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IMPACT OF EXCHANGE RATE VOLATILITY ON THE EXPORT PERFORMANCE OF DEVELOPING COUNTRY: EVIDENCE FROM BILATERAL TRADE BETWEEN BANGLADESH AND THE US

ABSTRACT

The paper investigates the effects of exchange rate volatility on export volume from Bangladesh to the US market by using monthly time series data over the period of 1991 to 2012. A wide range of econometric techniques have been employed to analyze the relationship between the study variables. The study reveals a stable and significant long run relationship between the variables. By employing Cointegration technique, it is observed that in the long run, a 1% increase in exchange rate that is depreciation of Taka against US dollar causes 2.32% increase in export volume. The estimated error correction coefficient indicates that 36%deviation of export data is corrected in the short run. Impulse response function of the study also affirms the positive relationship between the variables. Finally, Granger causality analysis suggests the existence of a unidirectional causality running from exchange rate to export.

Key Words: exchange rate, export, VECM, Bangladesh, USA

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INTRODUCTION

Since the collapse of the Bretton-Woods system, the volatility of real and nominal exchange rates has increased among countries that adopted a new regime of floating exchange rates. Moreover, the extent of exchange rate volatility among countries has been amplified by the free movement of capital between cross-border. So far, a number of literatures on the relationship between exchange rates and trade focused on the effect of increased volatility of exchange rates on trade primarily. Now, many researchers have shifted their attentions to investigate the nature and magnitude of the impact of exchange rate volatility on trade flows as well which brings two distinguished hypotheses. The first argues that the volatility of exchange rates would have an adverse effect on trade flows; the second argues that the volatility of exchange rates would encourage trade flows (Altintas, Cetin, and Oz, 2011).

Bangladesh economy has gone through several major policy changes since its independence in 1971. Starting with economic policies dominated by socialist ideologies, it first jumped into a market economy in the late 70s when policies were being reformulated in line with the IMF-World Bank suggestions. Concurrently, export sector was also given a breakthrough with policies such as reducing the ceiling on private borrowing and investments, and export-led industrialization. Exchange rate management policy also experienced progressive changes. Historically, Bangladesh had been maintaining various pegged exchange rate regimes, such as pegged to the British pound sterling (1972-1979), pegged to a basket of major trading partners' currencies with pound sterling as the intervening currency (1980-1982), pegged to a basket of major trading partners' currencies with US dollar as the intervening currency (1983-1999), and an adjustable pegged system (2000-2003). Bangladeshi currency 'Taka' entered into floating exchange rate from May 31, 2003. At present, exchange rate is determined by the demand and supply of the currency under the market-based floating system.

Again, the US is one of the largest trading partners of Bangladesh and has become a robust importance for the export destination of Bangladesh. As the major component of export of Bangladesh comprises Ready Made Garment (RMG) products and the US is the single largest destination country for Bangladeshi RMG export, so it is imperative to explore the impact of exchange rate volatility on the export performance of Bangladesh to the US market. Since independence, the volume of export to the US has increased and Bangladeshi Taka has also depreciated significantly. However, how much contribution this depreciation is associated to the export growth of Bangladesh is not yet clear. The

empirical studies show that the relation between exchange rates and export varies due to economy, time period, and extent being concerned, methodology applied. All these require a fresh insight into the exchange rate volatility-export relation between Bangladesh and the US. The paper has an important contribution in formulating trade policy. A major portion of the successful RMG exporters are from developing countries like Bangladesh, India, Combodia, Srilanka, and Vietnam. Therefore, the finding of the study provides an insightful thought regarding trade policy not only for Bangladesh but also for other developing countries which largely depend on RMG sector.

The rest of the paper proceeds as follows: Section 2 provides a brief survey of the literature review, Section 3 describes the data and methodology, Section 4 shows the empirical findings with analysis. The last section of the paper provides concluding remarks along with future research direction.

LITERATURE REVIEW

Export income is a function of export price and volume of goods, and the exchange rate of the local currency to the international currency. Adubi and Okunmadewa (1999) and Chukwu (2007) suggest that export drive is based on export price (itself fairly stable) and the fluctuations in the exchange rate. Fluctuations, positive or negative, influence export: increasing export when depreciation occurs and decreasing export when exchange rate appreciations occur.

Byrne, Darby, and MacDonald (2008) found that exchange rate volatility has a negative impact on trade. Gheong, Mehari, and Williams (2005) analyzed the relationship between exchange rate uncertainty, trade volumes, and price competitiveness. The authors used the sectoral data on UK exports and VAR models and concluded that unexpected fluctuation in exchange rates is usually accompanied by increasing export prices and decreasing trade volumes. Since export/import traders prefer to avoid the increased risk associated with additional exchange rate volatility, they try to avoid it by adjusting both prices and quantity. Nabli and Véganzonès-Varoudakis (2002) showed that exchange rate overvaluation caused huge loss in the export of Middle Eastern and North African (MENA) countries by decreasing their export competitiveness. The study by Mohamad and Jusoff (2008) examines the impact of exchange rates on the export performance of selected Southeast Asian economies, namely, Indonesia, Malaysia, Singapore, and Thailand by constructing panel data. They concluded that exchange rate variability have significant

impacts on export performance as findings suggest that an undervaluation of Real Exchange Rate can be used to promote export, while an overvaluation will tend to reduce export. Arize, Osang, and Slottje (2008) studied the impact of real exchange rate volatility on the quarterly export flows of eight Latin American countries over the period of 1973 to 1997. The results show an inverse significant relationship between the volatility of the real effective exchange rate and export demand in both short and long run. Similarly, the empirical evidence of the study of Cameron, Kihangire, and Potts (2005) suggests that Uganda's exports of tropical freshwater fish were negatively and significantly correlated with exchange rate volatility. Rutto and Ondiek (2014) investigated the impact of exchange rate volatility on tea exports from Kenya and reported that exchange rate volatility negatively affects performance of tea exports of the country. Bahmani-Oskooee and Hegerty (2008) used 17 Japanese industries from 1973 to 2006 to examine the impact of increased exchange rate volatility in the US-Japan bilateral trade. They found that in the short-run, some industries are influenced by exchange rate volatility but in the long-run, trade shares of most industries are relatively unaffected by exchange rate uncertainty. Bustaman and Jayanthakumaran (2007) investigated the long-run and short-run impacts of exchange rate volatility on Indonesia's exports of priority commodities to the US over the monthly period between 1997 and 2005. The results show both positive and negative coefficients among the range of commodities. They show that in the long-run, higher exchange rate of volatility leads to higher cost and to less foreign trade for majority of commodities.

One common argument is that exporters can easily insure against short-run exchange rate fluctuations through financial markets, while it is much more difficult and expensive to hedge against long-term risk. Some studies (*e.g.*, Cho, Sheldon, and McCorriston, 2002; De Grauwe and de Bellefroid, 1986; Obstfeld, 1995; Peree and Steinherr, 1989) demonstrated that longer-term changes in exchange rates have more significant impacts on trade volumes than do short-run exchange rate fluctuations that can be hedged at low cost.

On the other hand, Vianne and de Vires (1992) showed that even if hedging instruments are available, short-run exchange rate volatility still affects trade because it increases the risk premium in the forward exchange rate. Doroodian (1999), Krugman (1989), Mundell (2000), and Wei (1999) argue that hedging is both imperfect and costly as a basis to avoid exchange rate risk, particularly in developing countries and for smaller firms more likely to face liquidity constraints. This leads to the conventional argument that

exchange rate volatility causes revenue uncertainty that will dampen trade due to risk aversion, irreversible investment in productive capital, or both.

The empirical literature on this topic is mixed. Several authors have found that exchange rate uncertainty may induce marginal producers and traders to shift from trade to non-traded goods, thereby dampening trade volumes (Arize, Osang, and Slottje, 2000; 2004; Broda and Romalis, 2011; Chowdhury; 1993; Pozo, 1992). Chit, Rizov, and Willenbockel (2010) examined the real exports of five emerging East Asian economies among themselves, as well as to 13 industrialized countries and concluded that exchange rate volatility in East Asian economies has a significant negative impact on export flows to the world market. Some other studies have found that, on the contrary, exchange rate volatility may stimulate trade (Dellas and Zillberfarb, 1993; Frankel, 1992; Sercu and Vanhulle, 1992). Finally, many empirical studies have failed to establish any significant link between measured exchange rate variability and the volume of international trade (Aristotelous, 2001; Assery and Peel, 1991; Gagnon, 1993; Tenreyro, 2004). Boug and Fagereng (2010) found no significant evidence that export performance of Norwegian firms has been affected by exchange rate uncertainty. The study of Ozturk and Kalyoncu (2009) shows a mixed result which reported that exchange rate uncertainty exerted a significant negative impact on trade for the Republic of Korea, Pakistan, Poland, and South Africa, but a positive effect for Turkey and Hungary. Using the GARCH model, the study of Zakaria (2013) attempts to reveal the impact of exchange rate volatility on Malaysia's total real export to the major trading partner countries namely the US, the UK, Japan, and Singapore. The results show that Malaysian exports to the US is significantly and negatively related with exchange rates volatility and to Japan, it is significantly but positively related with exchange rates volatility. On the other hand, Malaysia's exports to the UK and Singapore were found not significantly related to the volatility in the exchange rates. The findings from the study indicate an ambiguous relationship between export performance and exchange rates volatility.

One possible reason for such mixed results is the aggregation problem. The effects of exchange rate volatility on export volumes may vary across sectors (Bini-Smaghi, 1991; Klein, 1990; Maskus, 1986; McKenzie, 1999). This might occur because the level of competition, the nature of contracting – and thus the price-setting mechanism – the currency of contracting, the use of hedging instruments, the economic scale of

production units, openness to international trade, and the degree of homogeneity, and storability of goods vary among sectors.

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.

DATA AND METHODOLOGY

This study investigates the impact of exchange rate volatility on the export performance of Bangladesh in the US market. The data set comprises of monthly time series data over the total 264 sample periods from January of 1991 to December of 2012. The data on export from Bangladesh to the US have been collected from the United States Census Bureau, US Deptartment of Commerce and the source of the exchange rate data is Global Economic Monitor released by the World Bank.

Export. Export data comprises goods and services sold to the US market from Bangladesh over the total sample periods. Export of goods and services is measured in terms of million US dollars.

Real Exchange Rate. Exchange rate is the value of the domestic currency in terms of foreign currency. Real exchange index is the trade-weighted nominal exchange rate deflated by the ratio of foreign price to the domestic price. We construct real exchange rate as $RER = e_{tw}\,(PPI_f\,/GDPdeflator)$, where e_{tw} is the trade-weighted nominal effective exchange rate, PPI_f is the producer price indices of major trading partner (the US) of Bangladesh and GDP deflator is used for the domestic price of non-tradable goods. In this study, nominal effective exchange rate is defined as the cost of one trade-weighted average of Bangladesh's major trading partner US' currency in terms of Bangladeshi currency. The summary descriptive statistics of the study variables are shown in Table A1.

The structural model to estimate the relationship between log transformed variables is stated below:

$$LEXPORT_t = \beta_0 + \beta_1 LEXR + \varepsilon_t$$

Where,

LEXPORT is the natural logarithm of export

LEXR is the natural logarithm of exchange rate

β_0 and β_i are the parameters known as the intercept and slope coefficient and ε is the classical random disturbance term.

To check for non-stationarity property, the data are subjected to Augmented Dickey and Fuller test (ADF test). The following regression is for ADF test purpose:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \Sigma \Delta Y_{t-i} + \varepsilon_t$$

Where ε_t is a white noise error term and $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$ is the number of lagged difference which is empirically determined. Using Schwarz Information Criterion (SIC) the lag length is selected automatically by E-views software.

In analyzing the causal relationship, we will start with basic Ordinary Least Square (OLS) regression model and the robustness of the OLS model will be verified by Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) test. In the later stage, in order to derive statistically robust estimates we will go for more sophisticated analysis by applying Vector Error Correction Model (VECM).

The precondition for Vector Error Correction Model is the existence of cointegrating relationships between the variables. For the purpose of testing the cointegration, we have chosen the Johansen procedure and lag order is selected on the basis of Schwarz Bayesian Criteria (SBC). The study employs both trace (λ_{trace}) statistics and the maximum eigenvalue (λ_{max}) statistics. For the both tests if the test statistic value is greater than the critical value, the null hypothesis of no cointegrating vectors will be rejected.

If there is at least one cointegrating relationship among the variables, one can proceed to carry out Vector Error Correction Model (VECM) which provides information about the speed of adjustment to long run equilibrium avoiding the spurious regression problem (Engle and Granger, 1987).The Error Correction Model (ECM) is based on following regression: $\Delta Y_t = \alpha + \beta \Delta X_t + \beta U_{t-1} + \varepsilon_t$.

Where U is the one period lagged value of the residual and the error correction component of the model which measures the speed at which the prior deviations from equilibrium are corrected and Δ represents first-differences operator.

Diagnostic checks have been carried out to the models used for VECM by employing Wald test for lag exclusion, Lagrange Multiplier (LM) test for serial correlation and White test with cross products for heteroskedasticity. In case of Wald test and LM test, same lag order is adopted as that of corresponding lag order in VECM (Harris, 1995). In all the cases, if the P-value exceeds the significance threshold of 5%, we can accept the null hypothesis that the model is well specified.

After VECM model is estimated, then we employ Variance Decompositions to investigate the behavior of an error shock to each variable on its own future dynamics as well as on the future dynamics of the other variables in the VECM system. Impulse response analysis is also carried out by giving a shock of one standard deviation (± 2 S.E. innovations) to the study variables.

The last step of our analysis is to test for causality between export and exchange rate in the long run based on Granger causality test. The test involves estimating the following regressions to examine Granger causality:

$$Y_t = \sum_{i=1}^{n} \alpha_i X_{t-i} + \sum_{j=1}^{n} \beta_j Y_{t-j} + \varepsilon_{1t} \quad (1)$$

$$X_t = \sum_{i=1}^{m} \lambda_i X_{t-i} + \sum_{j=1}^{m} \delta_j Y_{t-j} + \varepsilon_{2t} \quad (2)$$

It is assumed that the disturbance ε_{1t} and ε_{2t} are uncorrelated. First regression assumes that current value of Y is related with the past values of X; and second regression proposes that current value of X is related with the past values of Y.

ANALYSIS AND EMPIRICAL FINDINGS

The unit root test

Table1 shows the results of ADF test statistics used to check the non-stationarity property of the data and to determine how many times the variable needs to be differenced to result in a stationary series. The ADF test statistics reported in Table 1 indicate that the variables are integrated of order I (1).

Table 1. Results of ADF test

Variables	ADF Test Statistic	
	Level	First difference
LEXPORT	-2.198347	-6.216783 ***
LEXR	-1.934345	-14.97400 ***
	Test Critical value	
1% level	-3.993335	-3.456302
5% level	-3.427004	-2.872857
10% level	-3.136780	-2.572875

Note: *** indicates statistically significant at the 1% level.

The results in Table 1 show that the ADF test statistics is greater than the critical values and fail to reject the null of non-stationary for all of the variables at level. After the first differencing, the result shows that LEXPORT and LEXR became stationary at the 1% significance level, implying that all the variables are first order integrated I(1). Figure A1 shows stationarity trend after first differencing the variables.

Testing cointegration

As the variables are considered to be I (1), the cointegration method is appropriate to estimate the long run relationship between the variables. Two types of log-likelihood ratio tests (*i.e.*, the Trace statistics and the Maximal Eigenvalue) both have been used to determine the number of cointegrating vectors (Johansen, 1995). Table 2 reports the result of both test statistics.

Table 2. Unrestricted cointegration rank test

(Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	P-value**
None *	0.138327	39.24912	15.49471	0.0000
At most 1	0.001499	0.391562	3.841466	0.5315

(Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	P-value **
None *	0.138327	38.85756	14.26460	0.0000
At most 1	0.001499	0.391562	3.841466	0.5315

Note: (1)Trace test and Max-eigenvalue test both indicate 1 cointegrating eqn(s) at the 0.05 level; (2) * denotes rejection of the hypothesis at the 0.05 level; (3) **MacKinnon-Haug-Michelis (1999) p-values.

The Trace statistics and Maximal Eigen statistics both identified one cointegrating vector as the test statistic value is greater than the critical value at 5% significance level. The presence of cointegration is the evidence of the existence of a stable and long run relationship between export and exchange rate. The normalized cointegrating coefficients are reported in Table 3.

Table 3. Cointegrating equation

Cointegrating Equation	CointEq1
LEXPORT(-1)	1.000000
LEXR(-1)	2.320667***
	(0.14284)
	[16.2469]
C	4.124142

Note: (1) Standard errors in ( ) and t-statistics in [ ]; (2) *** indicates statistically significant at the 1% level.

The normalized equation shows that in the long run, exchange rate has a positive impact on export of Bangladesh. The relationship is found statistically significant at the 1% level. The result implies that in the long run, a 1% increase in exchange rate *i.e.*, depreciation of local currency Taka against US dollar contributes to 2.32 % increase in export volume from Bangladesh to the US.

Vector error correction model

Vector Error Correction Mechanism (VECM) has been employed to determine the level of short run adjustments towards long run equilibrium relationship between the variables. The results of VECM are shown in Table 4.

Table 4. Error correction model

Error Correction:	Δ LEXPORT	Δ LEXR
ECM_{t-1}	-0.364294 **	0.000682
	[-6.34839]	[0.25251]
Δ LEXPORT(-1)	0.114053	-0.003880
	[1.77816]	[-1.28489]
Δ LEXR(-1)	-0.419298	0.082106
	[-0.31397]	[1.30598]
C	0.006378	0.003023 *
	[0.46177]	[4.64895]

R-squared	0.187905	Log likelihood	48.85873
Adj. R-squared	0.171982	Akaike AIC	-0.328419
Sum sq. resids	10.50916	Schwarz SC	-3.054624
S.E. equation	0.203008	Mean dependent	-0.246476
F-statistic	11.80053	S.D. dependent	0.223097

Note: (1) Figures in parenthesis represent the t-statistics; (2)** and * indicate statistically significant at the 5 % and 10% level respectively.

The coefficient of the error correction term is negative and statistically significant at 5% level. The estimated error correction coefficient indicates that about 36%deviation of the export volume from its long run equilibrium level is corrected each period in the short run.

To check the validity of our models, we have carried out diagnostic checks analysis employing Wald test for lag exclusion, LM test for serial correlation, White test with cross products for heteroskedasticity and is reported in Table 5.

Table 5. Diagnostic checks analysis

VEC Lag Exclusion Wald Tests		
(Chi-squared test statistics for lag exclusion) for Dlag 2. (Joint test)		**P-Value**
20.33450		**0.71**
VEC Residual Serial Correlation LM Tests		
Lags	**LM-Stat**	**P-Value**
1lag	**8.960489**	**0.061**
2lag	**9.688726**	**0.052**
VEC Residual Heteroskedasticity Tests (with inclusion of cross products)		
Joint test of Chi-square		**P-Value**
66.96915		**0.25**

As, P-value is greater than the 5% significance level, so our VEC Lag Exclusion Wald Test supports the appropriateness of lag structure and we accept the null hypothesis that

the additional lag is jointly insignificant across equations. Based on the LM test, we cannot reject the null hypothesis of no serial correlation at the 5% level of significance which indicates that there is no serial correlation between residuals. In case of Heteroskedasticity Test, P-value exceeds the significance threshold of 5% which states that all errors are homoscedastic.

The results from diagnostics checking indicate that the considered model is well specified and also confirms the robustness of the outcome.

Variance decompositions and impulse response function

We employ Variance Decomposition to measure the percentage of forecast error of variation that is explained by another variable within the short-run dynamics and interactions. The results of Variance Decompositions are presented in Table 6. The results of Table 6 shows that the dynamic contrast in export explains 100% of the components of variation in the first period when the shock by a standard deviation of one in the variable itself, and in the 12thperiod, it goes to 94.55 % of the error prediction of the variability.

Table 6.Results of variance decompositions

Period	S.E.	LEXPORT	LEXR
1	0.203008	100.0000	0.000000
2	0.253972	99.97448	0.025524
3	0.266308	99.69933	0.300669
4	0.270759	99.24189	0.758106
5	0.273204	98.73151	1.268493
6	0.274785	98.18316	1.816843
7	0.275978	97.60022	2.399780
8	0.277016	96.99676	3.003241
9	0.277991	96.38476	3.615244
10	0.278939	95.77086	4.229145
11	0.279873	95.15872	4.841277
12	0.280801	94.55063	5.449368

During the second period about 0.03 % variation in export is due to variation in exchange rate and it fluctuates over the periods that goes up to about 5.45 % in the 12thperiod. Figure A2 shows the impulse responses. It shows the impact of a one standard deviation generalized innovation in the exchange rate on the export. The effect of a shock to the exchange rate on the export was positive throughout 12 month horizon.

Granger causality test

As there is a lagged relationship between the variables, so Granger Causality test is applied to determine the direction of such relation. The results are presented in Table 7.

Table 7. Granger causality test

Null Hypothesis	F-Statistic	P-Value	Granger Causality
LEXR does not Granger Cause LEXPORT	23.3016	0.000***	Yes
LEXPORT does not Granger Cause LEXR	1.18673	0.307	No

Note: *** indicates statistically significant at the 1% level

Granger-causality results suggest that the null hypotheses that LEXR does not Granger cause LEXPORT is rejected at 1% significance level which states that there is a uni-directional causality running from exchange rate to export.

CONCLUSIONS

This study attempts to investigate the predictive power of exchange rate volatility on the export of Bangladesh to the US market. The results of unit root test show that all the data series of the variables are integrated of order one. Our Johansen procedure of cointegration test suggests that there is at least one cointegrating relationship between the variables. The result of the analysis shows that in the long run, exchange rate has a positive and significant impact on export where about 36% deviation of the export from its long run equilibrium level is corrected each period in the short run. Evidence from Granger causality analysis suggests that there exists a uni-directional causality from exchange rate to export.

However, most of the countries favoring depreciation of the exchange rate are in support of export promotion. Nonetheless, the impact and consequence of exchange rate depreciation might not be same for all industries of export. In fact, exchange rates affect not only the export price but also the cost of imported goods. On one side, real appreciation of local currency may inhibit export promotion by making relative prices of goods expensive and in other side, real depreciation makes import costly by raising the relative cost of imported goods. Also, in the long run, this depreciation may make the export less attractive as this increases production cost and hence price due to higher imported raw material cost. We have to consider that exporting firms are not the same as they are different in terms of degree of trade exposure and also with ability to cope with

the associated risks. For example, larger firm with diversified business may offset the risk of exchange rate fluctuation by benefiting diversification of operations or by availing hedging option of forward, future or options contracts. However in reality, like other developing countries, there are only a few firms in Bangladesh which are in diversified international operations and there is also lack of hedging facilities in Bangladeshi financial market. Even though the export of Bangladesh is benefiting from depreciation, the result is not conclusive. Since the total balance of trade in Bangladesh with the rest of the world is negative, this means the country is importing more than exporting. As higher depreciation of currency causes higher cost of import and most of the people in Bangladesh are living below the poverty line, it is a debatable issue of how long the country can sustain higher depreciation of the currency that results in higher cost of import. The respective authority of the country should consider not only an effective and pragmatic policy to support export but also diversifying the pattern of the export items by expansion of production line in international operations and by introducing hedging facilities in financial market of the country. Before taking any appropriate policy supporting the development of the trade, the authority should have a full understanding on the impact of exchange rate movements on firm trade behavior as well as on aggregate economic conditions of the country.

Future research can be undertaken to investigate the trade-offs between export benefit and higher import cost due to depreciation of currency. In addition, the study can proceed further by using longer time periods and the results can be compared to other export-oriented, developing countries.

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APPENDIX

Table A1. Summary statistics of the study variables

	EXPORT	Exchange Rate
Mean	202.9633	55.78274
Median	186.6500	57.45000
Maximum	504.7000	83.42318
Minimum	31.10000	35.79000
Std. Dev.	111.6315	13.27539
Skewness	0.544030	0.148498
Kurtosis	2.471419	1.790561
Jarque-Bera	16.09598	17.06044
Probability	0.000320	0.000197
Observations	264	264

Figure A1. Trend with stationary

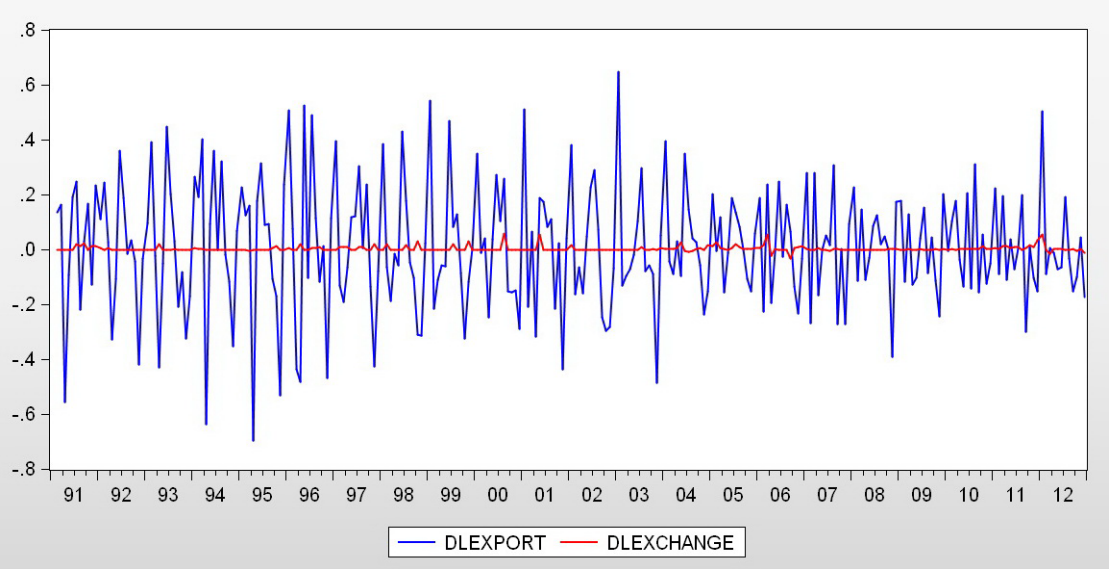

Figure A2. Impulse response function