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Abstract

This paper attempts to explore among financial development, exports, imports, FDI, remittances and exchange rate in Bangladesh over a period of 1990 to 2020 using time series analysis. The Johansen-Juselius procedure is applied to test the co-integration relation between variables followed by the Granger Causality test and Impulse response function. To check the robustness of the study DOLS model is also applied. The empirical results documented a strong long-run co-integration relationship between exchange rate and the explanatory variables. The Granger Causality test reveals bidirectional causality exchange rate to financial development, exchange rate to FDI and financial development to FDI. Whereas unidirectional causality found among the variables of exchange rate to imports, exchange rate to remittances, financial development to exports, exports to FDI, exports to imports, remittances to exports, financial development to imports, remittances to financial development, remittances to FDI and remittances to imports in the short run. The impulse response function shows shock on exchange rate has significant negative impact on exports, imports, and remittances inflows of the country. We conclude that Bangladesh should formulate export and remittances-led polices and ensure higher degree of financial development to enhance her economic growth rates at large.

Keywords: Financial development, Exchange rate, exports, Remittances, Co-integration.

1. Introduction

Bangladesh is named as the next generation Asian tiger with its tremendous economic growth record in the last few years. Some policy makers along with business leaders often exert more focus on export competitiveness with the currency exchange rates. The policy makers focus on exchange rate make better sense to hold the sustainable growth rate boosting export of this country. In the year of 2018 and 2019 export growth rate was 8.08 and 10.93 percent respectively (Source: WDI 2020). However, the role of the real exchange rate and its volatility impact on financial development and trade openness has not been thoroughly explored yet in the academic literature. The real exchange rate has positive effect on economic growth, but impact may be vivid in terms of financial development (Alom, 2014).

Inward remittances played a significant role in the economic development of Bangladesh since inception of this country in 1971. The workers' remittances of Bangladesh started to grow at a faster rate since mid-1990s. As, both Middle East and central Asian labor markets were unconditionally recruiting Bangladeshi labor forces. The higher amounts of inward remittances boost up economy of this country to mitigate the unemployment problems and alleviate poverty. Moreover, the remittances inflows also increased financial activities of marginal people through engaging them in the financial system which ultimately escalate financial development legacy of this country. Remittance's income increased over the years and thus contributed to balance of payments as well as foreign currency reserve of Bangladesh bank.

The volatility of real exchange rate has effect on trade openness, and if so, does their effectiveness decline with global value chains (GVCs) participation? Because real exchange rate volatility and its impact on trade openness significantly matters for an emerging economy like Bangladesh. The World Bank Group recently unveiled new firm level evidence on the link between real exchange rates and export performance in a recent paper focusing on Poland that suggests the answer to both questions may be "yes…but with nuances."

The effect of real exchange rates on export participation depends on how much a firm participates in GVCs. More specifically, the effect is conditional on how much a firm relies on imported intermediates. The more foreign value added is embedded in their exports; the less 'vulnerable' (better hedged) firms are to real exchange rate fluctuations.

When firms' share of imported intermediates is greater than 30 percent, the effect of real exchange rates on export participation fades. And the value addition in Bangladesh's RMG is quite low since it must import from raw materials to machineries which cost the lion share of the cost. One very important thing must keep in mind that other exporters of RMG competing with Bangladesh, how they would react with their own currencies. If Bangladesh starts a 'Beggar thy neighbor's" approach which means it is trying to increase her RMG export at the cost of other competitors, then they may retaliate which could start a currency war and then no one may attain the benefit out of it which we had observed during the Asian currency crisis in 1997-98.

The objective of this study is to investigate the relationship among the variables of financial development, exports, imports, FDI and remittances on exchange rate in the context of Bangladesh. Furthermore, exchange rate influence on financial development, exports, imports, FDI and remittances of Bangladesh both short run and long run aspect is the rudimentary motive of this paper. In doing so, we will be able to guide policy makers to identify optimum level of exchange rate to manage trade openness and financial development of Bangladesh so that country can attain the vision of '2041'.

2. Literature review:

The existing literature documented dilemmatic evidence of real exchange rate has the capacity to influence economic growth. For instance, some studies found positive relationship between real exchange rate and economic growth (e.g., Razmi et al. 2012; Rodrik 2008; Tarawalie 2010). On the other hand, counter argument also documented by researchers that is a negative linkage (e.g., Bleaney and Greenaway 2001; Conrad and Jagessar 2018; Elbadawi et al. 2012) or insignificant relationship (e.g., Tang 2015). Moreover, real exchange rate volatility has a negative shock on productivity growth postulated by Aghion et al. (2009), while Vieira et al. (2013) revealed that high real exchange rate volatility has a negative impact on economic growth. However, Comunale (2017) noted that exchange rate volatility does not have any robust effect on GDP growth. The economic growth ultimately converges in the financial development of a country (Alom, 2018).

Mustafa and Nishat (2004) explore the relationship of volatility of exchange rate and export growth of Pakistan using quarterly data from 1991:3 to 2004:2. Competitively valued exchange rates are crucial to promote exports, say Freund and Pierola (2012). Export surges are associated with large real

depreciations. The effect is larger in developing countries – where market failures preventing reallocation into tradable are more pervasive, and it operates mostly through the extensive margin: more entry into new markets or products. According to the traditional Mundell-Fleming model, depreciation of the real exchange rate is expansionary via its effects on trade balance assuming that the Marshall-Lerner conditions are satisfied. Dornbusch (1980) is one of the main advocators of this view. On the other side, real devaluations can have contractionary effects on real economy especially in developing countries. Diaz- Alejandro (1963), Krugman and Taylor (1978), Edwards (1986) and Winjbergen (1986) are among the first that give theoretical support to contractionary devaluation mechanism.

The literatures on exchange rate, remittances and financial development are still narrow and outcomes are mixed. A group of researchers postulated argument that remittances can contribute to financial sector development if remittances come through financial sector and deposited to local banks (Aggarwal, Demirgüç-Kunt, and Martinez Peria 2006; Fajnzylber and Lopez 2008). However, researchers still fail to establish that the development impact of remittances is higher in more financially developed countries. While Mundaca (2005) shows that remittances' impact on economic growth that has effect on financial development which is apparent, Giuliano and Ruiz-Arranz (2006) find evidence in favor that remittances boost growth in countries with less developed financial systems noting that remittances may provide an alternative way to finance investment and help overcome liquidity constraints. On the other hand, Alberola and Salvado (2006) and Freund and Spatafora (2008) argue that financial development and market competition stemming from additional bank entry can stimulate higher remittance flows to the country by reducing transaction costs.

The literatures on exchange rate and growth and exchange rate and financial development in the context of Bangladesh have mixed outcomes. Alom k. (2014) found both short run and long run aspect of relationship between exchange rate and economic growth in Bangladesh. Hossain T. et al. (2014) also reported that inflation, economic growth, and current account balance have positive and significant impact on exchange rate. Razzaque et al. (2017) suggest that in the long run, a 10 per cent depreciation of the real exchange rate is associated with, on average, a 3.2 per cent rise in aggregate output. However, literatures are very poor in the frame of exchange rate and financial development aspects considering the effect of remittances, export imports and FDI. This study found a gap in this framework hence, researchers focused to conduct the study in the context of Bangladesh.

3. Methodology:

3.1. The model and data

To conduct a study of empirical analysis and investigate the relationship between exchange rate, export, Import, FDI, personal remittances and financial development which required the following variables for the study on Bangladesh.

Y: Exchange Rate
X1: Financial Development
X2: Export
X3: Import
X4: Foreign Direct Investment (FDI)
X5: Remittances

The researcher collects data from World Bank Development Indicators (WDI). The data are annual and cover the period 19902020 for Bangladesh. To empirically investigate the following model all variables, transform in natural logarithms. We estimate Johansen co-integration and Granger Casualty test to examine the long and short run relationship between exchange rate and other explanatory variables. To test data stationarity, we conduct widely used unit root tests; Augmented Dicky Fuller test (ADF), DF-GLS and Phillips- Peron (PP) test. These tests are followed by Johansen (1988) and Johansen and Juselieus (1990) likelihood ratio tests for Co-integration. Once the respective variables are found to be Co-integrated. Then, we check the co-integrating properties of our concerned variables before testing for Granger causality. A vector auto regressive model (VAR) offers a useful method of analyzing the impact of a given variable on itself and all other variables by using variance decompositions (VDCs) and impulse response functions (IRFs). To check the robustness of this study we employed DOLS model in this study.

3.2. Co-integration Test

One of the research objectives is to investigate the long run dynamics relationship among the variables of ER, FD, Exports, Imports, FDI and Remittances. The system can be represented as follows:

$$ER_{it} = \alpha_i + b_i FD_{it} + c_i Export_{it} + d_i Import_{it} + e_i FDI_{it} +$$
$$f_i Remittances_{it} + \varepsilon_{it}; \qquad (2)$$

i = 1, 2, 3 …N; t = 1,2,3,………T

In implementing the tests for co-integration, we use the likelihood ratio test due to Johansen (1988) and Johansen and Juselius (1990). The method involves estimating the following unrestricted vector autoregressive (VAR) model:

$$Y_t = A_o + \sum_{j=1}^{p} A_j Y_{t-j} + \varepsilon_t \qquad (3)$$

Where t Y is an n × 1 vector of non-stationary I (1) variables, in our case $Y_{t\,=}$ ER, FD, Export, Import, FDI and Remittances), n is the number of variables in the system, five in this case. A_0 is a 5 × 1 vector of constants, p is the number of lags, j A is a 5 × 5 matrix of estimable parameters, and ε_t is a 5 × 1 vector of independent and identically distributed innovations.

3.3. *Granger causality and DOLS tests*

Apart from the examination of the long-run co-movements of the five variables of interest, the researcher will explore the short-run dynamics by performing Granger causality tests for cointegrating systems. Such an exercise will provide an understanding of the interactions amongst the variables in the system and will shed light on the directions of the causality.

The concept of causality was initially defined by Granger (1969). Broadly speaking, in a multivariate framework, a time series x_{1t} Granger-causes another time series x_{2t} if series x_{2t} can be predicted with better accuracy by using past values of x_{1t} rather than by not doing so, other information is being identical. Testing causal relations between five variables Consider a *p*-dimensional multivariate stochastic process, $\mathbf{X}(t) = [X1(t), X2(t), \cdot\cdot\cdot, Xp(t)]^T$, where p is the number of recording channels. Parametrically, the spectral density matrix of the process can be computed by estimating its multivariate autoregressive (MVAR) representation.

Stock and Watson (1993) suggest a parametric approach for estimating long-run equilibria in systems which may involve variables integrated of different

orders but still cointegrated.The potential of simultaneity bias and small-sample bias among the regressors is dealt with by the inclusion of lagged and led values of the change in the regressors.

4. Results and Discussions

Table 1. Descriptive statistics for Bangladesh: 1990-2020

	LER	LEXP	LFD	LFDI	LIMP	LREM
Mean	4.079594	23.09536	3.354076	19.26561	23.47344	22.19201
Median	4.163987	23.02533	3.379082	19.93915	23.35454	22.18525
Maximum	4.439655	24.55976	3.862482	21.76395	24.89546	23.80287
Minimum	3.542952	21.34756	2.677285	14.14513	22.05437	20.46108
Std. Dev.	0.290042	0.995915	0.399192	2.404267	0.932247	1.122117
Skewness	-0.409619	-0.092700	-0.223510	-0.848130	0.084397	-0.114698
Kurtosis	1.742745	1.758869	1.628884	2.410268	1.655009	1.472466
Jarque-Bera	2.908630	2.034090	2.686388	4.165731	2.373429	3.081895
Probability	0.233560	0.361662	0.261011	0.124573	0.305222	0.214178
Sum	126.4674	715.9561	103.9764	597.2340	727.6765	687.9523
Sum Sq. Dev.	2.523726	29.75539	4.780637	173.4149	26.07253	37.77439
Observations	31	31	31	31	31	31

The variables under study are found to be normally distributed (table 1). The mean-to-median ratio of each variable is single digits. The standard deviation is also low compared to the mean, showing a small coefficient of variation. The range of variation between maximum and minimum is also reasonable. The numeric of skewness of each variable is low and is mildly negatively and positively skewed. The Jarque-Bera test statistics also accept the null hypothesis of normal distribution of each variable. Thus, the normality of the distribution is ensured in the study.

Table 2. Unit Root Tests for Bangladesh: 1990-2020

ADF (Augmented Dickey-Fuller)		PP (Philips-Perron)	
Trend &intercept	No trend	Trend &intercept	No trend
FD test statistic (Prob)	test statistic (Prob)	**FD** test statistic (Prob)	test statistic (Prob)
Level: -0.88(0.92)	1.51(0.96)	Level: -1.24(0.77)	6.44(0.00)
1st Diff: - 4.36(0.00)*,**	- 6.19(0.60)	1st Diff: -5.46(0.00)*,**,***	6.63(0.00)
Exchange Rate		**Exchange Rate**	
Level: -4.11(0.01)**, ***	3.44(0.99)	Level: -2.30(0.41)	5.95(1.00)
1st Diff: -3.67(0.04)**	-5.27(0.00)	1st Diff: -2.78(0.04)**	-3.79(0.00)*,**
Fdi Inflow		**Fdi Inflow**	
Level: -2.77(0.18)	-0.96(0.37)	Level: -2.97(0.15)	-0.76(0.37)
1st Diff: -4.64(0.00)*,**	-5.71(0.00)*,**	1st Diff: -4.06(0.01)**	-4.96(0.00)*,**
Remittances		**Remittances**	
Level -4.91(0.01)**,***	-5.58(0.00)**,***	Level: -4.86(0.03)**,***	-5.55(0.00)**,***
1st Diff: -6.17(0.00)*,**,***	-6.86(0.00)*,**,***		

Exports	1st Diff: - 11.22(0.00)*,**,*** - 12.95(0.00)*,**,***
Level: - 2.88(0.18) 2.70(0.99)	**Exports**
1st Diff: -5.23(0.00)*,**,*** - 4.88(0.00)*,**,***	Level: -2.88(0.18) 3.29(0.99)
	1st Diff: -5.22(0.00)*,**,*** -6.08(0.00)*,**

Notes

* Indicates statistical significance at the 1% level

** Indicates statistical significance at the 5% level

*** Indicates statistical significance at the 10% level

Table 2 shows that the null of unit root accepted and rejected for the five variables at level. However, the null of unit root is rejected for first differenced variables, indicating that all variables are first differenced stationary or integrated of order one, I (1).

Table 3. Results of Johansen Maximum Likelihood Estimation: 1990-2020

Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.819484	161.4144	95.75366	0.0000
At most 1 *	0.810183	111.7682	69.81889	0.0000
At most 2 *	0.590644	63.57913	47.85613	0.0009
At most 3 *	0.462824	37.67717	29.79707	0.0050
At most 4 *	0.411563	19.65569	15.49471	0.0111
At most 5 *	0.137134	4.277393	3.841466	0.0386
Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.819484	49.64614	40.07757	0.0032
At most 1 *	0.810183	48.18912	33.87687	0.0005
At most 2	0.590644	25.90196	27.58434	0.0808
At most 3	0.462824	18.02148	21.13162	0.1290
At most 4 *	0.411563	15.37830	14.26460	0.0332

At most 5 *	0.137134	4.277393	3.841466	0.0386
* Indicates statistical significance at the 5% level				

Table 3 presents the result of Johansen co-integration test both at the trace and maximum eigenvalue levels. Accordingly, the trace statistics show that all the variables have cointegrating relationship in this study. The results of trace statistics are quite interesting from policy making sense as all independent variables have long run effect on exchange rate fluctuations of Bangladesh. The results of maximum eigenvalue statistics detect four cointegrating relationship at the 5% level. In other words, these tests indicate the presence of a long-run relationship among the variables in this study.

Table 4. Granger Causality Test: 1990-2020

Null Hypothesis:	Obs	F-Statistic	Prob.
LEXP does not Granger Cause LER	30	0.10261	0.7512
LER does not Granger Cause LEXP		1.49079	0.2326
LFD does not Granger Cause LER	30	2.57309	0.1203
LER does not Granger Cause LFD		6.76245	0.0149
LFDI does not Granger Cause LER	30	4.39552	0.0455
LER does not Granger Cause LFDI		5.17980	0.0310
LIMP does not Granger Cause LER	30	0.01532	0.9024
LER does not Granger Cause LIMP		3.32136	0.0795
LREM does not Granger Cause LER	30	0.10070	0.7534
LER does not Granger Cause LREM		11.6124	0.0021
LFD does not Granger Cause LEXP	30	4.54707	0.0422
LEXP does not Granger Cause LFD		1.77874	0.1934
LFDI does not Granger Cause LEXP	30	1.86924	0.1828
LEXP does not Granger Cause LFDI		3.63956	0.0671
LIMP does not Granger Cause LEXP	30	0.02110	0.8856
LEXP does not Granger Cause LIMP		4.91299	0.0353
LREM does not Granger Cause LEXP	30	6.93826	0.0138
LEXP does not Granger Cause LREM		0.03339	0.8564

LFDI does not Granger Cause LFD	30	12.1363	0.0017	
LFD does not Granger Cause LFDI		5.03702	0.0332	
LIMP does not Granger Cause LFD	30	0.03067	0.8623	
LFD does not Granger Cause LIMP		6.65144	0.0157	
LREM does not Granger Cause LFD	30	10.0363	0.0038	
LFD does not Granger Cause LREM		0.68801	0.4141	
LIMP does not Granger Cause LFDI	30	2.44158	0.1298	
LFDI does not Granger Cause LIMP		1.54421	0.2247	
LREM does not Granger Cause LFDI	30	3.54701	0.0705	
LFDI does not Granger Cause LREM		0.23469	0.6320	
LREM does not Granger Cause LIMP	30	7.43622	0.0111	
LIMP does not Granger Cause LREM		0.21058	0.6500	

Table 4 demonstrates that the casual relationships among the variables in the short run. The results documented bidirectional causality exchange rate to financial development, exchange rate to FDI and financial development to FDI. Whereas unidirectional causality found among the variables of exchange rate to imports, exchange rate to remittances, financial development to exports, exports to FDI, exports to imports, remittances to exports, financial development to imports, remittances to financial development, remittances to FDI and remittances to imports. The findings indicate the variables selected in the study have both bidirectional and unidirectional causal relationship in the short run. That means explanatory variables have immediate effect due to exchange rate fluctuation well documented in this study in the context of Bangladesh.

Table 5. Dynamic Least Squares (DOLS): 1990-2020

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEXP	0.238113	0.082813	2.875311	0.0238
LFD	1.192453	0.164945	7.229378	0.0002
LFDI	0.001513	0.005787	0.261372	0.8013
LIMP	-0.411806	0.104005	-3.959478	0.0055
LREM	-0.074919	0.132969	-4.563431	0.0007
C	5.913224	0.341810	17.29976	0.0000

R-squared	0.999100	Mean dependent var	4.103697
Adjusted R-squared	0.996527	S.D. dependent var	0.263372
S.E. of regression	0.015521	Sum squared resid	0.001686
Durbin-Watson stat	2.415276		

To check robustness of findings, we have employed dynamic least square (DOLS) in this study. To address the endogeneity issue and simultaneity bias in the sample DOLS offer best outcomes in the parametric framework. Findings of DOLS demonstrate that financial development and exports have strong positive long run effect on exchange rate. However, results also confirmed that imports and remittances have negative significant effect on exchange are in the long run proved in the table 5.

Figure 1 explains accumulated response one standard deviation innovation shock of exchange rate with all explanatory variables in this study. Where, we can see that shock on exchange rate itself leads to decreasing trend in future exchange rate of Bangladesh. If shock applies on exchange rate, then it has significant negative impact on exports, imports and remittances inflows of the country. Thus, findings are quite plausible and consistent with earlier results represented in the study. The accumulated response of exchange to financial development and exchange rate to FDI are positive and significant. That indicates when shock applies on exchange rate that translates positively on the variables of financial development and FDI.
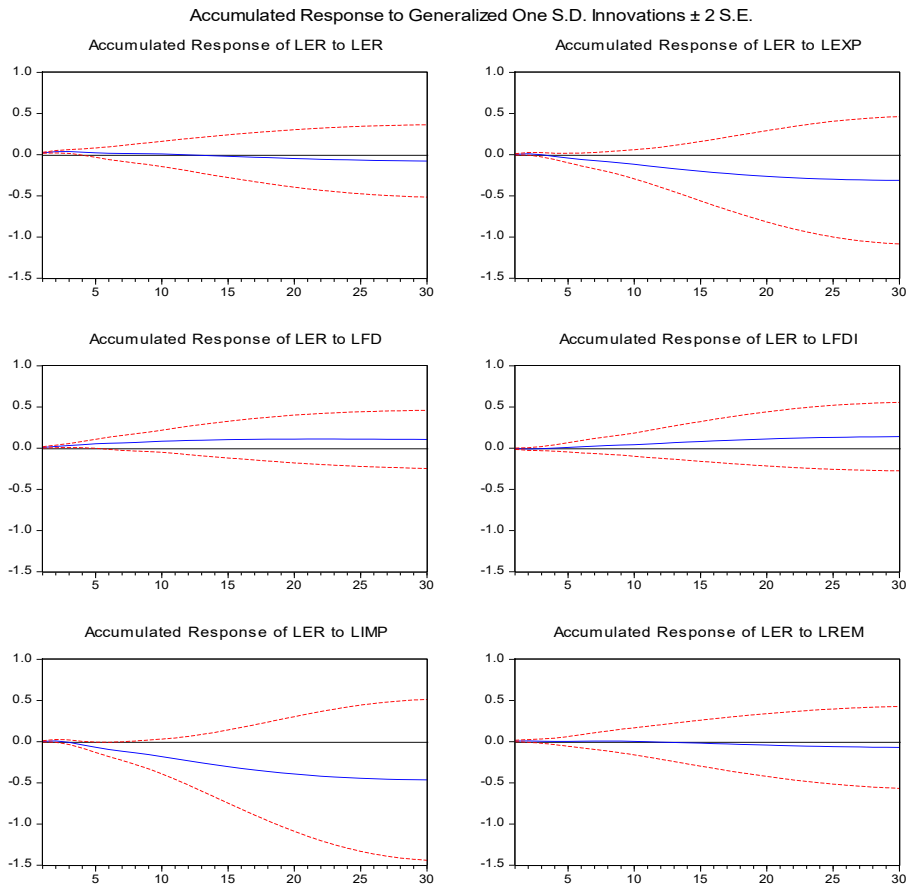
Figure1. Accumulate response of exchange rate.

5. Conclusion and Policy Implications

This study conducted on Bangladesh as this country often termed as next generation Asian tiger. This country has tremendous growth prospect with demographic dividend according to World Bank. We believe when a country turned in the status of development that also has impact on financial system development. Economic and financial developments are complementary for each other in the sense of development considering other catalyst those also

play significant role. The results of co-integration test reveal that at the trace statistics level all the variables have long term run effect on exchange rate and maximum eigenvalue confirms that three hypotheses are accepted in the proposition of exchange rate effect in the study. The three hypotheses are bidirectional causality exchange rate to financial development, exchange rate to FDI and financial development to FDI. Whereas unidirectional causality found among the variables of exchange rate to imports, exchange rate to remittances, financial development to exports, exports to FDI, exports to imports, remittances to exports, financial development to imports, remittances to financial development, remittances to FDI and remittances to imports.

If shock applies on exchange rate, then it has a significant negative impact on exports, imports and remittances inflows of the country. Thus, findings are quite plausible and consistent with earlier results represented in the study. The accumulated response of exchange to financial development and exchange rate to FDI are positive and significant. Findings of DOLS demonstrate that financial development and exports have strong positive long run effect on exchange rate. However, results also confirmed that imports and remittances have negative significant effect on exchange rate in the long run. Thus, the policy makers need to make appropriate action which will bring the highest export earnings and thus help to stabilize the macroeconomic position in this economically stressful time of Corona.

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