

The Impact of Exchange Rate Volatility on Balance of Trade: Evidence from Selected Emerging Economies

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Abstract: *This study investigates the effect of exchange rate volatility on the balance of trade in Bangladesh during the period from 2012 to 2017. Four different emerging economies (Indonesia, Malaysia, Mexico, and South Africa) have also been considered in the same line to compare whether they are exhibiting similar empirical evidence or not. In this study, ARCH Heteroskedasticity test has been used to examine the presence of volatility in foreign exchange data. Except Mexico, all the selected economies have positive correlation between exchange rate and balance of trade. Bangladesh and Mexico have uni-directional causality from exchange rate to balance of trade. Indonesia has causality from balance of trade to exchange rate. However, South Africa has bi-directional causality and Malaysia have no causality between the variables. It can be said that Bangladesh is experiencing an absence of exchange rate volatility which may in turn lead to cause the balance of trade of the country. Other emerging economies are exhibiting a mixed result.*

Keywords: *Exchange Rate, Balance of Trade, Volatility, Granger Causality*

Introduction

Exchange rates affect the true prices of commodities traded among countries of the world; it determines the price actually paid when each trade is executed (Khan et al., 2014). At the same time, domestic inflation also plays a vital role in determining the changing patterns in the prices of tradable commodities. The exchange rate in whatever conceptualization, is not only an important relative price, which connects domestic and world markets for goods and assets, but it is also signals the competitiveness of a country's exchange power vis-à-vis the rest of the world in a pure market (Afolabi et al., 2011). It is one of the important prices in an open economy, since it affects so many businesses, investment, and policy decision (Khin-Sen, 2003). If changes in exchanges rates are becoming unpredictable, this creates uncertainty about the profits to be made and, hence, reduces the benefits of international trade. On the other hand, international trade has a

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significant value to the total development effort of all economies including Bangladesh (Ullah and Rahman, 2014). Continuous growth and development in the economy need to attend its determinants. Trade is a necessary condition for economic growth and development (Lotfalipour and Bazargan, 2014). The role of trade in the stated processes is the engine in economic growth (Sharifi-Renani & Mirfatah, 2012). Volatile exchange rate slows down the process of trade, destabilizes the capital movements, and shatters the investors' confidence to invest in a country with high exchange rate volatility, which ultimately slows down the process of growth. There is continuously growing body of literature dealing with the effects of exchange rate variability on international trade since the breakdown of 'Bretton-Woods System' of fixed exchange rates when real and nominal exchange rates fluctuated widely. Most of the studies focus on estimating exchange rate volatility effects on international trade off developed countries, especially in the United States as well as the trade between developed and developing countries (Ferto et al., 2012). This study, therefore, attempted to examine the impact of exchange rate volatility on balance of trade in Bangladesh and also to use this evidence to compare with other four emerging economies.

Objectives of the Study

Emerging economies are expected to exhibit similar kind of exposure in their economic parameters. This study is initiated to examine the fact that whether exchange rate in emerging economies have the identical influence on the balance of trade for their respective economy. In this study, five different emerging economies (i.e. Bangladesh, Indonesia, Malaysia, Mexico and South Africa) have been considered to examine the influence of exchange rate on balance of trade by using different statistical and econometric tools. More specific objectives have been summarized below:

- i. To examine the descriptive statistics of Bangladesh balance of trade and the foreign exchange rate against US dollar.
- ii. To examine the volatility of exchange rate for Bangladesh and to compare this result with that of other four selected emerging economies.
- iii. To examine and compare the statistical association between the foreign exchange rate and balance of trade in all the selected five economies.
- iv. Finally, to estimate and compare the Granger Causal evidence between exchange rate and balance of trade in all the selected emerging economies.

Exchange Rate and Balance of Trade in Bangladesh:

Trade Balance implies the difference between the value of a country's merchandise exports and the value of its merchandise imports. Bangladesh is an emerging and small open economy. The trade regime of Bangladesh has undergone many changes and

difficulties over the last few decades. It had difficulties in import financing during the 1970s immediately after its independence. Initially, it followed the line of import substitution, which defines restricting imports. But with the change in government policy towards promoting a laissez-faire economy and with inflows of foreign aid in increased volumes, Bangladesh initiates to import more in the early 1980s (Mostafa and Rashid, 2014). There was a marked departure in the trade policy of Bangladesh when its trade policy was substantially liberalized with the implementation of the financial sector reforms program in the 1990s. Since 1992, Bangladesh has continued to liberalize its trade regime, by, inter alia, greatly reducing tariffs and eliminating some quantitative restrictions on imports. Despite the substantial reforms of the financial sector, Bangladesh has been experiencing deficits in trade balance.

Figure 1: Balance of Trade and Exchange Rate Condition in Bangladesh

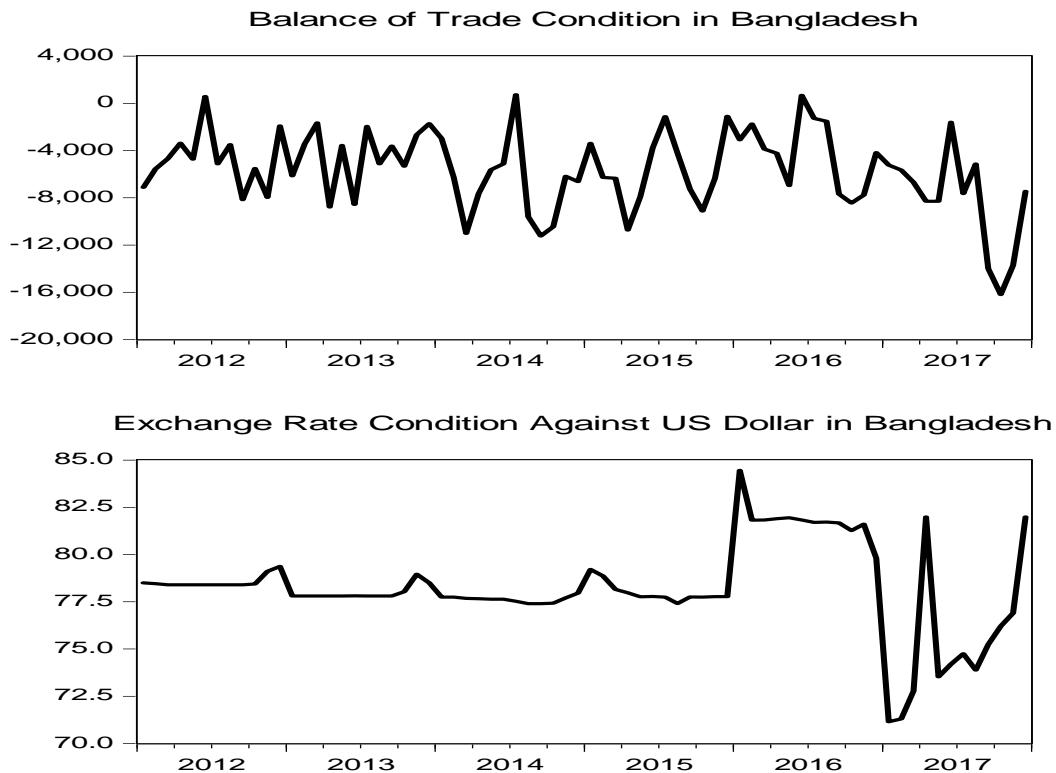


Figure: 1 depicts the balance of trade and exchange rate condition in Bangladesh during the period from 2012 to 2017. Bangladesh has experienced a sharp ups-and-down in the balance of trade from 2012 to the end of 2015, but after then it shows a declining trend. During the period from 2012 to 2017, the mean balance of trade is negative i.e. -5686 with standard deviation is 3409 (see appendix table: 1). On the other hand, foreign exchange rate for Bangladesh shows a stable move from 2012 to the middle of 2015. But

it has got a sharp fall in middle of 2016 and a sharp rise at the beginning of 2017. However, the mean and standard deviation value for exchange rate of Bangladesh is 78.2 and 2.42, respectively, during the period from 2012 to 2017.¹

Review of Literature

The impact of exchange rate volatility on trade has been much discussed but the large body of existing literature does not suggest unequivocally a clear picture of the impact of trade balance due to change in exchange rates. Therefore, the relationship between exchange rate and balance of trade has been a subject of intense theoretical and empirical debate in both finance and economics literature. The theoretical relationship between higher exchange rate volatility and international trade has been conducted by Hooper and Kohlhagen (1978). They place their arguments that exchange rate volatility lead to a higher cost of risk-averse traders which leads to less foreign trade. If changes in exchange rate becomes unpredictable, it results uncertainty about the profit to be made and reduces the benefits of international trade. On the other hand, current theoretical developments suggest that there are situations in which exchange rate volatility might be expected to have either negative or positive effects on trade volume (Ozturk, 2006). According to De Grauwe (1988), exchange rate volatility may have either a positive or a negative impact on trade according to the degree of firms' risk aversion. If producers exhibit only a slight aversion to risk, they produce less for export as the higher exchange rate reduces the expected marginal utility of export revenues. If they are extremely risk averse, they will consider the worst possible outcome. This implies that an increase in exchange rate risk will raise the expected marginal utility of export revenue as producers will want to export more to avoid a drastic decline in their revenue (Huchet-Bourdon, 2011).

The IMF's 2004 study (Prashad et al., 2004) on exchange rate volatility and trade flows indicated that there was no obvious negative relationship between aggregate exchange rate volatility and aggregate trade. It allowed for an exploration of the effect of exchange rate volatility on trade along several new dimensions, for example by type of volatility (short- and long-run, real and nominal, and other characteristics), by country group (with useful distinction by regions and income levels), and by type of trade (using disaggregated data across different types of goods). In this examination of the relationship between exchange rate volatility and trade, IMF looked at the time paths of the two variables and found no obvious (negative) association.

Chowdhury (1993) investigates the impact of exchange rate volatility on the trade flows of the G-7 countries in the context of a multivariate error correction model. He observes a significant negative impact on export volume for each country.

¹ See appendix table: 1

Prasad, Rogoff, Wei, and Kose (2004) find that volatility has detrimental effects on international trade and thus has a negative economic impact, especially on emerging economies where underdeveloped capital markets and unstable economic policies exist.

Bristy (2014) shows that exchange rate volatility has a negative impact on the economic growth of Bangladesh.

Lotfalipour and Bazarman (2014) intend to study exchange rate volatility on the trade balance of Iran during the period from 1993 to 2011. They have applied unit root test GARCH (1, 1) test, and balance panel data model and found that exchange rate has no significant effect on the trade balance. It is also found that trade balance was more affected by import rather than export and suggested to implement the policy that focuses on the production of import substituting goods.

Khan et al. (2014) investigate the impact of exchange rate volatility on the export and import demand functions during the period from 1970 to 2009 with reference to Pakistan's trading partners. They have used GARCH-based exchange rate volatilities and the least-square dummy variable technique with fixed effect estimation to measure the volatility on both demand functions. They have found that when Pakistan employed the US dollar as the vehicle currency with its trading partner, volatility discouraged both imports and exports. In contrast, both the import and export demand function remained unaffected by volatility distortions when Pakistan traded with its developing partners using bilateral exchange rates valued in domestic currency terms.

Mostafa and Rashid (2014) investigate the interrelationship between the monthly trade balance and exchange rate data of Bangladesh by applying unit root test, Engle-Granger Cointegration method and Granger Causality test during the period from July 1981 to December 2010. They have observed that cointegration existed between these two variables. The error correction model reveals that the speed of adjustment coefficient of the trade balance equation corrects about 13% of deviation from the long-run path within a month with a uni-directional causality running from exchange rate to trade balance, while the speed of adjustment coefficient of the exchange rate equation corrects only 0.003%. This is somewhat low and statistically insignificant.

Hassan et al. (2015) have examined the monthly time series information from 1991 to 2012 by a wide variety of econometric tools to test the effect of exchange rate volatility in Bangladesh's export volume in the US market. The study shows a stable and significant long-term relationship between the selected variables. Co-integration test provides a long term equilibrium relationship and an increase of exchange rate by 1 percent results an increase in the volume of exports by 2.32 percent. The estimated error correction equation indicates that 36% of the exported data has been corrected in a short

period of time. The response of research to the response function also requires positive relationships between variables. Finally, Granger causality analysis suggests the existence of a unidirectional causality running from exchange rate to export.

Hassan et al. (2016) have examined the long run and short run effects of the Real Effective Exchange Rate (REER) on real export earnings of Bangladesh. They have used the unit root tests, cointegration techniques, and the Error Correction Model (ECM) with time series data for the period from 2003M6 to 2015M5. The main findings of the study demonstrate that the REER has a significant impact on real export earnings in the long run while it has no effect in the short run. They also found that appreciation in the REER has a negative impact on real export earnings in Bangladesh.

Literature based on Bangladesh context differs in results but the pessimistic views are dominant that depreciation has little effect on export earning or on correcting trade balance (Centre for Policy Dialogue, 1996). Such pessimistic view is supported by the low price elasticity found by many Bangladeshi researchers over the periods. However, Hossain (2000) questioned their findings including the one by Centre for Policy Dialogue (CPD) on the grounds that they had not taken time series properties of data into consideration and had not covered sufficient number of observation particularly after the beginning of trade liberalization in the 1980s. However, he found Bangladesh's export price to be inelastic. Similarly, the study by Alam (2010) shows no causality runs from real depreciation of Taka against US dollar to export earning of Bangladesh.

Methodologies of the Study

The purpose of this paper is to examine effect of exchange rate volatility on the balance of trade in Bangladesh. This study also attempts to compare the evidence of volatility impact on balance of trade of other selected emerging economies i.e. Indonesia, Malaysia, Mexico and South Africa. In this case, foreign exchange rate against US dollar have been considered for Bangladesh, Indonesia, Malaysia, Mexico and South Africa and is indicated by BDEXR, INDOEXR, MALEXR, MEXEXR and SAEXR, respectively. On the other hand, Balance of Trade (BOT) data for the same countries have been taken in their respective currency of the countries and is indicated by BDBOT, INDOBOT, MALBOT, MEXBOT and SABOT. Daily and monthly exchange rate data from January 1, 2012 to December 31, 2017 has been used in this study. This exchange rate against US dollars has been collected from International Monetary Fund (IMF) Exchange Rate Archives and Bangladesh Bank website. Monthly Balance of Trade (BOT) has been collected from Trading Economics Archives. In order to measure the volatility of exchange rate on different economies, ARCH Heteroskedasticity test under GARCH (1, 1) model has been applied. Then the correlation test has been applied to examine the statistically association between exchange rate and balance of trade in all the five selected

economies. Finally, Granger Causality test (1988) has been employed to examine the causal linkage between exchange rate and balance of trade in all these five selected economies.

ARCH Heteroskedasticity Test

ARCH effect can be tested in pre-estimation as well as post-estimation analysis. In post-estimation, it tests remaining ARCH effect i.e. conditional Heteroskedasticity has been removed. For this purpose, it is applied on standardized residuals of the fitted model. This is an LM-test for the ARCH effect in the residuals (Engle, 1982). Normality tests are used to test the behavior of ARCH effect if the normality can be described by the conditional error distribution. Another way is to inspect the autocorrelation structure of the residuals and squared residuals using Portmanteau test. Portmanteau tests are used for diagnostic checking of the fitted time series models. An indication of ARCH effect is that the residuals are uncorrelated but the squared residuals are correlated.

Granger Causality Test

The causality relationships between the variables in this study are determined by using the methodology based on Granger (1988). The Granger tests involve the estimation of the following equations.

$$X_t = \alpha_0 + \sum_{j=1}^k \alpha_{1j} X_{t-j} + \sum_{i=1}^m \alpha_{2i} Y_{t-i} + \varepsilon_{1t}$$

$$Y_t = \beta_0 + \sum_{j=1}^n \beta_{1j} Y_{t-j} + \sum_{h=1}^p \beta_{2h} X_{t-h} + \varepsilon_{2t}$$

where ε_{1t} and ε_{2t} are assumed to be uncorrelated and $E(\varepsilon_{1t} \varepsilon_{2s}) = 0 = E(\varepsilon_{2t} \varepsilon_{2s})$ for all $s \neq t$.

These equations can be used to show the uni-directional causality from exchange rate (EXR) and balance of trade (BOT). If the estimated coefficients α_{2i} is statistically significant i.e. $\alpha_{2i} \neq 0$, then Y Granger-causes X. Similarly, X is the “Cause Variable” for y if β_{2h} is statistically significant i.e. $\beta_{2h} \neq 0$. If both α_{2i} and β_{2h} are significant, it would provide evidence of a mutual dependency between these two variables.

Analysis and Discussion

This study intends to capture the impact of exchange rate volatility on balance of trade in Bangladesh and also to compare this evidence with other four emerging economies i.e. Indonesia, Malaysia, Mexico and South Africa. In the beginning, the presence of volatility has been measured in all economy exchange rate data by applying ARCH Heteroskedasticity test. The results of ARCH Heteroskedasticity test is presented in

Table: 1. Under the null hypothesis, the ARCH test assumes no ARCH effect in the data set. Here the p -values of both the F-statistics and Observed R-squared are estimated for all the selected economies. It has been observed that except Indonesia and Malaysia, the p -values of F-statistics and Observed R-squared for the remaining economies (i.e., Bangladesh, Mexico and South Africa) are more than 5 percent level. Therefore, the results clearly depicts that the statistically significant ARCH effect is present in the exchange rate of Indonesia and Malaysia only. Other three economy's (i.e., Bangladesh, Mexico and South Africa) exchange rate data are free from ARCH effect. Therefore, it can be said that statistically significant volatility has been observed in Indonesia and Malaysian exchange rate data and volatility has not been observed in Bangladesh exchange rate data.

Table 1: ARCH Heteroskedasticity Test

Bangladesh	F-statistic	0.158264	Prob. F(1,1389)	0.6908
	Obs*R-squared	0.158474	Prob. Chi-Square(1)	0.6906
Indonesia	F-statistic	14.72829	Prob. F(1,1389)	0.0001
	Obs*R-squared	14.59475	Prob. Chi-Square(1)	0.0001
Malaysia	F-statistic	5.154925	Prob. F(1,1389)	0.0233
	Obs*R-squared	5.143260	Prob. Chi-Square(1)	0.0233
Mexico	F-statistic	0.093131	Prob. F(1,1389)	0.7603
	Obs*R-squared	0.093259	Prob. Chi-Square(1)	0.7601
South Africa	F-statistic	0.204029	Prob. F(1,1389)	0.6516
	Obs*R-squared	0.204293	Prob. Chi-Square(1)	0.6513

Note: Authors' Own Estimates

Table 2 presents the statistical association between exchange rates and balance of trade for the selected economies through correlation coefficient. It is found that except Mexico, the remaining four economies provide a positive correlation coefficient between exchange rate and balance of trade. Here, positive correlation coefficient of 0.217106 and 0.201620 have been observed in Bangladesh and South Africa respectively, and they are not found to be statistically significant at 5% level. On the other hand, significant negative correlation has been observed in case of Mexico. However, very negligible correlation has been found in case of Malaysia. Therefore, Bangladesh, Indonesia and South Africa are exhibiting similar kind of associations between exchange rate and balance of trade data. An increase in exchange rate, which results from the depreciation

of domestic currency against US dollar, also tends to increase the gap between the value of commodity import and export. As the relationship is negative in Mexico, an increase in exchange rate implies decrease in the balance of trade.

Table 2: Correlation Estimates between Exchange Rate (EXR) & Balance of Trade (BOT)

Country	Method	Between EXR and BOT
Bangladesh	Correlation Coefficient	0.217106
	t-Stat.	1.860825
	Prob.	0.0670
Indonesia	Correlation Coefficient	0.415071
	t-Stat.	3.817073
	Prob.	0.0003*
Malaysia	Correlation Coefficient	0.020097
	t-Stat.	0.168178
	Prob.	0.8669
Mexico	Correlation Coefficient	-0.331550
	t-Stat.	-2.940252
	Prob.	0.0044*
South Africa	Correlation Coefficient	0.201620
	t-Stat.	1.722243
	Prob.	0.0894

Note: *indicates statistically significant at 5 percent level

Test of Granger causality have been presented in Table- 4. Two variables, i.e., exchange rate and balance of trade for the five emerging economies have been used to examine their causal relation. Here null hypothesis is assumed to have no causal relation between exchange rate and balance of trade and 5 percent significance level have been considered in this test. It is observed that statistically significant uni-directional causality is present from exchange rate to balance of trade in case of Bangladesh and Mexico for having p -values of F-statistics less than 0.05. This result implies that balance of trade in these two countries is significantly caused by their exchange rate. Although statistically insignificant positive and negative association between exchange rate and balance of trade has been evident for Bangladesh and Mexico respectively, but these two countries exhibit a causal relation from exchange rate to balance of trade. On the other hand,

statistically significant uni-directional causality from balance of trade to exchange rate has been found in Indonesia at 5 percent significance level. South Africa has got a bi-directional causality between exchange rate and balance of trade at 5 percent level. Finally, Malaysia has no causal evidence between exchange rate and balance of payment.

Table 4: Test of Granger Causality between Exchange Rate and Balance of Trade on Selected Economies

Country	Direction of Causality			Observations	F-Statistics	Prob.
Bangladesh	BDEXR	→	BDBOT	70	3.31967	0.0424*
	BDBOT	~	BDEXR		0.04294	0.9580
Indonesia	INDOEXR	~	INDOBOT	70	2.90605	0.0618
	INDOBOT	→	INDOEXR		4.40312	0.0161*
Malaysia	MALEXR	~	MALBOT	70	2.25037	0.1135
	MALBOT	~	MALEXR		0.18050	0.8353
Mexico	MEXEXR	→	MEXBOT	70	4.34564	0.0169*
	MEXBOT	~	MEXEXR		2.77383	0.0698
South Africa	SAEXR	→	SABOT	70	6.08364	0.0038*
	SABOT	→	SAEXR		7.39385	0.0013*

Note: *indicates statistically significant at 5 percent level

Conclusion

Balance of trade and foreign exchange rate against a major foreign currency like US dollar are two sensitive variables for every economy especially for the case of emerging economies. In the absence of any natural resources like oil or gold, favorable balance of trade (i.e., when the value of export exceeded the value of import) is thought to be a good sign for enhancing economic growth and reducing the dependence on imported products from foreign country. On the other hand, foreign exchange rate defines the price of a major foreign currency in terms of domestic currency which is mainly used to make import payment. Although depreciation of foreign exchange rate may bring different result to both import or export oriented economy but foreign exchange rate certainly has an influence on the balance of trade in every economy. This study has made an attempt to examine the influence of foreign exchange rate on the balance of trade in Bangladesh and also attempted to examine the similar influence on few selected emerging economies. It

has been found that Indonesian exchange rate exhibits volatility and it also results two-way causality between exchange rate and balance of trade. On the other hand, Malaysian exchange rates are also found to be volatile but it has no causal linkage with that of balance of trade. Other three economies' (i.e., Bangladesh, Mexico and South Africa) exchange rate data are not statistically volatile but they have produced mixed causal evidence during the period under consideration. Here, exchange rate is causing balance of trade in Bangladesh and irrespective of having no ARCH effect in exchange rate of Mexico and South Africa, only South Africa has bi-directional causal linkage between exchange rate and balance of trade. At the end, extending the sample size and applying advanced econometric tools may generate convincing result in any upcoming studies.

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