

Exchange Rate and Economic Growth Nexus: Evidence from Bangladesh

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Author's contribution

The study was designed, analyzed and discussed by the author. The author takes full responsibility for the whole study including data collation, manuscript drafting and editing.

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ABSTRACT

In the paper a close look at exchange rate and economic growth nexus in Bangladesh for a period of 1985-2012 using time series analysis, considering Exchange Rate, FDI, Trade Openness, and Portfolio Equity as explanatory variables and linkage with GDP. We employed Johansen-Juselius cointegration test, multivariate Granger Causality and ADF and PP stationary tests for this purpose. All the variables were found stationary after first differencing both with trend & intercept and no trend. The empirical result shows explanatory variables have significant impact on economic growth in Bangladesh. We also found unidirectional causality, exchange rate to GDP per capita, exchange rate to trade openness and trade openness to GDP per capita in short run. The accumulated response of GDP per capita to exchange rate (ER) and trade openness is positive and significant. So, policy makers in Bangladesh should pay special attention to these areas in order to support economic growth rates.

Keywords: FDI; exchange rate; trade openness; gdp growth; cointegration.

1. INTRODUCTION

A country's economic growth is influenced by the real exchange rate of its cross-border trading;

and it serves as an important tool in relative price signaling inter-sectoral growth in the long run [1,2,3] suggest that real exchange rate has important effects not only on general economic

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performance and international competitiveness, but also on different sectors of the economy, foreign trade flows, balance of payments, employment, structure of production and consumption, external debt crisis and allocation of resources in a country [4,5]. Highly fluctuating, distorted and virtually meaningless real exchange rates result in an immense misallocation of resources and a miscalculation of the countries' comparative advantages during central planning, which distort their economic development [6].

The grade of trade openness is likely to influence the flows of international capital in a country and it has impact on economic growth as well exchange rate. The level of trade openness also specifies the degree of comparative advantage of a country in undertaking investment. This view basically focuses on the 'transaction cost theory' [7,8] that proposes a low transaction cost situation generates financial incentives (higher return on investment) for both the domestic and foreign players in supplying large amount of capital like FDI. Moreover, the economic growth of a country is significantly influenced by trade openness and trade openness has radical impact on exchange rate behavior which is vital for other variables in this study.

The portfolio equity and FDI is likely to influence exchange rate as well as economic growth of a country. Portfolio equity channels needed capital for investment in stock market and helps to capital formation and trade openness which facilitate the flows of capital between countries; The more capital formation put upward pressure on demand of fund for industrial development and finally impact will go on the economic growth of a country;. And in this aspect the relationship between FDI, trade openness, portfolio equity, exchange rate and economic growth should be positive. Therefore, this nexus should be co-integrated in the long-run. However, a question arises whether this nexus works equally for all developing countries, particularly in Bangladesh. Hence, the objective of this study to investigate the relationship between FDI, portfolio equity, trade openness, exchange rate and economic growth in Bangladesh. The findings of this study will contribute to the one of the South Asian tigers i.e. Bangladesh, where democratic practice and market based economy is prevailing. A country based investigation will address the problems of that particular country but it might not work for other countries in the same issue. And post financial crisis these issue become very

difficult to attract FDI and portfolio equity in the cross countries in the global market. So, this research will focus on the association between FDI, trade openness, portfolio equity, exchange rate and economic growth that was least focused in the earlier research conducted on Bangladesh.

The outline of this paper is as follows. The next section reviews the theoretical and empirical literature. Section 3 describes a standard growth equation and the data sources and definitions. Section 4 separately reports the estimation results for various measures. Section 5 concludes the paper and affirms the policy implications of the results.

2. EMPIRICAL LITERATURE

Empirical literature that exclusively appraises the effects of skewed exchange rate on output growth is limited as most of the past works focused on the effects of decline of various macroeconomics factors [9-12] find out a strong negative correlation between per capita GDP growth and RER misalignment index and the measure the instability of RER showing the correlation between growth and investment capital-output ratio (ICOR), and its impact. Fluctuation of exchange rate cause the growth as of it has correlation with investment and trade openness.

Theoretically, the connection between foreign direct investments (FDI), trade openness, exchange rate, portfolio equity and economic growth have a tendency to be positive. A number of reasons can be drawn in support of this statement. FDI promotes economic growth in a capital limited economy by increasing volume as well as efficiency of physical investment that emphasized by the neoclassical and endogenous growth theories [13-16]. In addition, FDI supplies long-term capital with new technologies and marketing capabilities, which has impact on enhance economic growth through creation of new employment opportunities, dynamic managerial skills spill over the new technologies and encourage modernizations [17]. FDI also smooth the progress of 'agglomeration economies' applying lower cost for all manufacturers in the market as well as industrial categorization and linkage among them [18]. [19] Shows FDI augments technological spread out remuneration, broaden the opportunities and strengthens the supplier skills of a host country for goods and services production process and selling techniques in the international competitive

market, which has result on upscale economic growth.

[20] have found that persistent in Africa and Latin America slow economic growth one of the major reasons was misalignment of real exchange rate whereas Asia and south Asian region has got very fast economic growth due to focus on macro economic factors and exchange rate policies . A study performed on 33 Sub-Saharan African countries showing the relationship between real exchange rate and macroeconomic performance, the authors established a negative relationship between the RER misalignment and economic performance. Using three actions of RER misalignment, (PPP-based, black market-based and endogenous growth model-based) the authors concluded that while levels of misalignment are higher leads to higher macroeconomic instability, on the other hand, lower levels of RER misalignment and instability lead to better economic performance. In the same way, [21] investigated on the same issue that is title empirical relationship between RER misalignment and economic growth in Egypt, Jordan, Morocco and Tunisia and found that RER misalignment adversely affected growth. Thus, we see conflicting findings about the relationship between trade openness and economic growth. Besides [13,14] in the context of internal growth theories, [22,16,23,24] asserted that the effect of the openness on economic growth was positive, [25-27] claimed the opposite of this idea.

[22] got the evidence that outward-oriented countries have enjoyed higher per capita growth rates than inward-oriented ones. Through a research of 95 countries from African, Asian and Latin American countries in the period 1976-85. By means of the “outward orientation” indicators erected from PPP comparisons, more stable and depreciating currencies were associated with higher per capita growth rates conclusion was drawn. [28] also confirmed negative relationship between exchange rate overvaluation and per capita growth.

The effects of FDI, trade openness, capital formation and economic growth rate in Bangladesh over a period of 1986-2008 by [29] found FDI and level of capital formation have significant positive impact on changes in real GDP and trade openness has negative lessening influence on GDP growth rates. In another finding on Bangladesh, [30] showed trade openness had favorable effect on economic

development. [31] investigated link between real exchange rate and export earnings and found no casual link between real exchange rate depreciation and export earning in Bangladesh. studied trade openness and real exchange rate on Pakistan and revealed significant positive effect of trade openness on real exchange rate. The real exchange rate can serve as a facilitating condition: it cannot sustain economic growth in and of itself, but an appropriate real exchange rate policy can be an important enabling condition for a country seeking to capitalize on opportunities for growth [32]. They also claimed that keeping the real exchange rate at competitive levels and avoiding excessive volatility are important for growth.

However, the evidence of a link between the exchange rate volatility (or variability) and economic growth is less definitive [36,5]. In addition, other studies focusing on the nexus between the exchange rate regime and growth [24] found that for developing countries, less flexible exchange rate regimes are associated with slower growth. For industrial countries, exchange rate did not appear to have any significant impact on growth. [33] investigated openness and long run economic growth and concluded that positive relationship between economic growth and openness was present. In addition to the above discussion in this study the researcher tried to find out the link of exchange rate and economic growth nexus considering FDI, trade openness and portfolio equity on Bangladesh which is one of the fastest growing economies in South Asian region despite of having my limitations. A brief survey on empirical literature has given in Table 1.

3. METHODOLOGY AND EMPIRICAL RESULTS

3.1 The Model and Data

To conduct a study of empirical analysis and investigate the relationship between exchange rate, trade openness, FDI, portfolio equity and economic growth which required the following variables for the study on Bangladesh.

- GDP per capita(Y);
- Exchange rate;
- Trade openness;
- FDI inflows;
- Portfolio equity.

The researcher collected data from World Bank Development Indicators (WDI). The data are annual and cover the period 1985-2012 for Bangladesh. The variables Exchange rate measured Official exchange rate (LCU per US\$, period average), FDI inflows and Portfolio equity and Y are measured in Foreign direct investment, net inflows (BoP, current US\$), Portfolio equity, net inflows (BoP, current US\$), GDP per capita (constant 2005 US\$) respectively and Trade openness calculation process was sum of exports and imports divided by GDP per capita. To empirically investigate the different models of time series all variables were transformed to natural logarithms.

We estimate Johansen cointegration and Granger casualty test to examine the long and short run relationship between GDP and other variables. To test data stationarity, we conduct two widely used unit root tests; Augmented Dicky Fuller test (ADF) and Phillips- Perron (PP) test. These tests are followed by [34,35] likelihood ratio tests for cointegration. Once the respective variables are found to be cointegrated. Then, we check the cointegrating properties of our concerned variables before testing for Granger causality. A vector error correction model (VECM) 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).

3.2 Descriptive Statistics

The variables under study are found to be normally distributed (Table 2). 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.

3.3 Stationarity Results

Before testing for cointegration we tested for unit roots in order to investigate the stationarity properties of the data, Augmented Dickey-Fuller (ADF) t-tests [36,37] test are used to each of the three time series real GDP, real exports and real

imports testing for the presence of a unit root. The lag length for the ADF tests was selected to ensure that the residuals were white noise.

$$\Delta x_t = \alpha + \delta t + \vartheta_t + \rho x_{t-1} + \epsilon_t; \text{ Where, } t=1,2,3,\dots,N \quad (1)$$

The results of the Augmented Dickey Fuller (ADF) test with and without trend as recommended by [38,37] test again with and without trend are reported in Table 3.

Table 3 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).

3.4 Co-integration Test Result

One of the research objectives is to investigate the long run dynamics relationship among the five variables i.e. GDP, exchange rate, trade openness, FDI, portfolio equity. The system can be represented as follows:

$$GDP_t = \alpha + bER_t + cTrade\ open_t + dFDI_t + ePort\ Equity_t + \epsilon_t; \quad (2)$$

Where,

$$t=1,2,3,\dots,N$$

In implementing the tests for cointegration 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:

$$Y_t = A_0 + \sum_{j=1}^p A_j Y_{t-j} + \epsilon_t \quad (3)$$

Where t Y is an $n \times 1$ vector of non-stationary I(1) variables, in our case $Y_t =$ (GDP, ER, Trade openness, FDI and portfolio equity), 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. If Y_t is cointegrated, it can be generated by a vector error correction model (VECM):

$$\Delta Y_t = A_0 + \sum_{j=1}^{p-1} \Gamma_j \Delta Y_{t-j} + \Pi Y_{t-1} + \epsilon_t \quad (4)$$

Table 1. A Brief summary of recent studies

Author(s) and date (reference)	Variable used	Country, coverage, and method	Findings
Edoumiekumo and Opukri, [2]	RGDP, exports, imports	Nigeria; annual data (1981- 2008); Johansen's co-integration test	1.Positive relationship exists between the variables, RGDP, export and import 2.Uni-directional relationship. Real GDP Granger cause export and import Granger cause RGDP and export
Adhikary, [39]	FDI, Trade Openness, Domestic Demand, and Exchange Rate, exports	Bangladesh: annual data 1980–2009; A VEC Approach	1.FDI is a vital factor which clarifies the changes in exports both in the short run and long-run 2. This study could not sketch any significant causal relationship between trade openness, domestic demand, and exchange
Adhikary, [29]	FDI, Trade Openness, Capital Formation, and Economic Growth	Bangladesh; annual data (1986–2008); VECM	1. Strong long-run equilibrium relationship between GDP growth rates. 2.FDI and level of capital formation are found to have significant positive effect on changes in real GDP 3.Openness unleashes negative but diminishing influence on GDP growth rates
Chimobi and Uche, [40]	Gov't consumption, household consumption, real GDP, and export	Nigeria; annual data (1970–2005); VAR	(i) No long-run equilibrium relationship (ii) Export causes domestic demand (iii) Bilateral causality between export and household consumption
Prasanna, [37]	Inward FDI, total manufactured exports, high technology manufactured exports, and manufacturing value added	India; annual data (1991-92–2006-07); OLS	FDI significantly influences exports
Martinez-Martin, [41]	FDI, exports, domestic income, world income, and competitiveness	Spain; annual data (1993–2008); VECM	A positive Granger causality runs from FDI to exports in the long-run
Duasa, [28]	Volume of exports and imports, REER, and trade balance	Malaysia; annual data (1999–2006); TAR and M-TAR	A long-run asymmetric cointegration exists between REER and exports
Babatunde, [42]	Merchandise exports, REER, average tariff rate, exchange rate, and imports of raw material	Sub-Saharan Africa; annual data (1980–2005); panel-fixed effect and random effect	REER stimulates exports
Njong, [43]	Real exports, real GDP, REER, import over total international trade, export over total international trade, lag exports, and lag FDI stock	Cameroon; annual data (1980–2003); AR (p)	FDI and REER significantly influence exports

Table 1 continued in next page.....

Wong.	GDP per capita, exports, private consumption, government consumption, and investment	ASEAN 5; annual data (1960–1996); error correction, Granger causality	(i) A long-run relationship exists between variables (ii) Bidirectional Granger causality between exports and GDP; private consumption and GDP per capita
Mortaza and Narayan, [44]	FDI inflows, import and export over GDP, M2/GDP, literacy rate, and domestic investment and inflation	Bangladesh, India, Pakistan, Sri Lanka, and Nepal; annual data (1980–2004); VAR, panel-fixed effect, and random effect	Unidirectional relationship between FDI, trade liberalization and economic growth for Bangladesh and Pakistan
F. S. T. Hsiao and M. C. W. Hsiao, [14]	Real FDI inflows, real GDP per capita, and real exports	China, Korea, Hong Kong, Singapore, Taiwan, Malaysia, Thailand, and the Philippines; annual data (1986–2004); panel VAR	Bidirectional causality between exports and GDP
Sahoo, [10]	FDI, world income growth, infrastructure index, domestic demand, exports, REER, and GDP growth	Bangladesh, India, Pakistan, Sri Lanka, and Nepal; annual data (1975–2003); panel-fixed effect	FDI positively influences exports
Arize, [45]	Log real exports, log REER, and log real foreign income	USA; monthly data (1971 : 2–1991 : 3); error correction, ARCH, and linear moment	(i) A long-run equilibrium relationship exists. (ii) Exchange rates and exports are negatively associated

Table 2. Descriptive statistics for Bangladesh: 1985-2012

	GDP per capita	FDI inflow	Exchange rate	Portfolio equity	Trade openness
Mean	5.861500	16.37578	3.873946	-1390168.	17.50541
Median	5.803089	17.97611	3.870850	0.000000	17.59139
Maximum	6.392744	20.85246	4.405043	1.53E+08	18.26877
Minimum	5.544001	-1.203576	3.332011	-1.53E+08	16.77147
Std. Dev.	0.267740	5.414923	0.318570	53121472	0.461953
Skewness	0.531439	-2.197817	-0.060354	-0.033142	-0.166025
Kurtosis	2.013598	7.610288	1.711935	6.822759	1.754089
Jarque-Bera	2.453147	47.33908	1.952629	17.05419	1.939644
Probability	0.293296	0.000000	0.376697	0.000198	0.379151
Sum	164.1220	458.5217	108.4705	-38924708	490.1515
Sum Sq. Dev.	1.935485	791.6776	2.740137	7.62E+16	5.761821
Observations	28	28	28	28	28

Table 3. Unit root tests for Bangladesh: 1985-2012

ADF (Augmented Dickey-Fuller)			PP (Philips-Perron)		
	Trend &intercept	No trend		Trend &intercept	No trend
	test statistic (Prob)	test statistic (Prob)		test statistic (Prob)	test statistic (Prob)
GDP			GDP		
Level:	-0.98(0.92)	1.60(0.96)	Level:	-1.56(0.77)	6.44(1.00)
1st Diff:	- 5.40(0.00)*, **,***	-0.18(0.60)	1st Diff:	-5.46(0.00)*, **,***	0.25(0.75)
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)** , ***	-0.67(0.41)	1st Diff:	-3.68(0.04)** , ***	-3.34(0.00)*, **,***
Fdi Inflow			Fdi Inflow		
Level:	-2.87(0.18)	-0.76(0.37)	Level:	-2.97(0.15)	-0.76(0.37)
1st Diff:	-4.52(0.00)*, **,***	-5.03(0.00)*, **,***	1st Diff:	-4.06(0.01)** , ***	-3.96(0.00)*, **,***
Portfolio equity			Portfolio equity		
Level:	-4.91(0.01)** , ***	-5.08(0.00)** , ***	Level:	-5.86(0.03)** , ***	-5.55(0.00)** , ***
1st Diff:	-6.47(0.00)*, **,***	-6.77(0.00)*, **,***	1st Diff:	-11.93(0.00)*, **,***	-12.73(0.00)*, **,***
Trade Open			Trade Open		
Level:	- 2.88(0.18)	2.70(0.99)	Level:	-2.88(0.18)	3.29(0.99)
1st Diff:	-5.12(0.00)*, **,***	-4.08(0.00)*, **,***	1st Diff:	-5.22(0.00)*, **,***	-4.08(0.00)*, **,***

Note: * indicates statistical significance at the 1% level
 ** indicates statistical significance at the 5% level
 *** indicates statistical significance at the 10% level

Where,

$$\Gamma_j = - \sum_{i=j+1}^p A_i \quad \text{and} \quad \Pi = \sum_{j=1}^p A_j - I$$

Δ is the difference operator, and I is an $n \times n$ identity matrix.

Table 4 presents the result of Johansen co-integration test both at the trace and maximum eigenvalue levels. Accordingly, the trace statistics detects at most two cointegrating vectors among the variables and maximum eigenvalue statistics detect one cointegrating relationship at the 5% level. In other words, these tests indicate the presence of a long-run equilibrium relationship among variables.

Table 4. Results of johansen maximum likelihood estimation: 1985-2012

Null Hypothesis	Alternative Hypothesis	Critical Value at 5%	λ trace Statistic
$r=0$	$r>0$	69.81	113.87*
$r \leq 1$	$r>1$	47.85	54.56*
$r \leq 2$	$r>2$	29.79	28.74
$r \leq 3$	$r>3$	15.49	9.13
$r \leq 4$	$r>4$	3.84	0.053
$r=0$	$r>0$	33.87	59.30*
$r \leq 1$	$r>1$	27.58	25.82
$r \leq 2$	$r>2$	21.13	19.60
$r \leq 3$	$r>3$	14.26	9.08
$r \leq 4$	$r>4$	3.84	0.05

Notes: * indicates statistical significance at the 5% level

Table 5 presents the coefficients of normalized cointegrating vectors among the variables.

Table 5. Normalized cointegrating vector

GDP per cap	Exchange rate	FDI inflow	Portfolio equity	Trade open
1.000	0.127	-4.27	-2.175	0.33755

3.5 Multivariate Granger Causality 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.

Table 6 demonstrates that the casual relationships among the variables, unidirectional causality found exchange rate to GDP per capita, exchange rate to trade openness and trade openness to GDP per capita. Whereas, no causality found FDI inflows to exchange rate, portfolio equity to exchange rate, portfolio equity to FDI inflows and GDP per capita to FDI inflows, trade openness to FDI inflows, GDP per capita to portfolio equity and trade openness to portfolio equity.

3.6 Impulse Response and Variance Decomposition

From Fig. 1, we see that the standard deviation of GDP per capita itself leads to positive increase in future economic growth in Bangladesh. The accumulated response of GDP per capita to exchange rate (ER) and trade openness is positive and significant. The response of GDP per capita to FDI inflow is positive but not significant. Finally, portfolio equity is found to be negative and significant to GDP per capita. And which is interesting in this study and indications might be found doing further research.

The variance decomposition outputs are reported in Table 7. We document that the variance of GDP growth rates is always caused by 100 per cent by itself in the first year. In the fifth year, the GDP growth variance is decomposed into its own variance (79.14%) followed by FDI (16.44%) and exchange rate (1.19%).

However, in subsequent years that are up to twenty years, the share of GDP growth rates increased to approximately 81.08% followed by the exchange rate, portfolio equity and trade openness (5.50%, 6.71% and 4.28% respectively). On the other hand, the FDI inflow in explaining the variation of real GDP increases gradually from the second years onwards. In summary, the volatility of GDP growth rates is mainly caused by its own variation, as it always accounts for major portion (above 40%) of the fluctuations.

Table 6. Granger causality test (period of 1985-2012)

Null Hypothesis:	Obs	F-Statistic	Prob.
FDI_INFLOW does not Granger Cause EXCHANGE_RATE	27	1.24880	0.2748
EXCHANGE_RATE does not Granger Cause FDI_INFLOW		0.45938	0.5044
PORTFOLIO_EQUITY does not Granger Cause EXCHANGE_RATE	27	0.88245	0.3569
EXCHANGE_RATE does not Granger Cause PORTFOLIO_EQUITY		0.01174	0.9146
GDP_PER_CAPITA does not Granger Cause EXCHANGE_RATE	27	1.33159	0.2599
EXCHANGE_RATE does not Granger Cause GDP_PER_CAPITA		6.58713**	0.0169
TRADE_OPENNESS does not Granger Cause EXCHANGE_RATE	27	2.47741	0.1286
EXCHANGE_RATE does not Granger Cause TRADE_OPENNESS		4.75492*	0.0392
PORTFOLIO_EQUITY does not Granger Cause FDI_INFLOW	27	0.02685	0.8712
FDI_INFLOW does not Granger Cause PORTFOLIO_EQUITY		0.00522	0.9430
GDP_PER_CAPITA does not Granger Cause FDI_INFLOW	27	0.01164	0.9150
FDI_INFLOW does not Granger Cause GDP_PER_CAPITA		0.04485	0.8341
TRADE_OPENNESS does not Granger Cause FDI_INFLOW	27	0.46391	0.5023
FDI_INFLOW does not Granger Cause TRADE_OPENNESS		2.19716	0.1513
GDP_PER_CAPITA does not Granger Cause PORTFOLIO_EQUITY	27	0.16033	0.6924
PORTFOLIO_EQUITY does not Granger Cause GDP_PER_CAPITA		0.46609	0.5013
TRADE_OPENNESS does not Granger Cause PORTFOLIO_EQUITY	27	0.21480	0.6472
PORTFOLIO_EQUITY does not Granger Cause TRADE_OPENNESS		2.39203	0.1350
TRADE_OPENNESS does not Granger Cause GDP_PER_CAPITA	27	4.36424*	0.0475
GDP_PER_CAPITA does not Granger Cause TRADE_OPENNESS		2.14186	0.1563

Accumulated Response to Generalized One S.D. Innovations

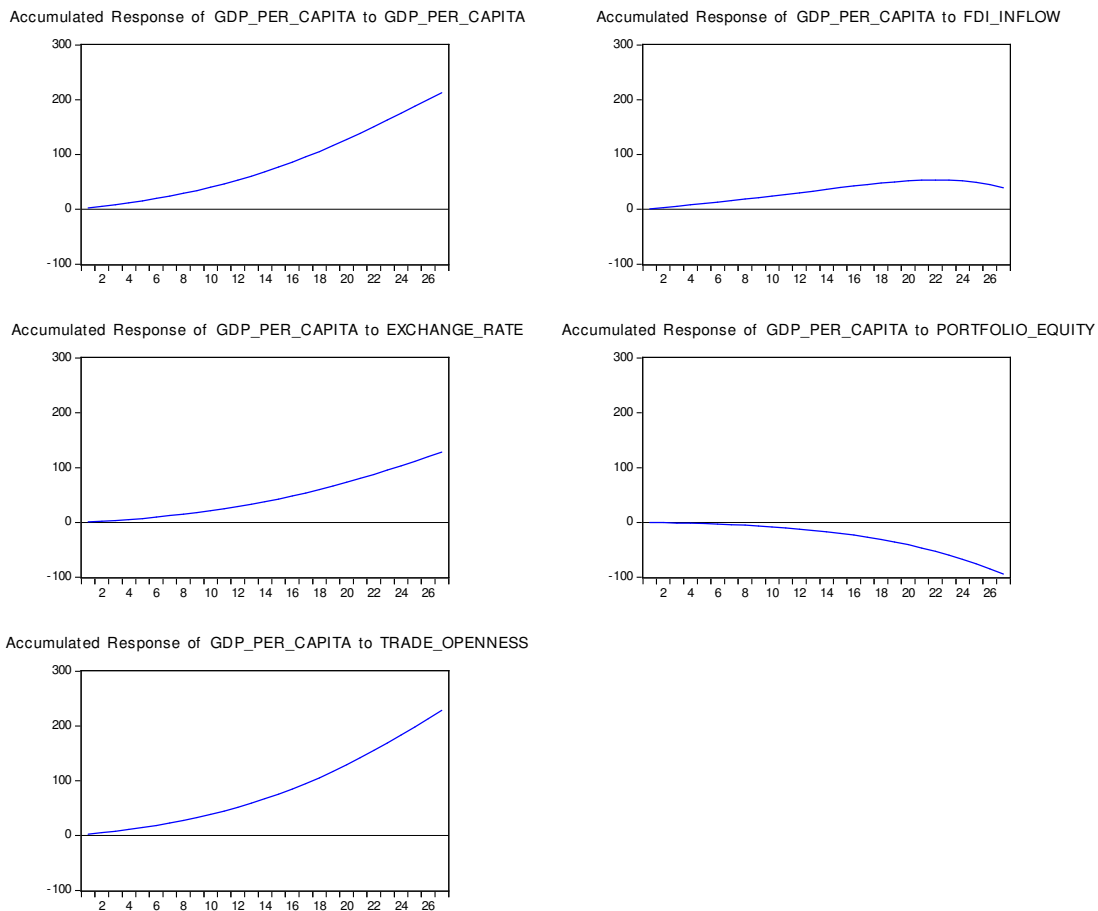


Fig. 1. Impulse Responses of GDP per capita: 1985-2012

Table 7. Variance decomposition of GDP per capita in Bangladesh: 1985-2012

Period	S.E.	GDP_PER_ CAPITA	FDI_INFLOW	EXCHANGE_ RATE	PORTFOLIO_ EQUITY	TRADE_ OPENNESS
1	2.642044	100.0000	0.000000	0.000000	0.000000	0.000000
2	3.971321	89.65599	10.11279	0.025316	0.205672	0.000225
3	5.315981	82.40578	14.62082	0.138817	2.179458	0.655128
4	6.628420	78.86655	16.84807	0.798427	2.532680	0.954274
5	7.825498	79.14523	16.44349	1.199818	2.057231	1.154233
6	9.058262	79.22854	15.27632	2.036815	2.346302	1.112028
7	10.39699	79.29898	13.97859	2.862171	2.910536	0.949720
8	11.68471	80.83451	12.44888	3.012430	2.920571	0.783608
9	12.97592	82.28729	10.87841	3.077201	3.121663	0.635437
10	14.39453	83.00588	9.539008	3.316683	3.596052	0.542380
11	15.89579	83.84422	8.417951	3.462986	3.770075	0.504770
12	17.46693	84.58031	7.394143	3.582264	3.922048	0.521231
13	19.18119	84.76379	6.468619	3.850390	4.312099	0.605106
14	21.01100	84.87475	5.621647	4.114742	4.629359	0.759497
15	22.91383	85.00266	4.822128	4.307520	4.863030	1.004661
16	24.94304	84.74391	4.095788	4.552556	5.233362	1.374380
17	27.11081	84.21177	3.468380	4.820300	5.624110	1.875438
18	29.38357	83.54994	2.966915	5.035362	5.934014	2.513774
19	31.79330	82.51954	2.610467	5.258388	6.298057	3.313551
20	34.36848	81.08745	2.406967	5.509041	6.710683	4.285859
21	37.09074	79.35979	2.398819	5.730990	7.071054	5.439344
22	39.98131	77.20959	2.629771	5.933990	7.429670	6.796978
23	43.08168	74.55324	3.112227	6.142210	7.818532	8.373792
24	46.39994	71.44568	3.888877	6.322191	8.167362	10.17589
25	49.96561	67.84322	5.018258	6.458192	8.470677	12.20966
26	53.83978	63.69767	6.513010	6.563673	8.756456	14.46919
27	58.06919	59.07004	8.389153	6.622711	8.984564	16.93353

Note: Estimated by generalized variance decomposition. Due to non-zero covariance between the original shocks, the sum of the decomposition is not necessarily equal to one (Pesaran and Shin, 1998)

4. CONCLUSION

This study establishes a relationship between economic growth and its determinants in Bangladesh covering the data up to most recent year that is 2012. The multivariate cointegration test reveals at most two cointegrating vectors among the variables and maximum eigenvalue statistics detect one cointegrating relationship among variables. Unidirectional causality was found for exchange rate to GDP per capita, exchange rate to trade openness and trade openness to GDP per capita. Whereas, no causality found FDI inflows to exchange rate, portfolio equity to exchange rate, portfolio equity to FDI in lows and GDP per capita to FDI inflows, trade openness to FDI inflows, GDP per capita to portfolio equity and trade openness to portfolio equity. Results from variance decomposition analysis are consistent with those of impulse response analysis. Based on findings from this investigation, it clearly indicates what the vital focus points are for further economic growth and

income level of an emerging economy like Bangladesh. Bangladeshi policy making authorities and the experts can use the results to develop guidelines for their upcoming strategy formulation in this area.

5. POLICY IMPLICATION

The policy implications of this study can be summarized by the following points. First, there exists a long-term link in the nexus of FDI, portfolio equity, exchange rate, trade openness, and economic growth of Bangladesh. This link indicates that the government of Bangladesh should utilize the above factors carefully on a long-run perspective to capitalize the benefits of the nexus properly. Second, FDI is an important factor in explaining the changes in exports. Thus, an FDI-led growth policy can be promoted to increase the country's overall investment and the rates of GDP growth as well. Third, trade openness tends to create positive impact on economic growth. Finally, government should be

more focused on exchange rates to benefit from its positive influence on economic growth.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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