EUROPEAN ACADEMIC RESEARCH
Vol. V, Issue 2/ May 2017

Impact Factor: 3.4546 (UIF)
DRJI Value: 5.9 (B+)

ISSN 2286-4822
www.euacademic.org

Exchange Rate Overshooting and Its Impact on Balance of Trade: A Case of Pakistan

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Abstract:

This main goal of this study is to check the exchange rate overshooting and its impact on balance of trade in Pakistan. The annual time series data from 1971 to 2015 is used to check the short run and long run relationship between Exchange rate overshooting and balance of trade. We employed the autoregressive distributed lag approach and results reveal that Exchange rate has positive and significant relationship with balance of trade in long run and short run. Devaluation of Pakistani rupees against USD, would increase the exports and ultimately trade balance will enhance. The inflation and money supply has negative and significant relationship with balance of trade in long run in Pakistan. The excess of money supply will increase inflation which reduces the exports and consequently, balance

of trade would decrease. This study has a policy implications for government as well as local and foreign investors. The government should also play an important role to make such strategies which can increase the balance of trade in Pakistan and can boost the economic growth of Pakistan indirectly.

Key words: Exchange rate, Balance of Trade, Inflation, Money Supply

JEL classification Codes: F31, F32

1. INTRODUCTION

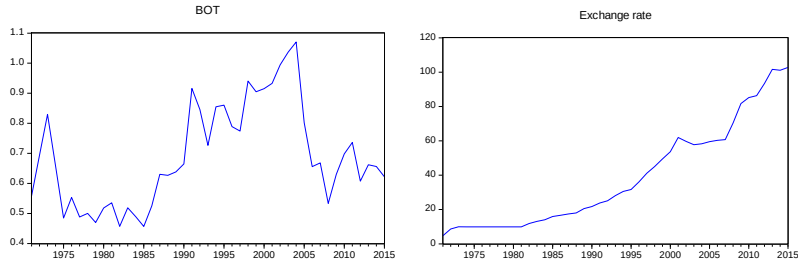
The exchange rate is a ratio of domestic currency and foreign currency. The exchange rate overshooting is not a new phenomenon, and it means that the change in exchange rate more than expectation of any individual. Some researchers stated that overshooting is the outcome of the speculators in exchange rate while other researchers proved that overshooting is due to monetary policy of any country. Overshooting model was first developed by Dornbusch, a German scientist by keeping in mind sticky price system. The fluctuation of exchange rate has ripple effect on other macroeconomic indicators like some are trade balance, money supply, and inflation, etc. These truth plays a significant role to the economic growth of every economy which opens its doors to international trade in goods and services. Lot of previous researchers like (Alexander, 1952; Harberger, 1950; Meade, 1951; Mundell, 1968) and most recent literature (Bahmani-Oskooee, 1985; Bahmani-Oskooee & Cheema, 2009; Kale, 2001) show that devaluation of the currency maintains fixed foreign exchange rate which cure to chronic trade imbalances.

During 1973 in Pakistan the major part of the imports was crude oil. The oil prices were increased which adversity impact on balance of trade. The deficit was fulfilled by external

borrowing which results in increasing external debt burden. Pakistan external debt reached to $45 billion which is expecting more to increase $52 billion after IMF loan. Pakistan should need to adopt such policies which increase trade balance. After 1982, Pakistan has changed his fixed exchange rate policy to floating exchange rate regime. Further, after 2000, floating exchange rate system was also substituted with free floating exchange rate system. In real sense, it was not free floating exchange rate system because State Bank of Pakistan is still regulating exchange rate policies with market intervention. Consequently, the depreciation of exchange rate increased the balance of trade.

Pakistan is an emerging nation and having persistent snags of balance of trade since the independence in 1947. Pakistan has a continuously decreasing trend in exchange rate against US dollar since 1992 even after adopting the floating exchange regime as you can see in Figure 1. Devaluation of currency helps to improve exports due to cheap prices of goods and services for foreigners and decrease imports which further has favorable impact on trade balance in any economy (Shahbaz, Jalil, & Islam, 2010). Pakistan is nowadays facing a huge difficulties due to electricity crisis, gas crisis and terrorism situations due to which imports and exports suffered a lot, and ultimately it hurts balance of trade. So it is important to check the impact of exchange rate overshooting on balance of trade in the presence of latest data from 1971-2015.

Figure: 1



Source: World Development Indicator

2. LITERATURE REVIEW

The exchange rate overshooting and its impact of balance of trade has gained considerable attention among researchers in last few decades. It becomes a serious issue for researchers in developing countries since 1972 because many developing countries shifted from fixed exchange rate system to floating exchange rate system. There are different studies have been explored the relationship between exchange rate overshooting and balance of trade with mix results. It is general agreement between researchers that exchange rate affect the trade balance in long run. Baharumshah (2001) clarify the existence of positive relationship with trade balance in Malaysia and Thailand having trade relationship with Japan and USA.

Lal and Lowinger (2002) found nominal exchange rate has positive and significant relationship with balance of trade in both short run and long run in South Asian countries. Onafowora (2003) reported that there is long run association between real exchange rate and trade balance in the data of tri countries, Indonesia, Thailand and Malaysia which have bilateral trade with US and Japan. Kemal and Qadir (2005) examined the positive relationship between exchange rate and imports and exports in Pakistan with negative relationship exchange rate to export and positive to imports. SaangJoon (2008) shows the positive association between China and USA in long run but no relationship found in short run.

According to (Bilawal et al., 2014) exchange rate has 68% significant impact on trade balance in Pakistan. Kakar, Kakar, and Khan (2010) found positive and significant relationship between exchange rate and balance of trade in both short run and long run in Pakistan. Amzath and Shen (2010) justify that trade balance, and real exchange rate are significant in long run as well as short run under fixed exchange rate system in Cote d'Ivoire. They also suggested that devaluation of currency promote export in Cote d'Ivoire. In

contrast to these study, some studies showing insignificant relationship. Rose (1991) concluded that real exchange rate has insignificant relationship with trade balance of five OECD countries.

Siddiqui and Akhtar (1999) presented the insignificant relationship between exchange rate and domestic prices. Wilson & Tat (2001) found nonexistence of significant relationship between exchange rate and trade balance in Singapore and USA. The little evidence found for J-curve hypothesis. Sekmen and Saribas (2008) showed the long run and short run relationship between exports and imports for Turkey but no relationship found between exports and imports with trade balance. Mukhtar and Rasheed (2010) tested import and export relationship and stability for long run in Pakistan and verified that there is significant relationship between imports and exports. Hye and Siddiqui (2010) showed export can cause imports but imports cannot cause exports.

Many scholars have also engrossed to study between exchange rate volatility and trade balance or imports and exports with different results. According to Wilander (2013), high exchange rate volatility will reduce the chance of using importers currency while high GDP per capita in importing countries increases the likelihood. McKenzie and Brooks (1997) described the positive and significant relationship between exchange rate volatility and trade balance between Germany and USA. Dell'Ariccia (1999) confirmed the association between uncertainty of exchange rate and trade balance in western Europe and showed that there is a very small but negative impact of exchange rate uncertainty on balance of trade. Mustafa, Nishat, and Kemal (2004) verified the impact of exchange rate volatility on export of Pakistan with some other major trading partner countries. They found negative and significant relationship between variables in long run except Bangladesh and Malaysia.

Chinese bank should pay more attention to stabilizing the Yuan against USD dollar exchange rate due to engrossing more inflows of hot money by floating exchange rate policy which can increase Chinese international competitiveness (McKinnon & Schnabl, 2014). Aftab (2002) found that Lerner condition is verified for data of Pakistan and suggested that devaluation of currency promote balance of trade in Pakistan. Choudhri and Khan (2002) documented that there is no co-integration between Rupees devaluation to inflation in Pakistan. Choudhary and Chaudhry (2007) testify that devaluation of Pak Rupee against USD negatively effects the price level but positive effects the output in Pakistan.

3. DATA SOURCE, VARIABLES, AND RESEARCH METHODOLOGY

3.1 Data Source and Variables Selection

For measuring the impact of exchange rate overshooting on balance of trade. We have taken trade balance as dependent variables and foreign exchange rate, inflation and money supply as our independent variables in this study. The annually time series data from 1971 to 2015 were taken from site of world development indicators.

Variables	Definition	Source
BOT	Balance of Trade: Ratio of Exports to Imports	World Development Indicators
EXR	Exchange Rate: Domestic currency (Rupee) divided by foreign currency (USD)	World Development Indicators
INF	Inflation: Consumer price Index annually	World Development Indicators
MS	Broad money supply: the sum of currency outside banks; demand deposits other than those of the central government. (% of GDP)	World Development Indicators

3.2 Research Methodology

3.2.1 Unit Root Test

We used unit root test to identify the stationary of the series. One of the advantage of autoregressive distributed lag (ARDL),

it can be apply on any combination either 1(0) or 1(1). Further, if we do not check unit root of our variables, then the outcomes can be spurious. We used two methods for Unit Root, Augmented Dickey-Fuller and Phillips-Perron.

3.2.2 Autoregressive Distributed Lag Bound testing

ARDL bound testing approach is used in this study to check the impact of exchange rate on balance of trade on Pakistani data. ARDL is used to measure the short run and long run co-integration. There are some assumptions before using ARDL. Data must be free from serial correlation, normality issues. Data must not be stationary at second difference. There are some steps for ARDL bound testing approach.

1. The following equation was estimated for ARDL bound testing approach for measuring exchange rate and its impact on balance of trade.

$$\mathrm{BOT_t} = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\, \mathrm{BOT_{t-1}} + \sum_{i=1}^{n} \beta_{2i}\, \Delta\mathrm{EXR_{t-1}} + \sum_{i=1}^{n} \beta_{3i}\, \mathrm{MS_{t-1}} + \sum_{i=1}^{n} \beta_{4i}\mathrm{INF}_{t-1} + \beta_5 \Delta\mathrm{BOT_{t-1}} + \beta_6 \Delta\mathrm{EXR_{t-1}} + \beta_7 \mathrm{MS_{t-1}} + \beta_8 \mathrm{INF_{t-1}} + \varepsilon_t \quad (1)$$

2. When co-integration is exist between data, then second step is to find the long run model by using following equation.

$$\mathrm{BOT_t} = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\, \mathrm{BOT_{t-1}} + \sum_{i=1}^{n} \beta_{2i}\, \Delta\mathrm{EXR_{t-1}} + \sum_{i=1}^{n} \beta_{3i}\, \mathrm{MS_{t-1}} + \sum_{i=1}^{n} \beta_{4i}\mathrm{INF}_{t-1} + \varepsilon_t \quad (2)$$

3. In final step, it is need to check the error correction mechanism for short run.

$$\mathrm{BOT_t} = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\, \mathrm{BOT_{t-1}} + \sum_{i=1}^{n} \beta_{2i}\, \Delta\mathrm{EXR_{t-1}} + \sum_{i=1}^{n} \beta_{3i}\, \mathrm{MS_{t-1}} + \sum_{i=1}^{n} \beta_{4i}\mathrm{INF}_{t-1} + \emptyset ECM_{t-1} + \varepsilon_t \quad (3)$$

4. RESULTS AND INTERPRETATION

Table 1 Unit Root test result

Variables	Augmented Dickey-Fuller (ADF)				Phillip-Perron (PP)			
	1(0)		1(1)		1(0)		1(1)	
	I	T&I	I	T&I	I	T&I	I	T&I
BOT	0.27	0.61	0.00***	0.00***	0.25	0.56	0.00***	0.00***
EXR	0.99	0.99	0.00***	0.00***	0.99	0.94	0.00***	0.00***
MS	0.39	0.00***	0.00***	0.00***	0.37	0.21	0.00***	0.00***
INF	0.02**	0.07*	0.00***	0.00***	0.01**	0.05	0.00***	0.00***

***,**,* Show level of significant at 1%,5% and 10% respectively

Table 1 shows the results of Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) which identify the stationarity of the data. Balance of trade, exchange rate, money supply and inflation are stationary at first difference for both ADF and PP. Only Inflation are stationary at level for both ADF and PP. No variable is stationary at 1(2), so we can proceed further for ADRL bound testing technique.

4.1 Lag length Criteria

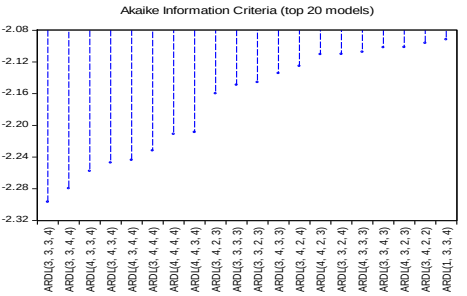


Figure 2

The lag length criteria is selected through ARDL bound testing approach. We use the Akaike Information Criteria for selecting lag length. The above figure shows the top 20 model, but best model with lag length is (1, 3, 3, 4). This lag length criteria is

selecting automatically by software. We can use this lag length criteria for further estimation of our results.

4.2 Determination of Co-integration by ARDL bound test

Table 2 ARDL bound test result for co-integration (1, 3, 3, 4)

Ho: There is no co-integration		
Test Statistic	Value	k
F-statistic	8.1670	3
Critical Value Bounds		
Significance	I(0) Lower	I(1)Upper
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Table 2 shows the value of F-statistic is 8.1670 which is greater than lower and upper bounds at 1% level of significant. So it means that null hypothesis is rejected and conclude that there is cointegration between variables of this study.

4.3 Long Run Coefficient Results

Table 3 Long Run Association ARDL (1, 3, 3, 4)

Dependent Variable: BOT				
Variables	Coefficient	Std. Error	t-Statistic	Prob.
D(EXR)	0.248138	0. 058486	4.242717	0.0003
MS	-0.078579	0. 021975	-3.575775	0.0015
LNINF	-0.362621	0. 115026	-3.152503	0.0043
C	4.399456	0. 975392	4.510451	0.0001

Table 3 shows the long-run association of independent variables with dependent variable. Exchange rate has positive and significant relationship with balance of trade in long run. Money supply and inflation have significant but negative relationship with balance of trade. So all independent variables are co-integrated with dependent variable in long run.

4.4 Diagnostic Tests

Table 4 Diagnostic Tests Results

Test Statistic	F version [p-value]	LM version [p-value]
Serial Correlation	0.742635 [0.4874]	2.592948 [0.2735]
Normality	N.A	0.801613 [0.2011]
Heteroscedasticity	0.351437 [0.9828]	3.207855 [0.9551]

Table 4 shows the diagnostic tests of data. We used Serial correlation, Normality, and Heteroscedasticity. Results show that our data is free from serial correlation, normality issues, and heteroscedasticity problems by using optimum lag length criteria (1, 3, 3, 4).

4.5 Error Correction Mechanisim

Table 5 Short Run Co-efficient Results ARDL (1, 3, 3, 4)

Dependent Variable: BOT				
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(BOT(-1))	-0.218619	0.150923	-1.448548	0.1604
D(BOT(-1))	-0.218619	0.150923	-1.448548	0.1604
D(BOT(-2))	-0.362473	0.140234	-2.584777	0.0163
D(EXR, 2)	0.016261	0.006131	2.652407	0.0139
D(EXR(-1), 2)	-0.016315	0.006406	-2.546969	0.0177
D(EXR(-2), 2)	-0.024456	0.006794	-3.599601	0.0014**
D(MS)	-0.006267	0.005981	-1.047789	0.3052
D(MS(-1))	0.008007	0.010503	0.762338	0.4533
D(MS(-2))	0.020209	0.007904	2.556634	0.0173*
D(LNINF)	-0.027317	0.041118	-0.664361	0.5128
D(LNINF(-1))	0.018589	0.050315	0.369451	0.715
D(LNINF(-2))	0.02429	0.060323	0.402667	0.6908
D(LNINF(-3))	0.11502	0.047305	2.431453	0.0229**
CointEq(-1)	-0.336195	0.086304	-3.895476	0.0007*
ECM = BOT - (0.2481×D(EXR) -0.0786×MS -0.3626×LNINF + 4.3995)				
R-squared	0.913820	Akaike info criterion (AIC)		-2.282978
Adjusted R-squared	0.856367	Schwarz criterion (SC)		-1.572473
F-statistic	15.90545	Hannan-Quinn criterion. (HQ)		-2.024251
Prob. (F-statistic)	0.000000	Durbin-Watson stat		2.240076

**Indicates significance at the 1% level.

*Indicates significance at the 5% level.

Table 4 shows the short run coefficients and error correction mechanism of the model. In short-run exchange rate has significant and positive relationship with balance of trade in short run. Moreover, previous two-year value of money supply has positive and significant relationship with balance of trade in short run. Current year and previous year value of inflation has insignificant relationship with balance of trade while previous three-year value of inflation affect the balance of trade positively and significantly. The value of ECM is significant and negative which shows that model is moving towards equilibrium position. However, the speed of adjustment is 33%. R-squared value is .91 which means that balance of trade is explained 91% by independent variables. DW stat shows that there is minor negative autocorrelation.

4.6 Model Stability Tests (CUSUM & CUSUM of Square)

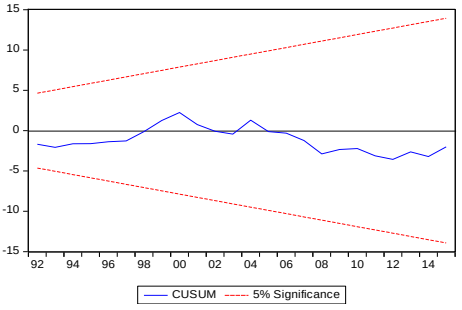


Figure 3

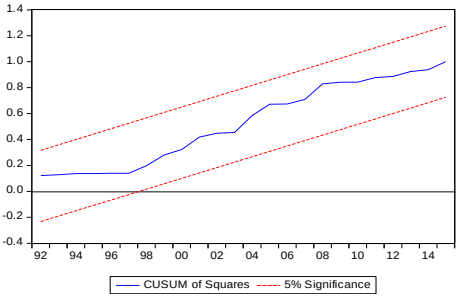


Figure 4

We have checked the model stability through CUSUM and CUSUM of square. In both above figures, the blue lines are between red lines which means that our model is stable under 5% level of significant as you can see in Figure 3 and Figure 4. If the blue line go out from two critical lines, then it said to be instability of our model.

5. CONCLUSION AND DEBATE

The main goal of the study is to check the impact of exchange rate overshooting on balance of trade in the presence of inflation and money supply in the context of Pakistan. We have used balance of trade as dependent variable while our independent variables are exchange rate, money supply, and inflation. The annual time series data from 1971 to 2015 was taken from world development indicator. The results reveal that exchange rate has positive and significant relationship with balance of trade in long run and short run. It means that Pakistani rupee is depreciated against USD. The devaluation of the currency will improve the exports and ultimately will boost the balance of trade in Pakistan. The inflation has negative and significant relationship with balance of trade in long run, but in short run, the three-year previous value of inflation has positive and significant impact on balance of trade. So, it means that in long run the inflation decreases the exports of the country and will promote the imports which ultimately tend to decrease balance of trade. The money supply has also negative and significant association with balance of trade in Pakistan in long run, but in short run, the previous two-year value of money supply has positive and significant relationship with balance of trade. Due to inflation in the country, the money supply is increased which also diminish the trade balance in Pakistan. This study has a policy implications for government as well as local and foreign investors. The government should also play an important role to make such strategies which can increase the

balance of trade in Pakistan and could cause indirectly boost the economic growth of Pakistan.

Acknowledgement:
This Research paper is funded by Research and Innovation Project of Graduate International Students of Zhongnan University of Economics and Law, Wuhan, P.R. China.
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