

Economic Analysis of Impact of Foreign Exchange on Trade Balance Sector of Pakistan

Abid Khan Syed Asghar Ali Shah
 Agricultural Research Institute Tarnab, Peshawar

Abstract

The present study investigates the impact of exchange rate movements on the level of exports and imports in Pakistan. The study based on time series both annual as well as quarterly data. Annual data covers a period about 40 years, starting from 1970-2012, whereas, quarterly data focuses from 2000 to 2012. Johnson co-integration techniques were employed for the estimation of quarterly observations. It reveals through the results that at first Pakistan's trade volume with developed countries including U.S.A, U.K and Europe. Later on, mixture of Pakistan exports and imports improved over the time. A larger proportion of primary goods replaced with semi manufacturing and manufacturing goods, whereas, imports of capital goods, consumer goods and petroleum products widened. The nature of response of export and import to exchange rate dynamic supports the theoretical background being low price elastic. Alternatively, if value of rupees fall against dollar, then the magnitude of import bill rises more as compared to export bill. The study suggests that Pakistan should reduce the concentration of trade with few countries and diversify its trade. Similarly, the lower base of commodities may increase to a number of other commodities.

Keywords: BoP, VAR, Co-integration, Unit root, Augmented Dickey fuller, Corrollogram

INTRODUCTION

Currency is a part of the money. According to Walker, (1979) "Money is what Money does. Currency is a paper form of money. Anything which performs the function of money can be taken as money. Historically different things have been used as money. Anything which possesses the characteristics like medium of exchange, measure of unit, storability and general acceptability etc could be taken for granted as money. Presently, every country has its own currency, possessing the earlier stated characteristics, backed by the central authority and monetary authority of that country.

It has both national and international significance. The value of a local currency is evaluated in terms of exchange rate in international market. Exchange rate helps to gauge the value of one country currency in relation to other countries' currencies. Exchange rate is a measure of competitiveness around the globe. Index of Competitiveness currency of a country plays a leading role in the economic stability across the nation. The determinants of exchange rate are the demand and supply of currency in the foreign exchange market. The monetary authorities and the govt. too play a significant role in determination of exchange rate. Economists are of the opinion that devaluation encourage the export and discourage the import of a country.

Exchange rate plays a vital role in businesses, investments and policy and planning decisions of a country. Since two decades it (exchange rate) has become one of the important areas for research. It has a remarkable development, especially in post Bretton-Wood era, in which the exchange rate has been volatile, after introduction of floating exchange rate 1st March 1982.

Exchange rate has been of great concern for economists and researchers throughout the world in developed as well as in developing countries. Kureger (1983) found a relationship between the trade balance and exchange rates. Other researches who did great efforts in this area are Greenwood (1994), Hanarios (1989), Bahmani-Oskooee, (2001), Mahdari and Sohrabian, (1993), Mustafa et al (2004), Rehman et al (1997), Singh (2000). The above cited researchers have reached the conclusion that exchange rate plays a crucial role in different sectors of the economy and in multiple directions of a nation.

Some of the researches, like Greenwood (1984), Rose and Yellon (1989), Rehman Mustafa (1996), Rehman et al (1997), Saadia Badar (2006) who examined the case of Pakistan, where they found no or weak relationship between the two important variables i.e. exchange rate and trade balance at hand. The Pakistani rupee depreciated against US dollar until the turn of last century, when Pakistan's large-current account surplus pushed the value of rupee up versus the dollar. The central bank of Pakistan intervened in order to stabilize the exchange rate through lowering interest rate and buying dollars from the market which aimed to maintain the country export competitiveness.

The Pakistani currency was linked to US currency in 1971, delinked in 1982, and Pak rupee has been made fully convertible from July, 1994. Now, it is being managed under the floating exchange rate.

From now onward the value of Pakistani currency in terms of other currencies fluctuates according to the market forces of supply and demand for foreign exchange in the foreign exchange market. It is necessary to mention here the difference between devaluation and depreciation and its appropriate terminologies respectively like revaluation and appreciation. In the words of Samulson "A decrease in official price of a nation's currency or

in terms of gold is called devaluation” and the opposite action, in other words an increase in the official price of a nation’s currency is termed as revaluation. On the other hand, the fall in the value (price) of domestic currency comparison with foreign currencies caused by the market forces is known as depreciation and the opposite of this would be regarded as appreciation of the currency. These are the technical terms that need to be explained and all the terminologies which contain while explain the exchange rate scenario is to be dealt with in the relevant chapters of this research effort.

Balance of payment (BOP) regarded as an important area, from which to see the impact of foreign exchange rate in case of Pakistan. “Balance of payment is a record of economic transactions between the residents of one country and the rest of the world during course of one year. BOP is further divided into two broad groups, that is, current account and capital account. Current account is total amount of the export and import of visible good and services and transfer payments. Capital account is the record of capital movement between one country and the rest of the world during specific time of interest. Now it is going to explain the export and import fluctuation is relation to the global exchange rate.

Material and Method

The present study investigate the short and long run relationship among real effective exchange rate, real value of exports and imports (rupee in million) in Pakistan. There are a number of ways to undertake analysis, however, present study employ Kemal & Qadir (2005) procedure. There are several advantages of this procedure. First, it isolates the short run and long run relationships, that is, it highlights the strength of relationships in both short as well as in the long run. Secondly, it highlights the behavior of error correction mechanism if any, that is, it gives information about tendency towards equilibrium in case there are shocks to the system. Third, this procedure is directly more relevant from theoretical point of view as well. As it is well known macroeconomic principle that exports, imports and exchange rate movements are inter-related.

There are two method of finding co-integration relationship among variables of interest which are Engle – Granger and Johansen technique. Engle – Granger is single equation technique with a number of shortcomings. However, Johansen cointegration technique is based on system of equations, and is more powerful than Engle – Granger technique. It is, therefore, the reason that Johansen technique is utilized in the present study.

There are a number of steps involved in the analysis. First, researcher needs to decide whether data is stationary or not. If data is stationary, Johansen co-integration technique cannot be utilized. However, if data is non-stationary, and integrated of order one, it can be employed. Secondly, An estimation of parsimonious vector auto regression model with optimal lag length is the second step to carry out. Third step is to apply co-integration test, and find out long run co-efficient of the variables. Finally, a representative vector error correction mechanism is constructed to estimate the short run relationships. These steps have been outlined in more details.

The first step is to find whether data is stationary or not. There are a number of tests which can be used to decide about the stationary of the variables. Augmented – Dickey Fuller (1981), abbreviated as ADF, is the more popular test in literature due to its simplicity and powerfulness. Dickey and Fuller 1981. Mathematically, ADF can be expressed in equation (1) for a time series variable ‘Y’ below:

$$\Delta y_t = a_0 + \lambda y_{t-i} + a_1 t + \sum_{i=1}^p \beta_i \Delta y_{t-i} + e_t \quad (1)$$

There are three options in equation (1)

- “ a_0 ” is the intercept or drift parameter of the time series.
- “ t ” is the time trend in time series. There may be downward or upward linear trend in the data.
- It is also possible that both drifts and time trend exit in the data.

The Augmented Dickey Fuller (ADF) may be carried out for above three options, namely, constant or intercept or drift, time trend or trend and finally both. Selection of appropriate lag length may be decided using Akiak Information Criterion (AIC).

First, direction of causality among variables would be tested using Granger Causality test (Granger, 1969) which is outlined by Karlsson et al., (2002) as given in equation (2) to equation (4):

$$\ln imp_t = a_{10} + \sum_{i=1}^n a_{1i} \ln imp_{t-i} + \sum_{i=1}^n a_{2i} \ln exp_{t-i} + \sum_{i=1}^n a_{3i} \ln er_{t-i} + \epsilon_{1t} \quad (2)$$

$$\ln exp_t = a_{10} + \sum_{i=1}^n a_{1i} \ln exp_{t-i} + \sum_{i=1}^n a_{2i} \ln imp_{t-i} + \sum_{i=1}^n a_{3i} \ln er_{t-i} + \epsilon_{2t} \quad (3)$$

$$\ln er_t = a_{10} + \sum_{i=1}^n a_{1i} \ln imp_{t-i} + \sum_{i=1}^n a_{2i} \ln exp_{t-i} + \sum_{i=1}^n a_{3i} \ln er_{t-i} + \epsilon_{3t}$$

Results and Discussion

Exchange rate is most important macro variable and play a very vital role in the economic policy of a state and most important to promote country s foreign trade. The present study may be extended for several variables. The VAR model may be extended into VAR- type – simultaneus equations model, which require a larger data set for the purpose of estimation.

The summary statistics, given in table.1 for the period of 2000-12 for three selected variables namely exchange rate (Rs versus US \$), log of exports and imports (Rs in million). The average exchange rate is Rs 66.69 per US \$ during 48 quarters, from 2000-12.

Table:1:-Summary Statistics of Selected Variables

	Exchange Rate (ER) (Rs versus US \$)	Log of Exports - LNEXP (Rs million)	Log of Imports --LNIMP (Rs million)
Mean	66.69654	12.24233	12.18058
Median	60.435	12.30632	12.23563
Maximum	92	12.56603	12.49833
Minimum	51.65	11.6099	11.76492
Std. Dev.	12.3551	0.234959	0.234366
Skewness	0.781148	-0.853791	-0.338577
Kurtosis	2.010606	2.888114	1.583387
Jarque-Bera	7.409277	6.344769	5.341553
Probability	0.024609	0.041904	0.069198
Sum	3468.22	636.6014	633.39
Sum Sq. Dev.	7785.076	2.815498	2.801299
Observations	52	52	52

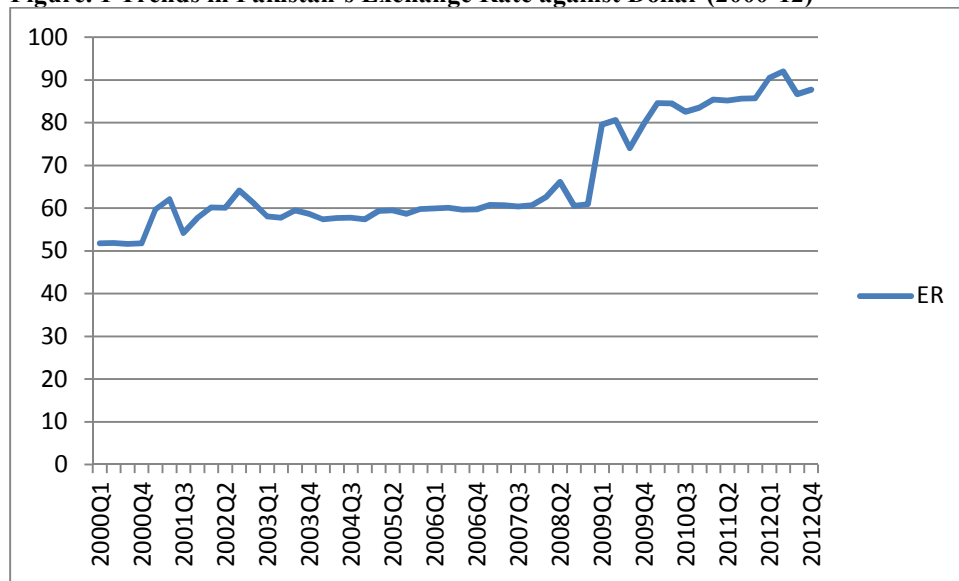
Source: Author's calculation, data from State Bank of Pakistan

The maximum exchange rate is 92 per US \$ and minimum is 51.65 per US \$.The standard deviation is 12.3551, with positive skewness of 0.78. The average values of log of exports and imports are given by 12.24 and 12.18 respectively. The maximum log of exports is Rs 12.56 million, whereas minimum is Rs 11.6099 million. Standard deviations of log of exports and imports are given andRs 0.234959 million and Rs 0.234366 million respectively. Coefficient of skewness is negative for both exports and imports of Pakistan. The lowest value of standard deviation for Pakistan's quarterly imports than its quarterly exports reinforces the theoretical argument that imports are relatively price inelastic. Less developed countries export primary goods to rest of the worlds, which is low price and income elastic.

TREND ANALYSIS

This section highlights overall description of the data to visualized appealing its characteristics. Figure No.1is shows trends in Pakistan Exchange rate against US dollar for various quarters from 2000 to 2012. Exchange rate has been below Rs 60 per dollar in fiscal year 2000. However, after 2001, Pakistani rupees depreciated against US dollar. Exchange rate reached to Rs 60 per US dollar, and remained around it till fiscal year 2008. After General Election in 2008, Pakistan People's Party takes over government by wining majority of national assembly seats. There were a number of challenges for new government in Pakistan including deteriorated macro – economic conditions.

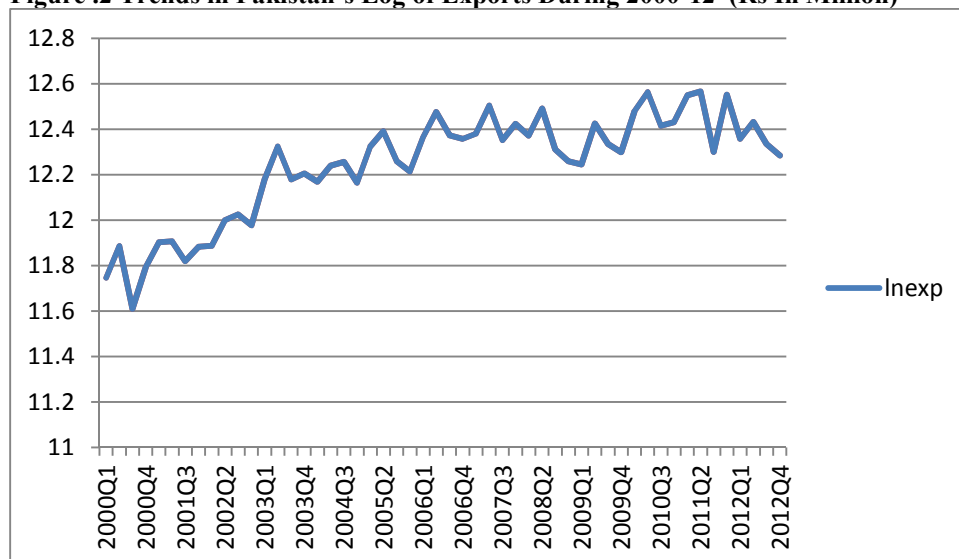
Figure. 1 Trends in Pakistan’s Exchange Rate against Dollar (2000-12)



Source: Author’s calculation, data from State Bank of Pakistan

Figure.2 shows trend in the log of quarterly exports (Rs in million) for Pakistan over 2000-12. There has been stable upward trend in export earning of Pakistan from first quarter of 2000 to second quarter of the 2008. It is the period where exchange rate stable, and fluctuated in range of Rs 60 per US dollar. Exchange rate depreciated after fiscal year 2008, and uncertainty in exchange rate increased meanwhile. The exports earning for Pakistan is more uncertain and volatile after fiscal year 2008 till 2012. The exports earning has been under pressure during depreciating Pakistan’s rupees against US dollar in particular and other strong currencies in general. It reinforce the theoretical argument that depreciating currency value though reduce foreign price of Pakistanis commodities, however, increases the risk of trading with Pakistan. It seems that, other things constant, risk factor is the major one in contributing to lower exports earning for Pakistan during 2008 to 2012.

Figure .2 Trends in Pakistan’s Log of Exports During 2000-12 (Rs In Million)

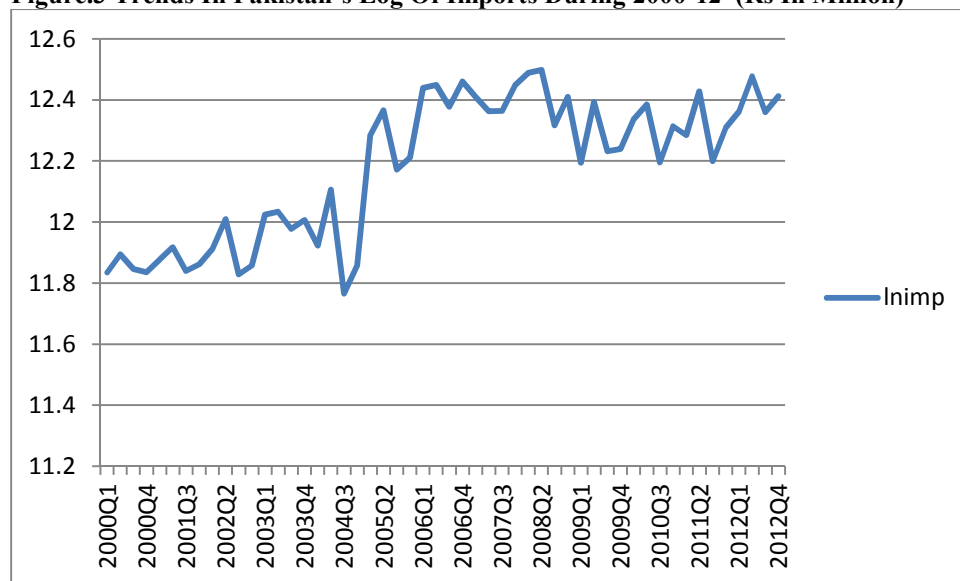


Source: Author’s calculation, data from State Bank of Pakistan

Figure.3 shows the trends in Pakistan’s log of imports (Rs in million) during 2000-12. Pakistan, like other developing countries, has to import finished good especially technology and other such raw materials which are necessary for macroeconomic growth and development. The demand for such products is relative price inelastic as it represents equipments for economic development particularly of industrial development. The benefits of such imports are larger in future, in case these industries are developed and modernized, however, short run effects the disequilibrium in the balance of payment and hence deterioration in exchange rate against foreign currencies. It also leads to higher public debts for balance of payment (BOP) support, and hence increasing interest payments along with the principle amount. Many less developed countries fail to increase their exports for repayment of

foreign loans which leads to rescheduling the existing loan, and thereby lead to debt trip and bankruptcy.

Figure.3 Trends In Pakistan’s Log Of Imports During 2000-12 (Rs In Million)



Source: Author’s calculation, data from State Bank of Pakistan

Figure.3 shows the Pakistan imports payment (Rs in million) rises over a time. There is a secular trend till fiscal year 2004, after a sudden jump till fiscal year 2006. It is in between 12.2 and 12.6 for the rest of the period (data is in logs).

Estimation of Results

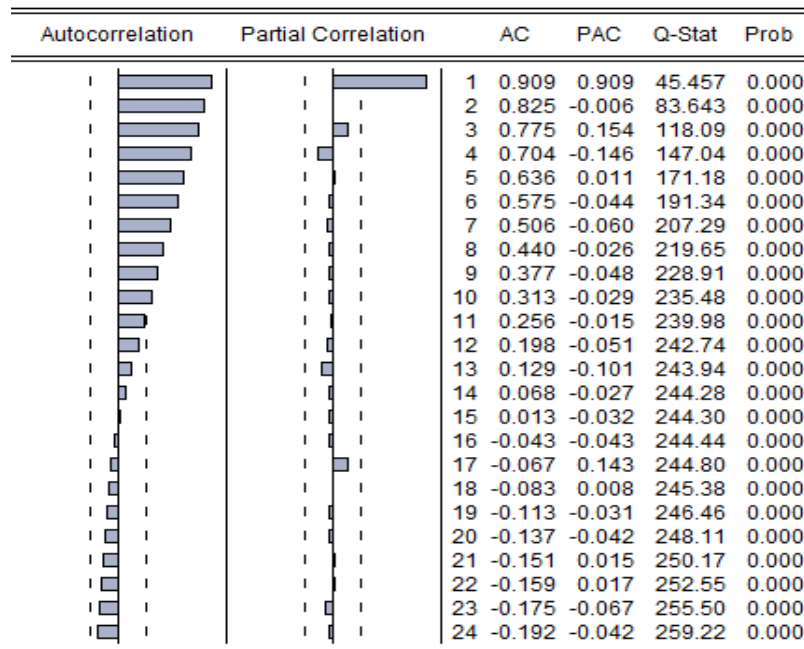
The first step in econometric analysis is to check each variable for the existence of unit root in time series variable. If there is evidence of unit root in the time series data then application of ordinary least square (OLS) is inconsistent as well as inefficient. The regression model estimated by OLS is spurious if there are evidences of unit roots in time series data. In this context, a large portion of the present chapter is devoted to the test of existence of unit root in the data.

There are several techniques for testing for unit root in the data, however, looking at correlogram and Augmented Dickey Fuller (ADF) test are among the important tools. Correlogram and ADF test can be constructed at level as well as first difference of the series. There are three options for the application of ADF test, namely, whether there is intercept in the regression equation or not, whether there is trend and intercept or no intercept and trend in the regression model. In this context, analyses are carried out for all possible options for ADF, and results are presented below.

Figure No.4 shows the correlogram for exchange rate of Pakistani rupee against US dollar at level of the series. It is evident that exchange rate series suffer from the problem of unit root as there are considerable not of spikes of correlations which are out of 95 percent confidence interval up to lag 10 of the series. It is therefore concluded that exchange rate series suffer from unit root problem. If exchange rate suffers from unit root’s problem then whether it disappears or not when first difference of the series is taken.

Figure 4: Correlogram For Exchange Rate At Level

Date: 11/18/14 Time: 17:31
 Sample: 2000Q1 2012Q4
 Included observations: 52

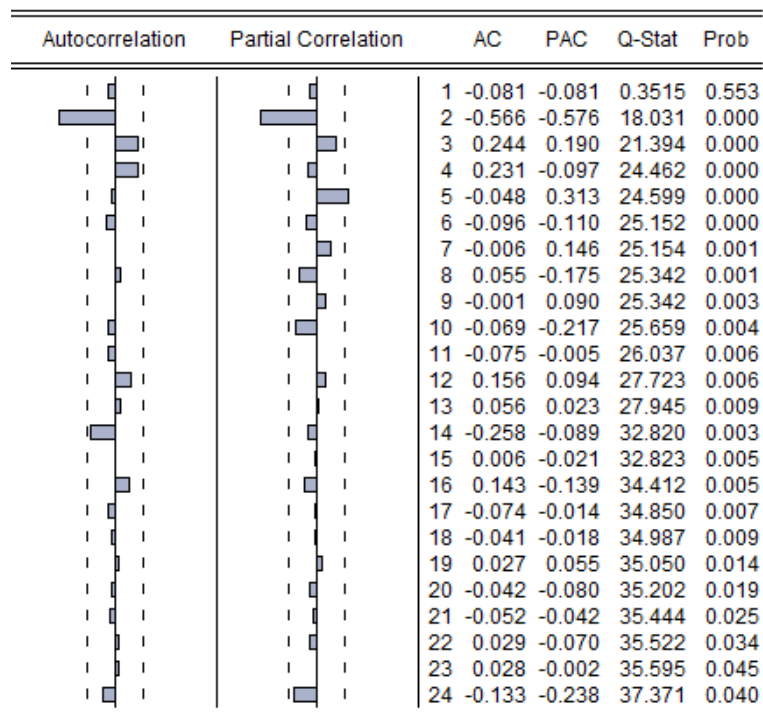


Source: Author's calculation using Eviews, data taken from State Bank of Pakistan

Figure No.5 shows the correlogram for exchange rate of Pakistani rupee against US dollar at first difference of the series. It is evident that problem of unit root disappears once data is difference for first order, or alternatively, exchange rate series is integrated of order one.

Figure 5: Correlogram for Exchange Rate At First Difference

Date: 11/18/14 Time: 17:34
 Sample: 2000Q1 2012Q4
 Included observations: 51



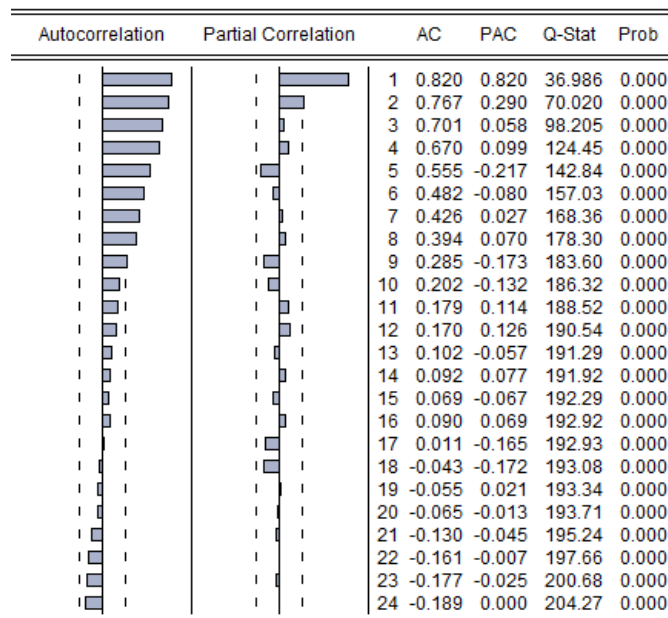
Source: Author's calculation using Eviews, data taken from State Bank of Pakistan

There is one partial correlation, in figure No.2, at lag two which is out of 95 percent confidence interval,

which can suspect the decision that exchange rate is integrated of order one, or there are no evidences of unit root if series is difference one. It is therefore vital to conduct ADF test for this series. ADF can be conducted for three options at both level and first difference. The intercept term acts as a drift in a variable which may push variable to its long run origin. The value of ‘tau – statistic’ is given by 0.43 with probability of 0.92, which is sufficient to reject alternative hypothesis and accept the null hypothesis of existence of unit root.

Figure 6: Correlogram For Log Of Exports At Level

Date: 11/18/14 Time: 17:56
 Sample: 2000Q1 2012Q4
 Included observations: 52

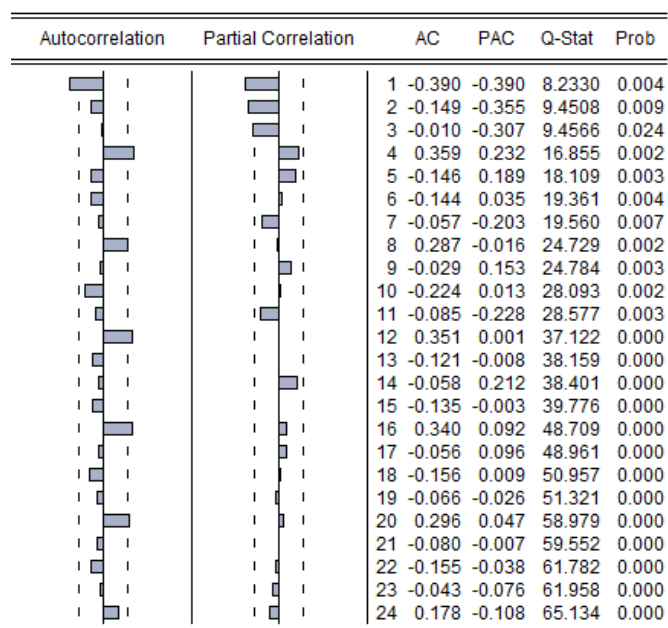


Source: Author’s calculation using Eviews, data taken from State Bank of Pakistan

Figure No.6 is constructed to see the behavior of the log of export data after taking first difference of the series. It is shown that all the auto-correlation coefficients, except at lag one, are with 95 percent confidence intervals. It shows that log of export series is stationary once first difference of series is taken.

Figure 7: Correlogram For Log Of Exports At First Difference

Date: 11/18/14 Time: 17:57
 Sample: 2000Q1 2012Q4
 Included observations: 51

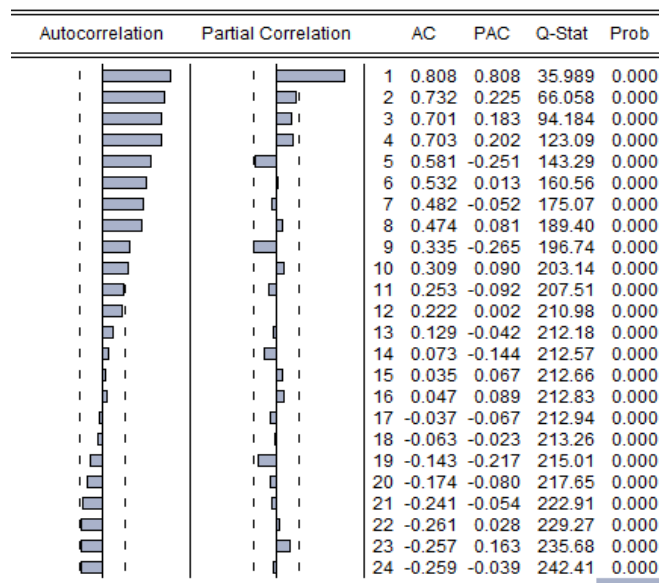


Source: Author’s calculation using Eviews, data taken from State Bank of Pakistan

As there are some partial and autocorrelation coefficients which are outside of the 95 percent of the confidence interval, therefore, it is necessary to confirm the decision drawn based on ADF test, a powerful test in the present context.

Figure .8 Correllogram for Log Of Imports At Level

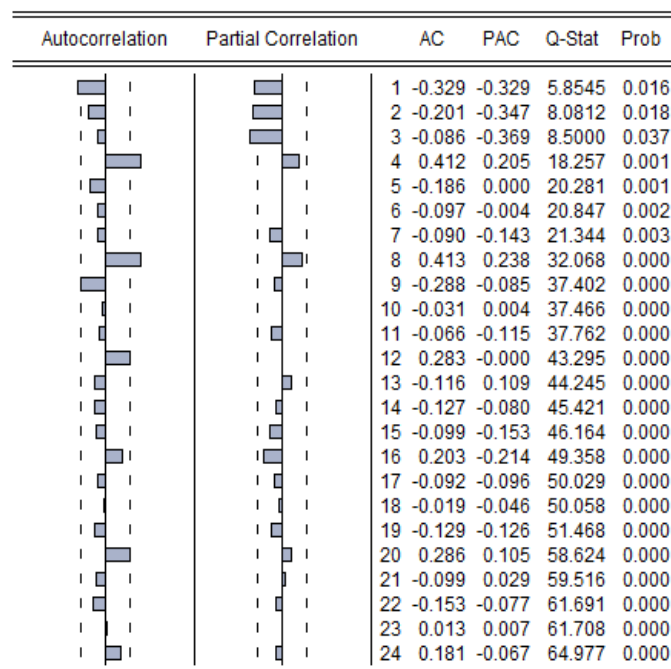
Date: 11/18/14 Time: 18:14
 Sample: 2000Q1 2012Q4
 Included observations: 52



Source: Author's calculation using Eviews, data taken from State Bank of Pakistan

Figure.9 Correllogram for Log of Imports at First Difference

Date: 11/18/14 Time: 18:15
 Sample: 2000Q1 2012Q4
 Included observations: 51



Source: Author's calculation using Eviews, data taken from State Bank of Pakistan

The value of 'tau – statistic' is -1.29 with probability of 0.62, which is enough high to conclude that there is unit root in the series.

There are different steps for further analysis. First step, among other, is to select appropriate lag length for model selection. There are several optimization techniques, shown in Table.2; Akaike Information Criterion (AIC) is one of the best techniques for small sample data size. It is therefore, AIC is used in the selection of lag length up to three.

Table.2: Lag Length Criteria for Vector Auto Regression Model

VAR Lag Order Selection Criteria

Endogenous variables: ER LNEXP LNIMP

Exogenous variables: @SEAS(1) @SEAS(2) @SEAS(3) @SEAS(4)

Date: 11/18/14 Time: 18:42

Sample: 2000Q1 2012Q4

Included observations: 48

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-135.5691	NA	0.094066	6.148713	6.616513	6.325495
1	-20.30550	196.9086	0.001129	1.721063	2.539713*	2.030432*
2	-13.10565	11.39977	0.001232	1.796069	2.965569	2.238025
3	-0.644884	18.17194*	0.001092*	1.651870*	3.172221	2.226413
4	2.378578	4.031282	0.001454	1.900893	3.772094	2.608022

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SIC: Schwarz information

Criterion

HQ: Hannan-Quinn information criterion

Source: Author's calculation using Eviews, data taken from State Bank of Pakistan

The following major conclusion can be drawn.

- Pakistan's imports rise faster than export which come definite in BOP. It may have link to real sector of economy.
- The exports of primary goods are falling over a time. It is a positive point.
- The main concentration of Pakistan export is to developed countries. If developed countries economies suffer from any crises, Pakistan is the direct hit as a result of such crises.

The estimated results from econometric model can be summarized as follow:

- All the time series variables suffer from the problem of unit root, so use of OLS is not valid.
- All the time series variables are integrated of order one and sample size is fairly large, so Johanson co-integration technique can easily be applied.
- The optimal lag length criterion test suggests that lag length up to three quarter.
- The test of co-integration shows that there is no one co-integrating vector, and hence exists long run relationship among the variables.
- The short run effects of lag exports on current exports are negative and significant. It suggests that if exports in current quarter are higher, and then exports in coming quarter falls.
- The impact of exchange rate dynamics is smaller on export of Pakistan. It means that if country currency depreciates, the foreign price for domestic exports falls, and hence demand rises but with lower magnitude or exchange rate depreciation increase export with lower quantity. Whereas, impact of exchange rate on imports of Pakistan is positive and larger than exports. It means that a given percentage rise in the exchange rate of rupees per dollar raise import by more quantity than exports. This is the typical type of situations that less developed countries are facing as a whole.

References

- Ahn . G. M. and Kim . Y. J. (2007) " The impact of Trade Openness on the Real Exchange Rate and the Trade Balance " Closed – Form Solution and Some Evidence.
- Akhtar, M., and Hilton, R. S. (1984), "Effects of Exchange Rate Uncertainty on German and U.S. Trade", Federal Reserve Bank of New York Quarterly Review, 9, 7-16.
- Arize, C. A. and Osang, T. and Slottje J. D. (2000), "Exchange rate volatility and foreign trade: evidence from Thirteen LDC.s", Journal of Business and Economic Statistics, Vol. 18 (1) 10-17.
- Bahmani-Oskooee, M. (2001), "Does Black Market Exchange Rate Volatility Deter the Trade Flows? Iranian Experience, Applied Economics, 34 (18), 2249-2255.
- Baloch , Q. A , (2011) Pakistan Trade Imbalance and Melting down of Economy.

- [Http: // www.sbp.org.pk / research / bulletin / 2006 / vol 2num2/ Determining Import Intensity of export for Pakistan](http://www.sbp.org.pk/research/bulletin/2006/vol2num2/Determining%20Import%20Intensity%20of%20export%20for%20Pakistan) dated 08-12-2013.
- Barret .B. C and Wang K.L (2005) Estimating the Effect of Exchange Rate Volatility on Export Volume;
- Boug .P and Fagereng . A. (2007) “ Exchange Rate Volatility and Export Perfomance” A Cointegrated VAR approach , A Discussion Paper No-522.
- Coric, B., & Pugh G. (2006), The effects of exchange rate variability on international trade: a meta-regression analysis”, *Applied Economics*, p. 1-14.
- Green wood (1994) “business and economic and even a new trend back to the local level of identity and economic activity “.
- Gotur, P. (1985) Effects of Exchange Rate Volatility on Trade: Some Further Evidence. *IMF Staff Papers* 32:3, 475–512.
- HasanovFakhri(2009) “ The Impact of Real Exchange Rate on Non- Oil Exports” An Asymmetric Adjustment toward The Equilibrium, 6(54).
- Hau, Harold (2002), “Real Exchange Rate Volatility and Economic Openness:Theory and Evidence”, *JournalofMoney,CreditandBanking*, Vol. 34(3), 611-630
- He, Q. (2010).Expanding varieties in the nontraded goods sector and the real exchange rate depreciation. *Journal of international and global economic studies* , 19-38.
- Keemal .M.A and Qadir .U (2005) The real exchange rate, export and import movemet: 44;2pp: 177-195.
- Khan .A. J. Azam . P. Syed . H. S (2014) “ The Impact of Exchange Rate Volatility on Trade” *The Lahore Journal of Economics* 19:1 pp 31-66.