countries, which allows a capital account liberalized in emerging market economies, which result increase substantionaly the level of foreign exchange reserves, but from capital account liberalization in emerging market countries create probilestic affect on accumulation of foreign exchange reserve, On one hand from capital liberalization the inflow of capital increased which result increase the level of foreign exchange reserve, but on the other hand the exchange rate market destabilized from these volatile and short run flows, these imbalance contentiously decrease the value of emerging market economies which result reversal capital flow and currencies crisis, most of countries increase their quantum level of foreign exchange reserves after the 1990s, financial crisis, because from these financial crisis most of countries gain experience that a large amount of foreign exchange reserve accumulation is better decision for protection of their economy (Akdogan 2010), and according to (Mendoza 2004) a large amount of foreign exchange reserves is a self insurance motive for unexpected economic shocks, because a large amount of foreign exchange reserve accumulation make stable the exchange rate, and a stable exchange rate result a stable economic environment.

OBJECTIVES OF THE STUDY

The main objectives of this study are:

1. To investigate long run movement/direction of Foreign Exchange Reserves and Exchange Rate (Real and Nominal exchange rate) in India and Pakistan.
2. To investigate short run movement/direction of Foreign Exchange Reserves and Exchange Rate (Real and Nominal exchange rate) in India and Pakistan.
3. To investigate the causality link between Foreign Exchange Reserves and Exchange Rate (Real and Nominal exchange rate) in India and Pakistan.

LITERATURE REVIEW

The existing studies have mostly on the exchange rate volatility, Uncertainty, and Demand of a foreign Exchange reserves, for instance (Prasad and Raju 2010) explore the sufficiency and consumption of international reserves with group of variables like exchange rate, export GDP, and openness, the result showed that there is positive relationship between international reserves, GDP and export volatility, its means that when the output of GDP and volatility in export increase the level of foreign exchange reserves increase, the result also suggest that the relationship between Foreign Exchange reserves and Exchange Rate are inversely proportional to each other when the exchange rate increase or currency depreciate, the Quantum level of Existing international reserves decrease because of government intervention in international market to restore their home currency value.

(Kasman and Ayhan 2008) explore the association among Foreign Exchange reserve and Exchange rate of Turkey and found that both variables foreign exchange reserves and exchange rates have long-run relationship, they also study the causality link between Foreign Exchange Reserves and Exchange Rate, they suggest that in case of Real Effective Exchange

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Rate the causality kink goes from Foreign Exchange Reserves to Real Effective Exchange Rate in both Long and Short run, and in case of Nominal exchange rate they suggest that in the long-run nominal exchange rate effect foreign exchange reserves. (Ahmed and Pentecost 2006) study the association among exchange rate and international reserves and propose that both variables exchange rate and international reserves have extensive association. (Aizenman and Marion 2003) and (Flood and Marion 2002) studied the demand for foreign exchange reserves, the result showed that instability of nominal effective exchange rate significantly reduce the level of international reserves, they also suggest that greater exchange rate flexibility lower reserves holding.

(Fukuda and Kon 2007) examined that what macroeconomic impacts accumulated foreign exchange reserve have in developing countries, they found that when the government increases their foreign reserve not only a liquid debt but also total debt increase, while the debt maturity becomes shorter, the increase a foreign debt also leads a permanent decline in consumption. Study by (Flood, Perraudin et al. 1998) Reserves and Exchange Rate Cycle and suggest that there is a inverse correlation among reserves and exchange rate series. (Prabheesh 2007) explore the demand for foreign exchange reserves using co integration analysis, the result showed that foreign reserves demand is a function of exchange rate flexibility in long run, the result also suggest that accumulation of international reserves is highly responsive to capital account as compare to opportunity cost. (Narayan and K.smyth 2006) explore the short and long run correlation among real, international reserves and interest rate differential and exchange rate, the result suggest that these three variables have single correlation, real exchange rate effect positively on international reserves, interest rate differential also optimistic effect but statistically insignificant, and in short run the relationship between these three variable are non monotonic.

The existing studies have mostly on the Exchange Rate Volatility and the Demand for Foreign Exchange Reserves, The relationship between Exchange Rate and Foreign Exchange Reserves, however, has not been investigated for Economies of Pakistan and India up to my knowledge, therefore, the main objectives of this study is to fill the gap by undertaking a study the Relationship and causality link between Foreign Exchange Reserves and Exchange Rate (Real and Nominal exchange rate) for the period of FY 1983 to FY 2009 for Economies of Pakistan and India.

MODELS

In this study we use models which are derived by (Kasman and Ayhan 2008) to examine the relationship between Foreign exchange reserves and Exchange rate for economy India.

Model A: $FERS = \alpha + \beta\, NEER + \varepsilon$ ..... (1)

Model B: $NEER = \alpha + \beta\, FERS + \varepsilon$ ..... (2)

Model C: $REER = \alpha + \beta\, FERS + \varepsilon$ ..... (3)

Model D: $FERS = \alpha + \beta\, REER + \varepsilon$ ..... (4)

REER = Real effective exchange rate

NEER = Nominal effective exchange rate

FERS = Foreign exchange reserve

ε = Error term

VARIABLE JUSTIFICATION

Most of Countries in Asia have slowly decrease their exchange rate variation by aggressively managing foreign exchange reserves after 1997/98 financial crisis, because a large amount of

foreign exchange reserves accumulation is a defensive decision for a protection of a country economy, according to (Mendoza 2004) a large amount of foreign exchange reserves is a self insurance motive for unexpected economic shocks, because large amount of foreign exchange reserves accumulation make stable the exchange rate. Most of other experimental studies for example (Calvo and Reinhart 2002); (Levy-Yeyati and Sturzenegger 2004) argues that foreign exchange reserves are used as a tool in international exchange market to stabilize the exchange rate, and also foreign exchange reserves fluctuation is used as a determinant of exchange rate. Foreign exchange reserves will raise when there is a high demand of home currency in an international market, and conversely foreign exchange reserves will decrease when in an international market the supply of home currency increased, thus according to this approach foreign exchange reserves are a residual holding by country (Prabheesh 2007); (Edwards 1984), (Calvo and Reinhart 2002) observe that demand for foreign exchange reserves accumulation is higher in developing countries because of exchange rate fluctuation, this means that a country which have experience of higher exchange rate fluctuation, their monitory authority intervene in international market and use the reserves stock to reduce the exchange rate fluctuation, this therefore suggest that there is a long run inverse relationship between these two variables. Similarly many other studies available for example (Prasad and Raju 2010), (Flood and Marion 2002); (Aizenman and Marion 2003) argues that there is an inverse relationship between nominal effective exchange rate and foreign reserves, grater the exchange rate fluctuation lower will be the foreign reserves, when the nominal effective exchange rate fluctuation increase they significantly reduce the foreign reserves level because of intervention of central bank in international market for necessary arrangement of exchange rate. Similarly (Kasman and Ayhan 2008) observe the same relationship and suggest that both variables have long run and causality relationship, in causality relationship foreign Exchange Reserves effect the Real Effective Exchange Rate in both Long and Short run while nominal exchange rate effect the foreign reserves, because uncertainty in exchange rate reduce the quantum level of foreign reserves by intervention central bank in international market to manage the exchange rate uncertainty.

HYPOTHESIS

Based on previous studies which are conduct by different author for different countries economy, I hypothesize that:

H1: There is no relationship between Foreign exchange reserves and Nominal Effective Exchange Rate.

H2: There is no relationship between Nominal Effective Exchange Rate and Foreign exchange reserves.

H3: There is no relationship between Real Effective Exchange Rate and Foreign exchange reserves.

H4: There is no relationship between Foreign exchange reserves and Real Effective Exchange Rate.

METHODOLOGY

This study examine the relationship and causality link among foreign exchange reserves and exchange rate, using co integration technique, vector auto-regression model (VAR), (VECM) and Granger causality test, the goal of this study is achieved in three steps: In first step we use Unit root test to determine the order of integration of data series, whether the data series are in first order, secondly we use the co integration test to find whether there is a long run relationship between variables, and in last step we test the causation using Granger causality test.

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Unit Root Test

In order to examine the integration level and data stationary, we use the classical unit root test called Augmented Dickey and Fuller (ADF) unit root test, this is because ADF is more reliable for testing the non stationary of data series, a stationary variable can be define as, A variable which have constant mean and variance with respect to time called stationary variable, when a variable is non stationary it requiring first-order differencing to achieve stationery which is called I(1), there are three types of different regression form of ADF unit root test for every time series data.

(I) Without Intercept (c) and Trend (t): $\Delta Y = \delta Y_{t-1} + u_t$ ……(5)

(II) With Intercept (c) : $\Delta Y = \alpha + \delta Y_{t-1} + u_t$ ……...(6)

(III) With Intercept (c) and Trend (t): $\Delta Y = \alpha + \beta T + \delta Y_{t-1} + u_t$ ……..(7)

In the above regression equations each equation has its own critical value which depends on sample size, and in each case the null hypothesis:

$H_o: \delta = 0$ (Unit root exist)

$H_1: \delta \neq 0$

Decision rule for accepting or rejecting the null hypothesis are:

If ADF test statistic > critical value in this case we cannot reject the null hypothesis, it means that a unit root exists.

If ADF test statistic < critical value in this case we can reject the null hypothesis, it means that the Unit root does not exists.

After converting the non stationary data series in to stationary data series the next step is applying co integration test.

Co integration Analysis

Co integration analysis a statistical technique use for time series data, it is used for determination of long run relationship between two or more variables, to perform co integration test among variables it is necessary to identify the integration order for each variable in the model. For identification integration order we use Dickey Fuller (DF) test, Augmented Dickey Fuller (ADF) test and Phillips perron (1988) test to determine the integration order. Once we identify the integration order then our next important step is to perform co integration test among variables to determine any long run relationship between variables. There are two basic co integration technique are more used, one is (Engle and Granger 1987) two step Co integration procedure which is used to the Co integration relation among two series, this technique has a problem of receptive selection of independent variables, and the other one is Johansen Co integration technique, which is produced by Johansen and Juselius this test is used for determination of Co integration based on trace statistics and Max-eigenvalue statistics, in this analysis trace statistics is used to test the null hypothesis which addressed that there are at most "r" Co integration equations against alternative which address that there are "m" equations, similarly Max-eigenvalue statistics is used to test the null hypothesis that "r" Co integration equations beside the alternative that there are "r + 1" equations.

Granger Causality Test

Granger causality test is a statistical technique use for causal affect based on forecasting, for example if X does Granger cause Y, it means that the past value of X should hold information that can help in forecasting Y, which shows that both variables have relationship. In this

study we use Granger causality test to determine the causality relationship between Foreign exchange reserves and Exchange rate. This model we can present in the form of ECM (error correction model):

$$\Delta Y = \alpha_1 + \text{lagged}(y, x) + \beta_1 EC_{t-1} + \varepsilon_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

$$\Delta X = \alpha_2 + \text{lagged}(x, y) + \beta_2 EC_{t-1} + \varepsilon_2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

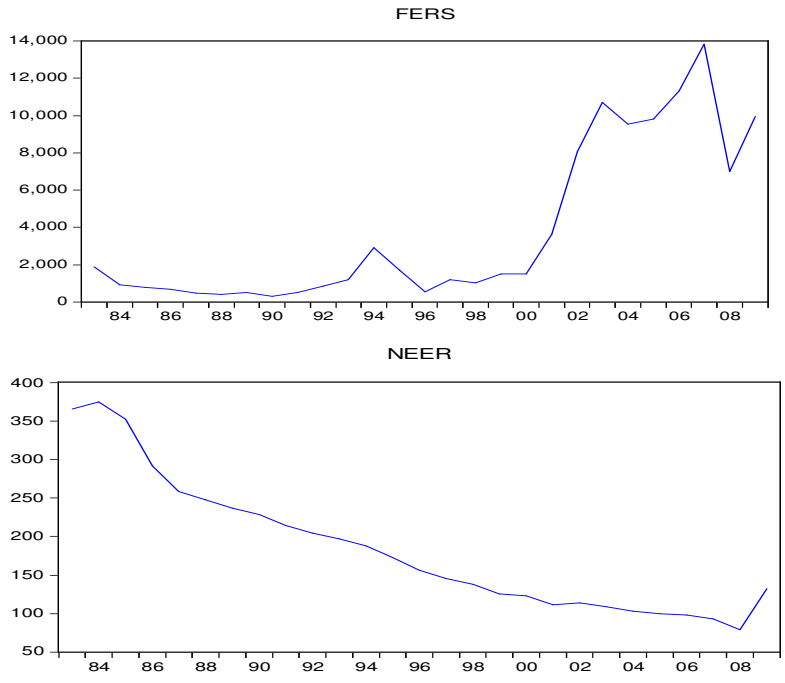
Where x and y indicate Exchange rate (real exchange rate and Nominal exchange rate) and foreign exchange respectively. $\beta_1 EC_{t-1}$ include co integrate terms, reflecting the long-run equilibrium relationship between variables. And the above Models the short-run dynamics is provided by the lagged values of the difference terms.

Explanation of the Data

The data is obtained for the period of 27 years started from 1983 to 2009 from source of International Financial Statistics (IFS) and Asian Development Bank (ADB), the variable which we used in this study are nominal effective exchange rate, real effective exchange rate, and foreign exchange reserves.

ANALYSIS AND DISCUSSION OF RESULT (COUNTRY PAKISTAN)

In this chapter we perform unit root analysis for the stationary for three variables, a stationary variable can be define as, A variable which have constant mean and variance with respect to time called stationary variable, when a variable is non stationary it requiring first-order differencing to achieve stationery which is called I(1), We have used the Augmented Dickey-Fuller (ADF) unit root analysis, because the result of ADF unit root analysis is more consistent. ADF unit root analysis can be expressed in three different regression form the first one is, without constant(c) and trend (t), with constant (c), and with constant (c) and Trend (t). The observed approach proposed diagram assessment for given data, if the diagram present such unique changes (increase and decrease) in variables and not clear step movement, then the time series is best represented by the second situation, therefore we have design time series diagram of all the variables in our model.



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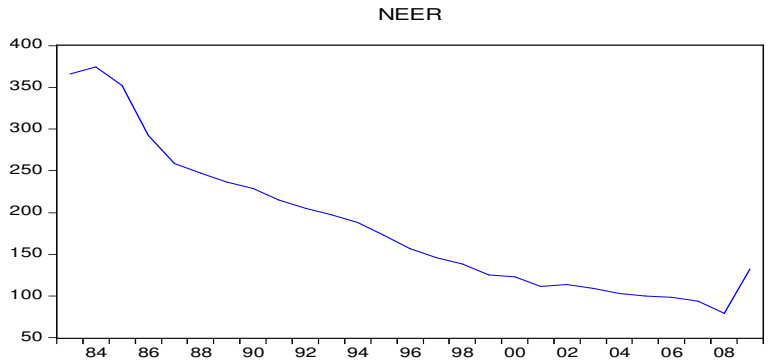

After observing the diagrams for total variables in the model we get that FERS, NEER and REER, have Trend in data on level, Therefore, in our study, we use a constant (c) and trend (t) and other with constant (c) and without trend (0) model. As we have taken annually data sets, we will use the lag (n = 1). Therefore, we chose (c, t, n) = (c, 0, 1) for without trend and (c, t, n) = (c, t, 1) for with trend in the Augmented Dickey fuller analysis.

Table 1. Analysis of Augmented Dickey fuller Hypothesis

Variables	*Types of analysis (c, t , n)*	*ADF analysis Statistics*	*D-W Statistics*	*Probability*
FERS	C 0 0	-0.774187	2.160920	0.4464
Δ FERS	C 0 0	-5.628224*	2.029051	0.0000
NEER	C 0 0	-2.861029	1.671877	0.9996
NEER	C 0 1	-3.788152*	1.671877	0.0010
REER	C 0 0	-3.398181	1.505278	0.0024
REER	C t 1	-3.398181	2.774480	0.0000

I. * represent rejection of null hypothesis at 1% level significance
II. ** represent rejection of null hypothesis at 5% level significance
III. c, t, and n stand for constant, trend, and lag correspondingly.
IV. P values represent Probability.
V. Δ represent 1 difference

In the above table FERS, is stationary on the levels and the first difference, while the next two Variables NEER and REER are stationary on level, the analysis rejected the null hypothesis that there is a unit root in first difference in variable FERS at 1% significance level and in NEER and REER at level and 1% significance level. The Durbin-Watson statistics also support the value of all variables FERS, NEER, REER.

Model –A

Johansen Co integration Analysis

In this segment, we will execute the Johansen Co integration technique, Co integration is a statistical technique use for time series data, it is used for determination of extensive Co integration among two or more variables, to perform Co integration analysis among variables it is necessary to recognize the integration order for each variable in the model. For identification integration order we use: Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and the last one approach is HQ (Hannan-Quinn) approach.

Table 2. Statistic for Selection of Lag Order

Lag	*Logl*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	-247.1661	NA	12348546	19.16662	19.26340	19.19449
1	-232.6946	25.60339*	4384161*	18.13035*	18.27552*	18.17216*

* denote lag order selection by the criterion

LR: sequential modified LR analysis statistic (each analysis at 5% level)

FPE stand for final prediction error

AIC stand for Akaike information criterion

SC stands for Schwarz information criterion

HQ stands for Hannan-Quinn information criterion

The above table shows that two variables (FERS and NEER) are integrated in first order. After that we are applying Co integration test to explore whether both variables are co integrating with each other. Before examining the relationship among variables, we first identify the appropriate lag order of VAR model. To achieve this task we apply information creation: Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQ). Table no. 2 present the result of most favorable lag Selection. According to the results of this analysis, 1 is the most favorable lag order.

VAR Co integration Analysis Statistic

The result which is find out from the Johansen Co integration technique discuses in table no. 3 .The 1st column of the table show hypothesis, with r = 0, which is stand for most none and r ≤ 1, show at most 1Co integration relationships. 2nd column of the table indicate Eigenvalue (it is scalar which create a change in Eigenvector by multiplying with matrix). The 3rd column present trace values and Maximum-Eigenvalue, the 4rt column present 5% significant value and the 5th column present 3% significant value.

Table 3. VAR Co integration analysis

Hypothesis	*Eigenvalue*	*Trace Statistic*	*5 Percent significant Value*	*1 Percent significant Value*
r = 0 *	0.505347	18.86631	15.411	20.041
r ≤ 1	0.078910	1.972729	3.761	6.65
Hypothesis	*Eigenvalue*	*Maximum Eigenvalue*	*5 Percent significant Value*	*1 Percent significant Value*
r = 0*	.505347	16.89358	14.071	18.63
r ≤ 1	.078910	1.972729	3.761	6.65

The above table shows the values of Trace statistic and Max-eigenvalue, trace statistic value is greater than 5% critical value and less than 1% critical value which shows one Co integration equation at 5 percent level of significance and no Co integration equation at 1 percent level of significance. Max-eigenvalue analysis also shows one co integrating equation at 5 percent level of significance and no Co integration equation at 1 percent level of significance because Max-eigenvalue also is greater than 5% critical value and less than 1% critical value. The result of these values shows that our null hypothesis is rejected. Which is denoted that there is One Co integration equation r = 1 between the two variables at 5 percent

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level of significance. Therefore, we can suggest that our annually data from 1983 to 2009 show that there is a long run relationship between Foreign Exchange Reserves and Nominal Effective Exchange Rate in Pakistan.

Granger Causality Analysis

In this section we apply Causality test (Granger causality test) to find out the causality link among two variables. The result of analysis shows in table 4.

Table 4.

Null Hypothesis	*Obs*	*F-Statistic*	*Prob.*
NEER have no impact on FER	26	3.69740	0.0670
FERS have no impact on NEER		0.00484	0.9451

On the basis of F-statistic an P-value we analyze the Granger causality result which is shown in above table, the hypothesis which addressed that NEER have no impact on FERS can be rejected and the hypothesis that FERS have no impact on NEER cannot be rejected, therefore we conclude that there is unicausality among two variables which goes from Nominal Effective exchange rate to Foreign exchange reserves, the presence of long run relationship between variables Granger causality analysis require vector error correction model (VECM), THE VECM result indicate an inverse relationship between Foreign exchange reserves and Nominal effective exchange rate the same result that nominal effective exchange rate affect the foreign exchange reserves is conduct by (Kasman and Ayhan 2008) for Turkey, (Prasad and Raju 2010) for India and (Ahmed and Pentecost 2006) for Africa.

Model –B
JohansenCo integration Analysis

Table 5. Statistic for Selection of Lag Order

Lag	*Logl*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	-143.1834	NA	4148.005	11.16796	11.26473	11.19582
1	-107.3352	63.42373*	284.4279*	8.487325*	8.632490*	8.529127*

The above table shows that two variables (NEER and FERS) are integrated in first order I(1). After that we are applying Co integration test to explore whether both variables are co integrating with each other. Before examining the relationship among variables, we first identify the appropriate lag order of VAR model. To achieve this task we apply information creation: (see detail in Model A), Table 5 presents the result of most favorable lag Selection. According to the results of this analysis, 1 is the most favorable lag order.

Table 6. VAR Co integration Analysis Statistic

Hypothesis	*Eigenvalue*	*Trace Statistic*	*5 Percent significant Value*	*1 Percent significant Value*
r = 0 *	0.505347	18.86631	15.41	20.04
r ≤ 1	0.078910	1.972729	3.76	6.65
Hypothesis	*Eigenvalue*	*Maximum Eigenvalue*	*5% significant Value*	*1 Percent significant Value*
r = 0 *	0.505347	16.89358	14.07	18.63
r ≤ 1	0.078910	1.972729	3.76	6.65

In the above table we present the Trace statistic value and Max-eigenvalue, based on these values we can determine the relationship of variables, trace value which is greater than 5%

critical value and less than 1% critical value shows one Co integration equation at 5 percent level of significance and no Co integration equation at 1 percent level of significance. Max-eigenvalue analysis also specifies one co integrating equation at 5 percent level of significance and no Co integration equation at 1 percent level of significance. The result of these values shows to that our null hypothesis is rejected. Which is denoted that there is One Co integration equation r = 1 between the two variables at a significance level of 5 percent. Therefore, we can suggest that our annually data from 1983 to 2009 show that there is a long run relationship between Nominal Effective Exchange Rate and Foreign Exchange Reserves in Pakistan.

Table 7. Granger Causality Analysis

Null Hypothesi	*Obs*	*F-Statistic*	*Prob.*
NEER have no impact on FERS	26	0.00484	0.9451
FERS have no impact on NEER		3.69740	0.0670

On the basis of F-statistic and P-value we analyze the Granger causality result which is shown in above table, the hypothesis which addressed that FERS have no impact on NEER cannot be rejected and the hypothesis that NEER have no impact on FERS can be rejected, therefore we conclude that two variables have unicausality which goes from Nominal Effective exchange rate to Foreign exchange reserves, and this result also support the VECM result that both variable have negative relationship, but independent variable i.e FERS does effect in very small amount which is near to zero, the same result that nominal effective exchange rate affect the foreign exchange reserves is conduct by (Kasman and Ayhan 2008; Prasad and Raju 2010) and (Ahmed and Pentecost 2006).

Model –C

Johansen Co integration Analysis

Table 8. Statistic for Selection of Lag Order

Lag	*Logl*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	-117.9854	NA	597.0949	9.229649	9.326425	9.257517
1	-85.39722	57.65606*	52.61186*	6.799786*	6.944951*	6.841589*

The above table shows that two variables (REER and FERS) are integrated in first order I(1). After that we are applyingCo integration test to explore whether both variables are cointegrating with each other. Before examining the relationship among variables, we first identify the appropriate lag order of VAR model. To achieve this task we apply information creation (see Model A for explanation). Table 8 present the result of most favorable lag Selection. According to the results of this analysis, 1 is the most favorable lag order.

Table 9. VARCo integration Analysis Statistic

Hypothesis	*Eigenvalue*	*Trace Statistic*	*5 % Significant Value*	*1 % Significant Value*
r = 0 **	0.755710	34.45094	15.41	20.04
r ≤ 1	0.025720	0.625348	3.76	6.65
Hypothesis	*Eigenvalue*	*Maximum Eigenvalue*	*5% Significant Value*	*1% Significant Value*
r = 0 **	0.755710	33.82559	14.07	18.63
r ≤ 1	0.025720	0.625348	3.76	6.65

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In the above table we present the Trace statistic value and Max-eigenvalue; based on these values we can determine the relationship of variables, according to the above table Trace analysis point out one Co integration equation at both 5 percent and 1 percent significance level. Maximum-eigenvalue analysis also point to one co integrating equation. The result of these values shows that our null hypothesis is rejected. Which is denoted that there is One Co integration equation r = 1 between the two variables at a significance level of 5 percent. Therefore, we can suggest that our annually data from 1983 to 2009 show that there is a long run relationship between Real Effective Exchange Rate and Foreign Exchange Reserves in Pakistan.

Table 10. Granger Causality Analysis

Null Hypothesi	*Obs*	*F-Statistic*	*Prob.*
NEER have no impact on FERS	26	0.04678	0.8307
FERS have no impact on NEER		2.73510	0.1118

On the basis of F-statistic an P-value we analyze the Granger causality result which is shown in above table, the hypothesis which addressed that FERS have no impact on REER cannot be rejected and the hypothesis that REER have no impact on FERS can be rejected, therefore we conclude that two variables have unicausality which goes from Real Effective exchange rate to Foreign exchange reserves, and this result also support the VECM result that both variable have negative relationship.

Model –D

JohansenCo integration Analysis

Table 11. Statistic for Selection of Lag Order

Lag	*Logl*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	-249.7277	NA	15038109	19.36367	19.46045	19.39154
1	-232.5243	30.43689*	4327091.*	18.11725*	18.26242*	18.15905*

The above table shows the result of lag order selection in which indicate that two variables (FERS and REER) are integrated in first order which is denoted from I(1). After that we are applying Co integration test to explore whether both variables are co integrating with each other. Before examining the relationship among variables, we first identify the appropriate lag order of VAR model. To achieve this task we apply information creation approaches (see Model A for explanation). Table 11 present the result of most favorable lag Selection. According to the results of this analysis, 1 is the most favorable lag order.

Table 12. VAR Co integration Analysis Statistic

Hypothesis	*Eigenvalue*	*Trace Statistic*	*5 % Significant Value*	*1 % Significant Value*
r = 0 **	0.755710	34.45094	15.41	20.04
r ≤ 1	0.025720	0.625348	3.76	6.65
Hypothesis	*Eigenvalue*	*Maximum Eigenvalue*	*5% Significant Value*	*1 % Significant Value*
r = 0 **	0.755710	33.82559	14.07	18.63
r ≤ 1	0.025720	0.625348	3.76	6.65

The Trace analysis statistic shows that there is one Co integration equation at both 5 percent and 1 percent significance level. Maxium-eigenvalue analysis also point out one co

integrating equation at both 5 percent and 1 percent level of significance. These values point out that our null hypothesis is rejected. Which is denoted that there is One Co integration equation r = 1 between the two variables at a significance level of 5 percent and 1 percent. Therefore, we can suggest that our annually data from 1983 to 2009 show that there is a long run relationship between Foreign Exchange Reserves and Real Effective Exchange Rate in Pakistan.

Table 13. Granger Causality Analysis

Null Hypothesis	*Obs*	*F-Statistic*	*Prob.*
NEER have no impact on FERS	26	2.73510	0.1118
FERS have no impact on NEER		0.04678	0.8307

On the basis of F-statistic an P-value we analyze the Granger causality result which is shown in above table, the hypothesis which addressed that REER have no impact on FERS can be rejected and the hypothesis that FERS have no impact on REER cannot be rejected, therefore we conclude that two variables have unicausality which goes from Real Effective exchange rate to Foreign exchange reserves, and this result also support the VECM result that both variables Foreign exchange reserves and Real effective exchange rate have negative relationship.

CONCLUSION

This study examines the relationship and causality link between Foreign exchange reserves and exchange rate (nominal and real exchange rate) for economy of Pakistan, using Co integration analysis. The goal of this study is achieved in three steps: In first step a Unit root analysis is used to determine the order of integration of data series, whether the data series are in first order, secondly Co integration analysis is used to find whether there is a long run relationship between variables, and in last step Granger causality analysis is used to analyze the causation. The Unit root analysis indicates that all variables are stationary in first order *I(1)*, after achieving the stationaraty of data series the next step is Co integration analysis, The Co integration result point out that there is a long run relationship exists between Foreign exchange reserves and Nominal effective exchange rate and foreign exchange reserves and Real effective exchange rate. After determination of long run relationship between foreign exchange reserves and exchange rate (nominal and real exchange rate) the next step is finding the causal relationship between these variables using Granger causality analysis, the Granger causality analysis point out that the causality link goes from Nominal effective exchange rate and Real effective exchange rate towards foreign exchange reserves it means that both Nominal and Real exchange rate effect the Foreign exchange reserves in economy of Pakistan.

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