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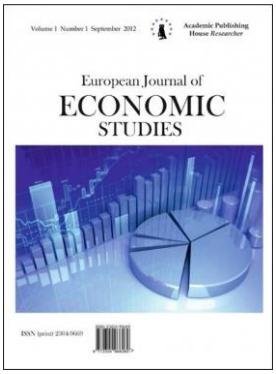

UDC 33

Liaison of Exchange Rate and Macroeconomic Variables: A Case Study of Pakistan

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Abstract

Exchange rate plays a significant role in the economic growth of a country because it has also a close relationship to some major macroeconomic variables like Gross Domestic Product (GDP), interest rate, current account and inflation etc. All these variables are adversely affected by uncertainty or fluctuations in exchange rate. The objective of this paper was to find out the relationship between the exchange rate and other above mentioned macroeconomic variables. The paper not only described the relationship but also defined the nature of the relationship between the selected variables. The results showed that exchange rate has a long run relationship to GDP, inflation, interest rate and current account. Granger Causality test concluded that there was unidirectional causal relationship between exchange rate and GDP and the direction of causal relationship run from exchange rate to GDP. There were also some policy implications suggested for the stability in exchange rate and removing the adverse effects of uncertainty in Pakistan.

Keywords: exchange rate, volatility, gross domestic product (GDP).

Introduction

The price currency of one country in terms of another is called exchange rate. It has a great significance in macroeconomics perspective. There are two types of exchange rate; one is fixed exchange rate and second is called floating exchange rate. Both have some strength and weaknesses. In the year 1944, under Bretton Wood System fixed exchange rate was introduced. But it was collapsed in year 1973. Bretton woods system had some elegances and imperfections as

well. For example, under Bretton Woods System, due to fixed exchange rate a country had to surrender its monetary policy autonomy but at the same time there were no fear of speculative attacks. In contrast with floating exchange rate, speculative attacks can destabilize the economy at any time. After the World War-II in the year 1944, fixed exchange rate was introduced in Bretton woods system and it was also collapsed in the year 1973. After that European countries made alliance and introduced a single currency "Euro" in all European countries in the year 1999.

Exchange rate plays a vital role in economic development of any country. It has direct relationship to price, interest rate and other macroeconomic variables. Pakistan is facing an increasing exchange rate against dollar since 1990's. Exchange rate also affects Gross Domestic Products (GDP), Interest Rate, Current Account, Inflation and purchasing power of the people. Volatility in exchange rate adversely affects all these variables in the economy of any country. Pakistan adopted flexible exchange rate in the year 1982 but it was not steady in the economy and also had speedy fluctuation. Uncertainty of exchange rate badly affects the international trade. Consequently, Pakistan has to face the external balance deficit because exports of the country have become cheap while imports are expensive. In this study, exchange rate is measured against United States Dollar (US $).

Literature Review

Hooper et al (1978) state that real exchange rate affects to trade inflows and out flows. They conclude that fluctuations in exchange rate may badly affect the economies while the change is seriously affecting the developing countries as compare to the industrialized and the developed economies.

Warner and Kreinin (1983) explore that exchange rate volatility has serious concern to the trade volume. They also analyze that exchange rate can affect the national income of the country by affecting other major economic variables.

Dhawan and Kumar (1991) analyze that due to volatility in exchange rate balance of payments adversely affect. Exports become cheap and imports turn into expensive and this situation cannot be in the favor of any developing country. They conclude that uncertainty in exchange rate has negative effects on balance of payments and trade.

Arize (1996) suggests that uncertainty in exchange rate reduces the volume of trade. Due to high volatility in exchange rate, growth of trade flows becomes slow down due to uncertainty about future profits. He concludes that fluctuations in exchange rate adversely affect the international trade. It is because of the fluctuations in exchange rate may disturb other major macroeconomic variables and the whole economy as well.

Zhou (1996) concludes that interest rate is one of the major factors which causes of volatility in exchange rate. He says that the investors prefer to invest in those countries in which there is high interest rate with almost zero or near to zero inflation. Due to illusion of money people are less conscious about the real interest rate. So high interest rate or rate of return can prevent the investment to fly from the country, it makes the currency and exchange rate stable in the economy.

Baak et al (2002) conclude that exchange rate has a significant role in economic development of the country and due to volatility in exchange rate imports and exports of the country adversely effects.

Aizenman (2007) analyzes that exchange rate can affect the rate of return on assets because due to depreciation in currency real rate of return may be reduced. Consequently, investors avoid investing in such countries in which exchange rate fluctuations are common.

Jincai (2007) analyses that macroeconomic variables are so closely correlated to each other that a swing in one variable disturb the all others. Sometimes, it becomes difficult to find out that which cause is disturbing to other. However, exchange rate is a sensitive and significant variable which can cause disequilibrium. A little flux in exchange rate makes the people conscious and their trust on economy tremble. He concludes that people are much sensitive towards their interest. And volatility in exchange rate can cut the interest rate which leads to decrease in investment.

Wang (2011) concludes that exchange market is the basic pillar of any economy. Historical evidences show that crash of stock markets lead to collapse of economies. So stability in stock market is major task for economists. In the response of slight volatility in stock market, major economic variables react. So it is necessary to overcome the major fluctuations in exchange rate.

Ardakani et al. (2012) analyze that after the break through of Breton Woods System, exchange rate became the major factor to disturb the economies. Moreover, oil price shocks (if the

oil is imported) also create fluctuation s in exchange rate and whenever the exchange rate fluctuates it may directly affect the GDP of the country. In response of that a budget deficit occurs which leads to disequilibrium in the economy. Investment is discouraged due to the depreciation of the currency and capital also escapes due to the fear of loss. The paper suggests that decrease in monetary policies and increase in fiscal policies may overcome the fluctuations in exchange rate.

Aurangzeb and Haq (2012) describe that the stability in exchange rate plays an important role in the economy. They also conclude that the fluctuated exchange rate is a major cause of economic destabilization of a country.

Shahbaz et al (2012) describe that exchange rate volatility has negative effects on investment. They also observed the negative relationship between exchange rate and economic growth in the long run.

Objectives of the Paper

- To find out the nature of relationship between exchange rate and other variables (GDP, Inflation, Interest Rate and Current Account)
- To find out the effects of exchange rate volatility on major macroeconomic variables (GDP, Inflation, Interest Rate and Current Account).
- To draw some suggestions/policy implications on the basis of findings.

Hypothesis of the Study

H_0: Exchange rate has no relationship to GDP.
H_1: Exchange rate has a relationship to GDP.
H_0: Exchange rate has no relationship to Inflation.
H_2: Exchange rate has a relationship to inflation.
H_0: Exchange rate has no relationship to interest rate.
H_3: Exchange rate has a relationship to interest rate.
H_0: Exchange rate has no relationship to current account.
H_4: Exchange rate has a relationship to current account.

Methodology

Research Type

This is exploratory research based on secondary data which is collected from several government reports and economic surveys of Pakistan. The selected time period for the study is from the year 1982-2012.

Data Analysis

Granger Causality Test is used to analyze the data and also find out the long run relationship between the variables Johansen Co-integration test is applied. Each hypothesis is tested independently because Exchange Rate is taken as independent variable in each hypothesis. The data is time series so there is a chance of unit root in the data. Therefore, Augmented Dickey Fuller (ADF) test is applied before running the Johansen Co-integration test.

Variables for Hypothesis # 1

Independent Variable: Exchange Rate (X)

Dependent Variable: Gross Domestic Product (Y)

$$\text{Ln}Y_{it} = \beta_1 + \beta_2 Lnx_t + \varepsilon_t \quad (1)$$

β_1 = Constant

β_2 = Slope of Coefficient

ε_t =Error Term

Variables for Hypothesis # 2

Independent Variable: Exchange Rate (X)

Dependent Variable: Inflation (Y)

$$\text{Ln}Y_{it} = \beta_1 + \beta_2 Lnx_t + \varepsilon_t \quad (2)$$

β_1 = Constant

β_2 = Slope of Coefficient

ε_t =Error Term

Variables for Hypothesis # 3
Independent Variable: Exchange Rate (X)
Dependent Variable: Interest Rate (Y)

$$\text{Ln}Y_{it} = \beta_1 + \beta_2 Lnx_t + \varepsilon_t \quad (3)$$

β_1 = Constant
β_2 = Slope of Coefficient
ε_t =Error Term

Variables for Hypothesis # 4
Independent Variable: Exchange Rate (X)
Dependent Variable: Current Account (Y)

$$\text{Ln}Y_{it} = \beta_1 + \beta_2 Lnx_t + \varepsilon_t \quad (4)$$

β_1 = Constant
β_2 = Slope of Coefficient
ε_t =Error Term

Test for Stationary

As the data is time series and there is a chance of unit root in the data so Augmented Dickey Fuller (ADF) test is used to check the stationary.

Simple autoregressive model can be represented as:

$$Y_t = \alpha Y_{t-1} + \varepsilon_t \quad (1)$$

The hypothesis of H_0 : α = 1 which means that series have unit root. It is measured against the alternative hypothesis of H_1: α < 1 which means that series is stationary. When the lags are added to ADF to avoid the problem of autocorrelation then the equation can be written in the general form as following:

$$\Delta Y_t = \alpha Y_{t-1} + \alpha_1 \Delta Y_{t-1} + \ldots\ldots\ldots \alpha_k \Delta Y_{t-(k+1)} + \varepsilon_t \quad (1.1)$$

Or

$$\Delta Y_t = \delta + \alpha Y_{t-1} + \sum_{i=1}^{k} \alpha \Delta Y_{t-1} + \varepsilon_t \quad (1.2)$$

Co-integration Technique

Before the estimation of regression it is necessary to find the long run relationship between the variables. It is necessary to obtain significance results the variables must have long run relationship. In order to find the long run relationship between the variables Johansen Co-integration test is carried out.

Results and Discussion

Table 1: Results of Augmented Dickey Fuller Test for Equation # 1

Var	Level	Ist Derivative	Result
LNY	-4.598768	-8.851817*	I (1)
LNX (GDP)	-2.154285	-4.337323**	I (1)

**show stationerity at 5 % level of significance and*
***show stationerity at 10 % level of significance*

The results in Table 1 imply that the variables are non-stationery at level, thus unit root is carried out. When the unit root is tested at first difference, the data became stationery. The results show that the problem of unit root has been removed and the variables are integrated of order 1, I(1).

Table 2: Results of Augmented Dickey Fuller Test for Equation # 2

Var	Level	Ist Derivative	Result
LNY	-2.767581	-3.431923*	I (1)
LNX (Inflation)	-4.722696	-5.228106**	I (1)

**show stationerity at 5 % level of significance*
*and **show stationerity at 10 % level of significance*

The results in Table-2 imply that the variables are found stationery at 1st difference while at level they are non-stationery.

Table 3: Results of Augmented Dickey Fuller Test for Equation # 3

Var	Level	Ist Derivative	Result
LNY	-5.176262	-7.328931*	I (1)
LNX (Interest Rate)	-2.312765	-3.124768	I(1)

**show stationerity at 5 % level of significance*
*and **show stationerity at 10 % level of significance*

The results in Table-3 indicate that the variables are found stationery at 1st difference.

Table 4: Results of Augmented Dickey Fuller Test for Equation # 4

Var	Level	Ist Derivative	Result
LNY	-2.785412	-4.012785*	I (1)
LNX (CA)	-0.987341	-3.491275**	I (1)

**show stationerity at 5 % level of significance*
*and **show stationerity at 10 % level of significance*

The results in Table-4 show that at 1st difference, unit root has been removed and data is now stationery.

Results of Johansen co-integration Test
Results for Equation # 1

Table 1(a): Results of Johansen Co-Integration Test: (Trace Statistics)

Hypothesized		Trace Statistics		Significance Level
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability**
None *	0.127865	26.56206	18.39771	0.0000
At most 1 *	0.984321	16.26277	3.851577	0.0001

Trace test shows 2 co-integrating eqn(s) at the significance level of 0.05
**indicates the significance level at 5 %*
*** P-Values Michelis et al. (1999)*

Table 1(b): Results of Johansen Co-Integration Test : (Maximum Eigenvalue)

Hypothesized		Maximum Eigenvalue		Significance Level
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability**
None*	0.127865	41.78553	17.14769	0.0002
At most 1 *	0.984321	16.26277	3.841466	0.0001

Trace test shows 2 co-integrating eqn(s) at the significance level of 0.05
**indicates the significance level at 5 %*
*** P-Values Michelis et al. (1999)*
Source: researchers' own calculations

Results for Equation # 2

Table 2(a): Results of Co-Integration Test: (Trace Statistics)
Trace test shows 2 co-integrating eqn(s) at the significance level of 0.05

Hypothesized		Trace Statistics		Significance Level
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability **
None *	0.341289	34.87231	18.39771	0.0000
At most 1 *	0.754391	12.76543	3.841466	0.0001

**indicates the significance level at 5 %*
*** P-Values Michelis et al. (1999)*

Table 2(b): Results of Co-Integration Test: (Maximum Eigenvalue)

Hypothesized		Maximum Eigenvalue		Significance Level
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability **
None *	0.341289	31.87632	17.14769	0.0002
At most 1 *	0.754391	12.76543	3.84166	0.0001

Trace test shows 2 co-integrating eqn(s) at the significance level of 0.05
**indicates the significance level at 5%*
*** P-Values Michelis et al. (1999)*
Source: researchers' own calculations

Results for Equation # 3

Table 3(a): Results of Co-Integration Test: (Trace Statistics)
Trace test shows 2 co-integrating eqn(s) at the significance level of 0.05

Hypothesized		Trace Statistics		Significance Level
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability **
None *	0.564321	39.65328	18.39771	0.0000
At most 1 *	0.885482	26.98123	3.841466	0.0001

**indicates the significance level at 5%*
*** P-Values Michelis et al. (1999)*

Table 3(b): Results of Co-Integration Test: (Maximum Eigenvalue)

Hypothesized		Maximum Eigenvalue		Significance Level
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability **
None *	0.564321	21.76424	17.14769	0.0002
At most 1 *	0.885482	26.98123	3.841466	0.0001

Trace test shows 2 co-integrating eqn(s) at the significance level of 0.05
**indicates the significance level at 5%*
*** P-Values Michelis et al. (1999)*
Source: researchers' own calculations

Results for Equation # 4

Table 4(a): Results of Co-Integration Test: (Trace Statistics)

Hypothesized		Trace Statistics		Significance Level
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability **
None *	0.932142	33.32189	18.39771	0.0000
At most 1 *	0.761209	19.98432	3.841466	0.0001

Trace test shows 2 co-integrating eqn(s) at the significance level of 0.05
**indicates the significance level at 5%*
*** P-Values Michelis et al. (1999)*

Table 4(b): Results of Co-Integration Test: (Maximum Eigenvalue)

Hypothesized		Maximum Eigenvalue		Significance Level
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability **
None *	0.932142	28.93164	17.14769	0.0002
At most 1 *	0.761209	19.98432	3.841466	0.0001

Trace test shows 2 co-integrating eqn(s) at the significance level of 0.05
**indicates the significance level at 5 %*
*** P-Values Michelis et al. (1999)*
Source: researchers' own calculations

The results of Johansen co-integration in Table 1(a), and Table 1(b) for Equation No. 1, Table 2 (a) and 2 (b) for equation No. 2, Table 3 (a), and 3 (b) for Equation No. 3 and Table 4 (a) and 4 (b) for Equation No. 4 show the trace and maximum eigenvalues. All the results indicate that all the variables are co-integrated hence have long run relationship.

Results of Ganger Causality Test

Table 1: Results of Granger Causality Test for Equation # 1

Null Hypothesis:	Number of Observation	F-test	Probability	Remarks
LN(Exchange Rate) does not Granger Cause LN(GDP)	30	3.50812	0.14351	Reject Null Hypothesis
LN(GDP) does not Granger Cause LN(Exchange Rate)	30	1.98732	0.07212	Accept Null Hypothesis

Source: researchers' own calculations

The above table shows unidirectional causality. The result shows that exchange rate causes the GDP but GDP does not cause the exchange rate

Table 2: Results of Granger Causality Test for Equation # 2

Null Hypothesis:	Number of Observation	F-test	Probability	Remarks
LN(Exchange Rate) does not Granger Cause LN(Inflation)	30	4.52781	0.11254	Reject Null Hypothesis
LN(Inflation) does not Granger Cause LN(Exchange Rate)	30	1.23587	0.17485	Reject Null Hypothesis

Source: researchers' own calculations

The results depict two way casual relationships between the variables.

Table 3: Results of Granger Causality Test for Equation # 3

Null Hypothesis:	Number of Observation	F-test	Probability	Remarks
LN(Exchange Rate) does not Granger Cause LN (Interest Rate)	30	3.21457	0.66251	Reject Null Hypothesis
LN(Interest Rate) does not Granger Cause LN(Exchange Rate)	30	3.41785	0.52478	Reject Null Hypothesis

Source: researchers' own calculations

The above mentioned results depict the bidirectional relationship between the variables. The table shows exchange rate does cause of interest rate and interest rate also have causal relationship to exchange rate.

Table 4: Results of Granger Causality Test for Equation # 4

Null Hypothesis:	Number of Observation	F-test	Probability	Remarks
LN(Exchange Rate) does not cause LN(Current Account)	30	5.68732	0.71451	Reject Null Hypothesis
LN(Current Account) does not cause LN(Exchange Rate)	30	4.37808	0.02145	Accept Null Hypothesis

Source: researchers' own calculations

The results show that the direction of casualty between exchange rate and current account runs from exchange rate to current account.

Conclusion

The study has been intended to find out the relationship between exchange rate and different macroeconomic variables. It is concluded from the findings that exchange rate has a long run relationship to GDP, inflation, interest rate and CA. Granger Causality test concludes that there is unidirectional causal relationship between exchange rate and GDP and the direction of causal relationship runs from exchange rate to GDP. Exchange rate and CA also have unidirectional causality, and the direction of causality runs from exchange rate to CA. There is bidirectional causality found between exchange rate and inflation. Bidirectional causality also exists between exchange rate and interest rate which indicates that fluctuations in exchange rate can cause change in interest rate and vice versa.

Policy Context

In Pakistan, State Bank (Central bank of Pakistan) announces monetary policy. Pakistan is facing the problems of high inflation rate, unemployment and current account deficit etc for the last several years. State bank is reducing the interest rate in each monetary policy. When interest rate reduces money supply increases in the economy which cause inflation. High inflation reduces the purchasing power of the people. Moreover, currency depreciates and exchange rate increases

(in direct term). Due to which exports become cheaper while imports turn out to be expensive which cause the deficit in balance of payments. Pakistan exports the raw material and imports the final goods. The prices of raw material are cheaper as compare to final goods. Therefore, cheap exports are not in the favour of economy. As the above mentioned results, Johnson Co-Integration indicates that there is a long run relationship between the variables, so fluctuations in one variable may affect the other variables. The theory of Exchange Rate and Long Run Purchasing Power Parity (PPP) also supports these results. The results of Granger Causality Test depict that there is a unidirectional causality between some variables (exchange rate and GDP, exchange rate and CA) while bidirectional causality also exists between some variables (exchange rate and inflation and exchange rate and interest rate). Therefore, it is suggested that State Bank of Pakistan should adopted contractionary monetary policy. So that money supply may be controlled to remove inflation. Due to this currency will be appreciated and deficit in balance of payment may also be reduced.

Suggestions/Policy Implications

- State Bank may adopt the contractionary monetary policy.
- There is a need to increase the interest rate so that money supply may be controlled and currency may be appreciated.
- State Bank may increase the supply of foreign reserve in the country in order to stabilize the exchange rate.
- Tax may be imposed on the imports of luxury items so that the deficit in balance of payment may reduce.
- Direct Foreign Investment may be encouraged in the country to overcome the unemployment.
- Government may decrease its non-developing expenditure, so that dependency upon foreign aid may become finish.
- Government may take solid steps against money laundering.
- Subsidies may be given by the government on goods of basic necessities so that the purchasing power of the people may rise.
- Exchange rate may be stable to discourage the speculative attacks on economy.
- Fast and continuous fluctuations in exchange rate cause the capital flight from the country, so necessary actions may be taken from the State Bank to overcome the problem.

References:

1. Aizenman, J. (2007). Large Hoarding of International Reserves and the Emerging Global Economic Architecture. Working Paper. 13277, NBER.
2. Ardakani, Z., Goudarzi, M. & Khanarinejad, K. (2012). Investigation of the factors affecting real exchange rate in Iran. Acta Universitatis Danubius, 8(4), 55-67.
3. Arize. (1996). Co-integration test of a long-run relation between the trade balance and the terms of trade in sixteen countries. North American Journal of Economics and Finance, 5, 203-215.
4. Aurangzeb, & Anwar, U. (2012). Factors Affecting The Trade Balance In Pakistan. Economics and Finance Review, 1(11), 25 – 30.
5. Baak, S., Al-Mahmood, A., & Vixathep, S. (2002). Exchange Rate Volatility and Exports from East Asian Countires to Japan and U.S. (Manuscript). University of Japan.
6. Chunsheng, Z. (1996). Stock Market Fluctuations and the Term Structure. Federal Reserve Report for the Year1996.
7. Dickey, D. A. & Fuller, W. A. (1979). Distribution of the Estimator for Autoregressive Time Series with a Unit Root. Journal of the American Statistical Association, 74, 427–431.
8. Hooper, P. & Kohlhagen, S. W. (1978). The Effects of Exchange Rate Uncertainty on the Price and Volume of International Trade. Journal of International Economics, 8, 483-511.
9. Kumar, R. & Dhawan, R. (1991). Exchange Rate Volatility and Pakistan's Export to the Developed World, 1974-1985. World Development. No. 19, 1225-1240.
10. Muhammad, S., Abdul, J., & Faridul, I. (2012). Real Exchange Rate Changes and the Trade Balance: The Evidence from Pakistan. The International Trade Journal, 26, 139–153.
11. Warner, D. F., & Kreinin, M. E. (1983). Determinants of International Flows. The Review of Economics and Statistics. No. 65, 96-104.

12. Xiufang, W. (2011). The relationship between stock market volatility and macroeconomic volatility: Evidence from China. Journal of Chinese Economics and Finance, 2(4), 67-77.
13. Xu, J. (2007). Interest Rate Uncertainty and Stock Market Volatility. Dissertations and Theses Collection (Open Access). Paper No. 25.

УДК 33

Связи обменного курса и макроэкономических переменных: социологическое исследование в Пакистане

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Аннотация. Обменный курс играет важную роль в экономическом росте страны, поскольку он взаимосвязан с некоторыми основными макроэкономическими переменными, такими как валовой внутренний продукт (ВВП), процентная ставка, текущий счет и инфляция и т.д. Все эти переменные зависят от неопределенности или колебания обменного курса. Целью данной работы было выяснить взаимосвязь между обменным курсом и другими упомянутыми выше макроэкономическими переменными. В статье описывается не только взаимосвязь, но также определяется характер отношений между выбранными переменными.

Ключевые слова: обменный курс, волатильность, валовой внутренний продукт (ВВП).