
Domestic demand, export and economic growth in Bangladesh: A cointegration and VECM approach

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Abstract: Using cointegration and error-correction mechanism techniques, this paper investigated the causal relationship between domestic demand, export and economic growth using data pertaining to Bangladesh's final household consumption and government consumption as a measure of domestic demand, real exports, and real GDP over the period 1971–2011. It is found that final household consumption, final government consumption and export influence short-run and long-run economic growth. Thus, there is a dynamic relationship among domestic demand, export, and economic growth in Bangladesh. Moreover, economic growth in Bangladesh has an impact on its domestic demand and exports in the short-run, but in the long-run economic growth has an impact on final household consumption only.

Keywords: Domestic Demand, Export, Economic Growth, Cointegration, VECM, Bangladesh

1. Introduction

Economic growth is instrumental in ensuring economic development in a developing country like Bangladesh. Bangladesh has been registering annual economic growth of more than 5 percent on the average for the last two decades (Bangladesh Bank, 2012). This figure for a developing nation is commendable. An increase in domestic demand would lead to an increase in economic growth but at the same time, it would decrease net exports. However, if the increase in domestic demand is greater than decrease in net-exports, it leads to an increase in economic growth (ADB, 2005). The higher domestic demand is likely to influence the production of firms, which increase economic growth. If domestic demand increases too much, the economy will get close to full capacity and therefore, would cause inflation. The increased domestic demand may also cause deterioration of the current account balance of payments. This is because higher domestic demand would lead to a decrease in export and increase in imports. If the economy is operating below full capacity, or if there is a recession, then an increase in domestic demand will cause higher economic growth without causing inflation. On the other hand, exports of goods and services increase foreign exchange earnings that ease the pressure on the balance of

payments, facilitate imports of capital goods, accelerate technological progress, and cause economies of scale which in turn increase production potential of an economy in the long run (Ramos, 2011). Moreover, export of goods and services increases intra-industry trade that helps the country to integrate with the world economy, reduce the impact of external shocks on the domestic economy, and finally, enhance economic development (Stait, 2005). The objective of the present study is to explore the short-run and long-run dynamics among domestic demand, export and economic growth in the context of Bangladesh.

The Gross Domestic Product (GDP) in Bangladesh expanded by 6.30 percent in 2012 from the previous fiscal year. The annual growth rate of GDP of Bangladesh averaged 5.59 percent from 1994 to 2012, reaching an all time high of 6.70 percent in 2011 and recording a low of 4.08 percent in 1994. In Bangladesh, service is the biggest sector of the economy and accounts for 50 percent of total GDP. Within services, the most important segments are wholesale and retail trade (14 percent of total GDP), transport, storage and communication (11 percent) and real estate, renting and business activities (7 percent). Industry accounts for 30 percent of GDP. Within industry, the manufacturing segment represents 18 percent of GDP while construction accounts for 9 percent. The remaining 20 percent is contributed by agriculture and forestry (16 percent), and fishing (4 percent), (Bangladesh Bank, 2012).

Bangladesh exports mainly readymade garments including knitwear and hosiery (75% of exports revenue). Others include shrimps, jute goods (including carpet), leather goods and tea. Main exports partners of Bangladesh are United States (23% of total), Germany, United Kingdom, France, Japan and India. Exports in Bangladesh increased to US\$ 3024.30 million in 2013 from US\$ 2705.50 million in 2012. Bangladesh has achieved double-digit export growth (11.18%) in the fiscal year 2012-13 (Bangladesh Bank, 2013). The trends in exports and economic growth of Bangladesh are shown in the figures below.

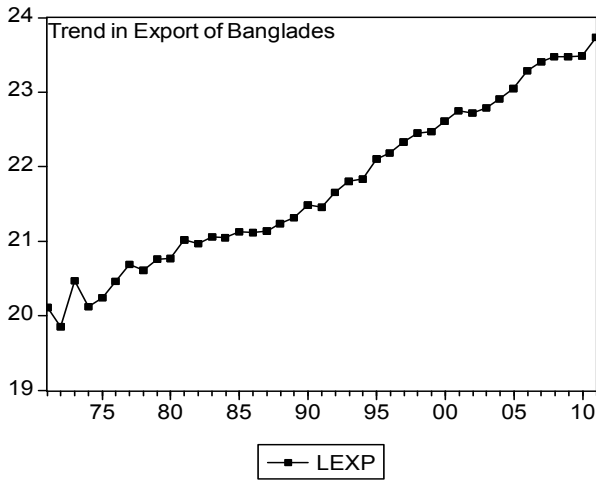


Figure 1. Trend in Export of Bangladesh

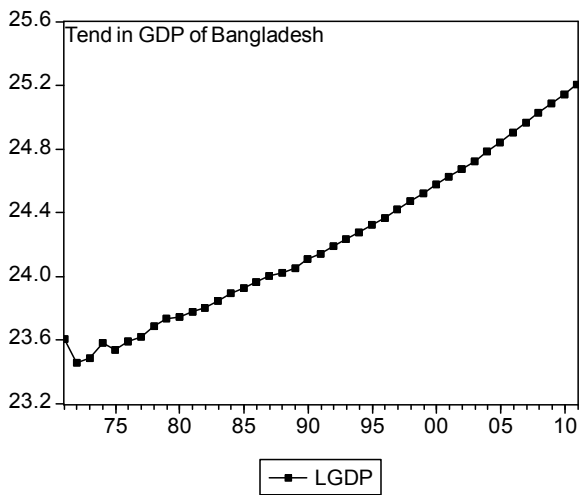


Figure 2. Trend in GDP of Bangladesh

The final domestic demand (sum of final household and government consumption expenditure) of Bangladesh was US\$ 88941.87 million in 2011 (World Bank, 2012). Over the past 51 years, the value for this indicator has fluctuated between US\$ 88941.87 million in 2011 and US\$ 3686.02 million in 1960. The trends of final household consumption and final government consumption in Bangladesh are shown in the figures below.

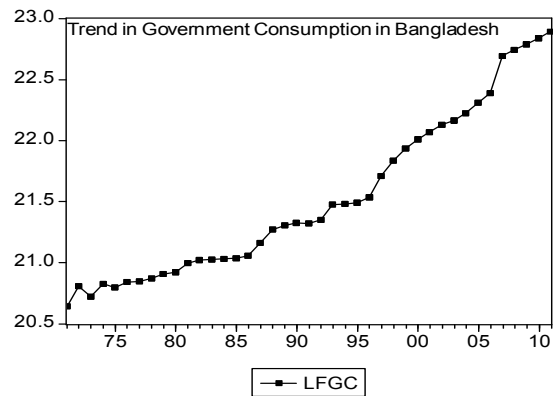


Figure 3. Trend in Government Consumption in Bangladesh

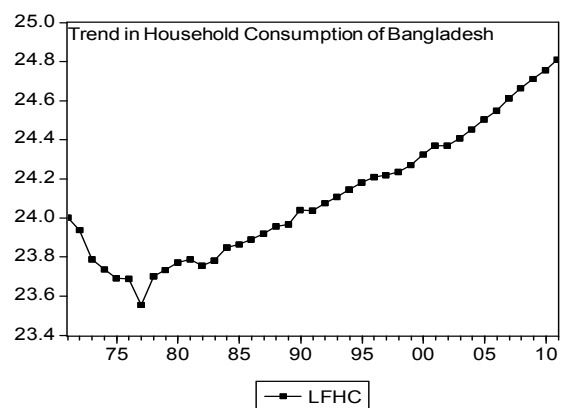


Figure 4. Trend in Household Consumption in Bangladesh

2. Literature Review

There is an extended body of literature dealing with the relationship between domestic demand, export and economic growth. Wah (2010) analyzed the role of domestic demand in the economic growth of Malaysia. He used time series data pertaining the periods over 1961-2000. Using a three-variable cointegration analysis, the study found that there exist short run bilateral causalities among the three variables, which implies that both the export-led growth and domestic demand-generated growth hypotheses are at least valid in the short run. On the other hand, the results are not supportive of the export-led growth hypothesis in the long-run. Instead, the highly significant positive impact of domestic expenditure on economic growth showed that use of domestic demand as the catalyst for growth is appropriate. Wong (2008) examined the importance of exports and domestic demand to economic growth in five Asian countries namely, Indonesia, Malaysia, the Philippines, Singapore and Thailand. He used Granger causality test to verify the relations between exports, domestic demand and economic growth. The results of the Granger causality test showed some evidence of bidirectional causality between exports and economic growth and between private consumption and economic growth. The relationship between investment and economic growth, and government consumption and economic growth was less conclusive in the

study. He concluded that a successful sustained economic growth requires growth in both exports and domestic demand.

Chimobi *et al.* (2010) studied the relationship between export, domestic demand and economic growth in Nigeria applying Granger causality and cointegration test. The cointegration test indicated no cointegration at 5% level of significance pointing to the fact that the variables do not have a long-run relationship. To determine the direction of causality among the variables, at least in the short run, the pair wise Granger causality test was carried out. The results of the causality test found that economic growth causes both export and domestic demand while domestic demand (proxied by government consumption) is caused by export. They also found a bilateral causality between export and household consumption (another proxy for domestic demand), which suggest that domestic demand, is an important tool that encourages engagement of the country (Nigeria) in international trade. Felipe and Lim (2005) analyzed how far the Asian countries have shifted from export-led growth policies to domestic-led growth policies. They carried out their studies in five Asian countries over the period 1993-2003 and they found no such kind of shifts. They also found that periods of expansionary domestic demand and deteriorating net exports signaled an ensuring crisis. They suggested that this should serve in the future as an early warning system. Tsen (2007) examined the nexus of exports, domestic demand and economic growth in the Middle East countries namely, Bahrain, Iran, Oman, Qatar, Saudi Arabia, Syria and Jordan. The results of Granger causality showed that export, domestic consumption and investment are important to economic growth and economic growth is important to export, domestic consumption and investment. He also found that exports have a stronger impact on economic growth when a country has a higher ratio of openness to international trade whereas investment and domestic demand have weak impact on economic growth when a country has a higher ratio of consumption to gross domestic product (GDP) or investment to GDP. In his study, consumption is found to be more important than investment in contributing to economic growth.

3. Data and Methodology

3.1. The Data and Variables

The objective of the present study is to explore the short-run and long run relationship among domestic demand, export and economic growth in Bangladesh. The paper is based on secondary data collected from Export Promotion Bureau (EPB), Bangladesh Bank (Central Bank of Bangladesh), Bangladesh Bureau of Statistic (BBS), World Bank National Accounts, and OECD National Accounts data files. The data are observations on final household consumption, final government consumption, export and real GDP. All data are measured in US dollar and all variables are taken in their natural logarithms to avoid the problems of heteroscedasticity and denoted as LFHC, LFGC, LEXP and LGDP. The

estimation methodologies employed in the present study are unit root test, cointegration, Granger causality, error correction, and vector autoregression techniques.

3.2. Unit Root Test

Unit root test need to be run in order to know whether the concerned variables are co-integrated or there is any causal relationship between two variables. Furthermore, the application of non-stationary data directly in the causality tests might create spurious problems. Therefore, it is necessary to examine whether the time series of the variables are stationary. This is done by the application of Augmented Dickey-Fuller (1979) test and Phillips-Perron (1988) test.

3.3. Augmented Dickey-Fuller and Phillips-Perron Tests

The following equation represents the ADF test with a constant and a trend as:

$$\Delta X_t = \alpha + \delta t + \beta X_{t-1} + \sum_{i=1}^n \theta_i \Delta X_{t-i} + \varepsilon_t \quad (1)$$

Where, t is time or trend variable, ε_t is a white noise error term, $\Delta X_{t-i} = (X_{t-i} - X_{t-(i+1)})$ are the first differences of variable. The null hypothesis for unit root test is $\beta=0$. If the coefficient is different from zero and statistically significant then the hypothesis of unit root of X_t is rejected. Again, the generalized form of Augmented Dickey-Fuller test developed by Phillips and Perron is as follows.

$$X_t = \beta_0 + \beta_1 X_{t-1} + \beta_2 (t-T/2) + \mu_t \quad (2)$$

Where, T is the number of observation and μ_t is a white noise error term.

3.4. Stability Analysis for VAR Systems

For a set of n time series variables $X_t = (X_{1t}, X_{2t}, \dots, X_{nt})$, a VAR model of order p , [VAR, (p)], can be written as

$$X_t = A_1 X_{t-1} + A_2 X_{t-2} + \dots + A_p X_{t-p} + u_t.$$

Where the A_i 's are ($n \times n$) coefficient matrices and $u_t = (u_{1t}, u_{2t}, \dots, u_{nt})$ is unobservable i.e. zero mean error term. The stability of a VAR can be examined by calculating the roots of

$$(I_n - A_1 L - A_2 L^2 - \dots) X_t = A(L) X_t$$

The characteristic polynomial is defined as

$$\Pi(z) = (I_n - A_1 z - A_2 z^2 - \dots)$$

The roots of $|\Pi(z)| = 0$ will give the necessary information about the stationarity or non-stationarity of the process. The necessary and sufficient condition for stability is that all characteristic roots lie inside the unit circle. Then Π is of full rank and all variables are stationary.

3.5. Testing for Cointegration Using Johansen’s Methodology

Once the stationarity has been confirmed for a data series, the next step is to examine whether there exist a long-run relationship among variables. Two or more variables are said to be cointegrated, meaning that they show long-run equilibrium relationship(s), if they share common trend (s). The original work done by Engle and Granger (1987), Hendry (1986) and Granger (1986) on the cointegration technique identified the existence of a cointegrating relationship as the basis for causality. Causality here, of course implies the presence of feedback from one variable to another. According to this technique, if two variables are cointegrated, causality must exist in at least one direction, (Granger, 1988, Miller and Russek, 1990); and may be detected through the vector error-correction model derived from the long run cointegrating vectors. Johansen’s methodology takes its starting point in the vector autoregression (VAR) of order p is given by

$$X_t = \mu + A_1 X_{t-1} + \dots + A_p X_{t-p} + \varepsilon_t \quad (3)$$

Where, Y_t is an $(nx1)$ vector of variables that are integrated of order one-commonly denoted as $I(1)$ and ε_t is an $(nx1)$ vector of innovations. This VAR can be rewritten as

$$\Delta X_t = \mu + \Pi X_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \varepsilon_t \quad (4)$$

Where, $\Pi = \sum_{i=1}^p A_i - I$ and $\Gamma_i = \sum_{j=i+1}^p A_j$

Here, Π is the $k \times k$ coefficient matrix, which contains information about long-run relationship. The rank of Π indicates the number of independent rows in the matrix and the rank(r) of Π matrix determines the number of cointegrating vectors (β), the number of steady state relations among the variables in (X_t) . Zero rank ($r=0$) implies no cointegration vectors, full rank ($r = p$) means that all variables are stationary, while a reduced rank ($0 < r < p$)

means the existence of r cointegrating vectors among variables. Johansen proposes two different likelihood ratio tests to determine the number of co-integrating vectors and thereby the reduced rank of the Π matrix: the trace test and maximum eigenvalue test, shown in equations (5) and (6), respectively.

$$\tau_{trace} = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \quad (5)$$

$$\tau_{max} = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (6)$$

Here, T is the sample size and $\hat{\lambda}_i$ is the i^{th} largest canonical correlation. The ‘trace statistic’ tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors. The maximum eigenvalue test, on the other hand, tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of $(r+1)$ cointegrating vectors.

3.6. Granger Causality Test

Engle and Granger (1987) showed that if two variables are co-integrated, i.e., there is a valid long-run relationship, then there exists a corresponding short-run relationship as well. This is popularly known as the Granger’s Representation Theorem. Correlation does not necessarily imply causation in any meaningful sense. The Granger approach (1969) to the question of whether X causes Y is to see how much of the current Y can be explained by past values of Y and then to see whether adding lagged values of X can improve the explanation. Y is said to be Granger-caused by X if X helps in the prediction of Y, or equivalently if the coefficients on the lagged X’s are statistically significant. Note that two-way causation is frequently the case when X Granger causes Y and Y Granger causes X. It is important to note that the statement “X Granger causes Y” does not imply that Y is the effect or the result of X. Thus, assuming the integration of order $I(1)$ and cointegration between the logarithm of the levels of human capital, export and GDP, the following ECM, based on Engle and Granger (1987) is formulated to carry out the standard Granger causality test:

$$\Delta X_t = \sum_{i=1}^n a_{1t} \Delta X_{t-i} + \sum_{i=1}^n b_{1t} \Delta Y_{t-i} + \sum_{i=1}^n c_{1t} \Delta Z_{t-i} + \sum_{i=1}^n d_{1t} \Delta Q_{t-i} + e_{1t} \quad (7)$$

$$\Delta Y_t = \sum_{i=1}^n a_{2t} \Delta X_{t-i} + \sum_{i=1}^n b_{2t} \Delta Y_{t-i} + \sum_{i=1}^n c_{2t} \Delta Z_{t-i} + \sum_{i=1}^n d_{2t} \Delta Q_{t-i} + e_{2t} \quad (8)$$

$$\Delta Z_t = \sum_{i=1}^n a_{3t} \Delta X_{t-i} + \sum_{i=1}^n b_{3t} \Delta Y_{t-i} + \sum_{i=1}^n c_{3t} \Delta Z_{t-i} + \sum_{i=1}^n d_{3t} \Delta Q_{t-i} + e_{3t} \quad (9)$$

$$\Delta Q_t = \sum_{i=1}^n a_{4t} \Delta X_{t-i} + \sum_{i=1}^n b_{4t} \Delta Y_{t-i} + \sum_{i=1}^n c_{4t} \Delta Z_{t-i} + \sum_{i=1}^n d_{4t} \Delta Q_{t-i} + e_{4t} \quad (10)$$

Where, Δ is the first difference operator, e_{1t} , e_{2t} , e_{3t} and e_{4t} are random error terms and n is the number of optimum lag length, which is determined empirically by Schwarz Information Criterion (SIC) for all possible pairs of (X, Y) series in the group.

The null hypothesis is that Y, Q, and Z does not Granger-cause X in the first regression; X, Q and Z does not Granger-cause Y in the second regression; X, Q and Y does not Granger-cause Z in the third regression and X, Y, and Z does not Granger-cause Q in the fourth regression.

3.7. Vector Error Correction Mechanism (VECM)

If cointegration has been found between series, we know that there exists a long-term equilibrium relationship between them. Therefore, we apply VECM in order to evaluate the

$$\Delta X_t = \sum_{i=1}^n a_{1i} \Delta X_{t-i} + \sum_{i=1}^n b_{1i} \Delta Y_{t-i} + \sum_{i=1}^n c_{1i} \Delta Z_{t-i} + \sum_{i=1}^n d_{1i} \Delta Q_{t-i} + \alpha ECT_{t-1} + e_{1t} \tag{11}$$

$$\Delta Y_t = \sum_{i=1}^n a_{2i} \Delta X_{t-i} + \sum_{i=1}^n b_{2i} \Delta Y_{t-i} + \sum_{i=1}^n c_{2i} \Delta Z_{t-i} + \sum_{i=1}^n d_{2i} \Delta Q_{t-i} + \beta ECT_{t-1} + e_{2t} \tag{12}$$

$$\Delta Z_t = \sum_{i=1}^n a_{3i} \Delta X_{t-i} + \sum_{i=1}^n b_{3i} \Delta Y_{t-i} + \sum_{i=1}^n c_{3i} \Delta Z_{t-i} + \sum_{i=1}^n d_{3i} \Delta Q_{t-i} + \gamma ECT_{t-1} + e_{3t} \tag{13}$$

$$\Delta Q_t = \sum_{i=1}^n a_{4i} \Delta X_{t-i} + \sum_{i=1}^n b_{4i} \Delta Y_{t-i} + \sum_{i=1}^n c_{4i} \Delta Z_{t-i} + \sum_{i=1}^n d_{4i} \Delta Q_{t-i} + \delta ECT_{t-1} + e_{4t} \tag{14}$$

Where, ECT_{t-1} is the error correction term. It is convenient to think of the ECM_t variable at the first lag, controlling the long-run path of the dependent variable. A negative and significant coefficient of the ECM in the above equations indicates that any short-term fluctuations between the independent variables and the dependant variable will give rise to a stable long run relationship between the variables.

3.8. Vector Autoregression (VAR) Model

The vector Autoregression is used for forecasting the interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. The VAR is a dynamic system of equations that examine the impacts of shocks or interactions between economic variables. VAR model is represented by the following equation:

$$X_t = \alpha_1 + \sum_{i=1}^n \alpha_i X_{t-i} + \epsilon_t \tag{15}$$

We expand this equation as

short run properties of the cointegrated series. In case of no cointegration, VECM is no longer required and we directly precede to Granger causality tests to establish causal links between variables. The regression equation form for VECM is as follows:

$$X_t = \alpha_1 X_{t-1} + \alpha_2 X_{t-2} + \alpha_3 X_{t-3} + \dots + \alpha_n X_{t-n} + \epsilon_t \tag{16}$$

Where, X_t is a vector of endogenous variables at time t and ϵ_t is vector of residuals.

4. Discussion of Results

4.1. Results of Unit Root Test

The Augmented Dickey-Fuller (ADF) test and Phillip–Perron (PP) test for unit root are applied to test the stationary property of the variables. Table 1 shows the ADF and PP test results for the variables at both level and first differences. These results indicate that we accept the null hypothesis of unit root for the variables at level, but we reject the null hypothesis of unit root at the first difference. Therefore, we draw the conclusion that at first difference LEXP, LFHC, LFGC and LGDP are stationary. Thus, the findings of the unit root test suggest that the variables LEXP, LFHC, LFGC and LGDP are integrated of same order.

Table 1. Results of Unit Root Test.

Variables	Augmented-Dickey Fuller Test		Phillips-Perron Test	
	Level(Calculated Value)	First Difference(Calculated Value)	Level(Calculated Value)	First Difference(Calculated Value)
LEXP	-1.917	-4.630	-0.141	-6.212
LFHC	-2.034	-11.362	-1.631	-6.172
LFGC	-0.791	-6.558	-0.971	-6.607
LGDP	-1.999	-5.718	-2.656	-14.192

4.2. Results of Stability Test

Stability test is carried out to check the satiability property of VAR system. From Table 2it is found that at least one roots lies outside the unit root circle at level. Therefore, the VAR does not satisfy the stability condition at level of all

considered variables. However, at first difference no root lies outside the unit root circle. Therefore, at first difference the VAR satisfy the stability condition. Thus, from the results of stability test, we can conclude that the considered variables are not stationary at level but are stationary at first difference.

Table 2. Results of Stability Test of VAR.

At Level		At First Difference	
Root	Modulus	Root	Modulus
1.02	1.02	-0.67	0.67
0.91	0.91	-0.35 - 0.48i	0.59
0.58 - 0.04i	0.58	-0.35 + 0.48i	0.59

At Level		At First Difference	
0.58 + 0.04i	0.58	0.44	0.44
-0.29 - 0.40i	0.49	0.16 - 0.36i	0.39
-0.29 + 0.40i	0.49	0.16 + 0.36i	0.39
-0.44	0.44	0.27	0.27
0.09	0.09	-0.23	0.23
At least one root lies outside the unit circle. VAR does not satisfy the stability condition.		No root lies outside the unit circle. VAR satisfies the stability condition.	

4.3. Results of Cointegration Rank Test

To determine the long run relationship among the stationary variables Johansen cointegration test is used. Table 3 shows the results of the cointegration test based on the maximum eigenvalue and trace statistic test. The trace test indicates the

existence of two cointegrating equations at 1% level of significance and the maximum eigenvalue test makes the confirmation of this result. Thus, these results confirm that there exist genuine long-run relationships among domestic demand, exports and economic growth in Bangladesh.

Table 3. Results of Johansen's Cointegration Rank Test.

Null Hypothesis	Alternative Hypothesis	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value	Max. Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	r = 1	136.01	68.52	76.07	74.49	33.46	38.77
At most 1 **	r = 2	61.51	47.21	54.46	40.49	27.07	32.24
At most 2	r = 3	21.02	29.68	35.65	15.89	20.97	25.52
At most 3	r = 4	5.14	15.41	20.04	4.83	14.07	18.63

*(**) denotes rejection of the hypothesis at the 5% (1%) level. The trace test and maximum eigenvalue test indicate 2 cointegrating equations at 5% level.

4.4. Results of Error Correction Estimation

In the short-run, there may be deviations from equilibrium and we need to verify whether such disequilibrium converges to the long-run equilibrium or not. Vector Error Correction Model (VECM) can be used to check this short-run dynamics. The estimation of a vector error correction model requires the selection of an appropriate lag length. The number of lags in the model has been determined according to Schwarz Information Criterion (SIC) and the appropriate lag length in the present study is 2. Then an error correction model with the computed-t values of the regression coefficient is estimated and the results are presented in Table 4.

Table 4. Vector Error Correction Estimates.

Variables	Δ(LGDP)	Δ(LFHC)	Δ(LFGC)	Δ(LEXP)
Error Correction:	-0.190***	-0.236**	-1.257	-0.418
CointEq1	[-3.633]	[-2.055]	[-0.952]	[-1.372]
ΔLGDP(-1)	-0.558**	0.590	-2.262	-3.728***
	[-2.553]	[1.227]	[-0.410]	[-2.923]
ΔLGDP(-2)	-0.172	0.956***	2.020*	-0.691
	[-1.245]	[3.153]	[1.780]	[-0.859]
ΔLFHC(-1)	-0.108*	-0.714***	0.105*	1.218**
	[-1.828]	[-3.376]	[1.743]	[2.173]
ΔLFHC(-2)	-0.137	-0.406**	-1.439	0.222
	[-1.628]	[-2.198]	[-0.678]	[0.452]
ΔLFGC(-1)	0.016*	0.030	-0.128	-0.017
	[1.789]	[1.530]	[-0.560]	[-0.327]
ΔLFGC(-2)	0.001*	0.030*	-0.073	-0.061
	[1.736]	[1.700]	[-0.365]	[-1.308]
ΔLEXP(-1)	0.050*	0.032	1.346*	-0.253
	[1.900]	[0.462]	[1.718]	[-1.400]
ΔLEXP(-2)	-0.006	-0.091*	0.758	0.270
	[-0.220]	[-1.920]	[1.027]	[1.586]
C	0.030	-0.155***	-0.113	0.274**
	[1.358]	[-3.156]	[-0.199]	[2.100]

Note: The value in [] indicate t-value; ***, **, and * indicate 1%, 5% and 10% level of significance.

The estimated coefficient of error-correction term in the LGDP equation is statistically significant at 1% level and has a negative sign, which conforms that there is not any problem in the long-run equilibrium relation between the dependent and independent variables, but its relative value (-0.190) for Bangladesh shows the rate of convergence to the equilibrium state per year. Precisely, the speed of adjustment of any disequilibrium towards a long-run equilibrium is that about 19.0% of the disequilibrium in economic growth is corrected each year. In the second equation, *i.e.*, in LFHC equation, the estimated coefficient of the error term is negative and statistically significant at 5% level. It means the error term contribute in explaining the changes in final household consumption.

However, in the LFGC and LEXP equations, the estimated coefficients of the error term are negative but statistically insignificant. As a result, the error terms do not contribute in explaining the changes in final government consumption and exports. Furthermore, the existence of cointegration implies the existence of Granger causality at least in one direction (Granger, 1988). The negative and statistically significant value of the error correction coefficient indicates the existence of a long-run causality between the variables of the study. The results in Table 4 show that there exists a bi-directional causality between final household consumption and economic growth, but unidirectional causalities from final government consumption to economic growth and exports to economic growth in the long-run.

The coefficients of first difference of LFHC, first and second differences of LFGC, and first difference of LEXP in LGDP equation in Table 4 are statistically significant, indicating the existence of short-run causality from final household consumption to economic growth, final government consumption to economic growth and export to economic growth. In LFHC equation, the coefficient of

second difference of LGDP, LFGC and LEXP are statistically significant indicating the short-run causality from economic growth to final household consumption, final government consumption to final household consumption and export to final household consumption. Again, in LFGC equation, the coefficient of second difference of LGDP, first difference of LFHC, and first difference of LEXP are statistically significant, indicating the short-run causality from economic growth, final household consumption and export to final government consumption. Finally, in LEXP equation, the coefficient of first difference of LGDP and LFHC are statistically significant, indicating the existence of short-run causality from economic growth to export and final household consumption to export.

4.5. Results of Granger Causality Test

In order to confirm the result of short-run causality among Δ LGDP, Δ LFHC, Δ LFGC and Δ LEXP based on VECM estimates, a standard Granger causality test has been performed based on F-statistic. The results in Table 5 indicate that the null hypothesis of Δ LFHC does not Granger cause Δ LGDP and Δ LGDP does not Granger cause Δ LFHC, are rejected at 10% and 1% level of significance. Thus, in the short-run, bi-directional causality exists between final household consumption and economic growth. On the other

hand, the null hypothesis of Δ LFGC does not Granger cause Δ LGDP and the null hypothesis of Δ LGDP does not Granger cause Δ LFGC, are rejected indicating that there exist short-run bi-directional causality between economic growth final household consumption.

The results in Table 5 also found that the null hypothesis of Δ LEXP does not Granger cause Δ LGDP and Δ LGDP does not Granger cause Δ LEXP, are rejected at 1% level. It indicates that there is short-run bi-directional causality between export and economic growth. Again, the null hypothesis of Δ LFGC does not Granger Cause Δ LFHC and Δ LFHC does not Granger Cause Δ LFGC; Δ LEXP does not Granger Cause Δ LFHC and Δ LFHC does not Granger Cause Δ LEXP, are rejected and statistically significant, indicating short-run bi-directional causality between government final consumption and household final consumption; and between export and household final consumption. Finally, the null hypothesis of Δ LEXP does not Granger Cause Δ LFGC, is rejected at 10% level of significance but Δ LFGC does not Granger Cause Δ LEXP, is accepted. Therefore, in the short-run a unidirectional causality is found between export and government final consumption in Bangladesh. These results support the previous results obtained from VECM about the existence of short-run causality between the variables.

Table 5. Granger Causality Test.

Null Hypothesis	Observation	F-Statistic	Probability	Decision
Δ LFHC does not Granger Cause Δ LGDP	39	2.707	0.081	Rejected
Δ LGDP does not Granger Cause Δ LFHC	39	34.246	0.000	Rejected
Δ LFGC does not Granger Cause Δ LGDP	39	3.096	0.057	Rejected
Δ LGDP does not Granger Cause Δ LFGC	39	4.307	0.021	Rejected
Δ LEXP does not Granger Cause Δ LGDP	39	15.594	0.000	Rejected
Δ LGDP does not Granger Cause Δ LEXP	39	10.064	0.001	Rejected
Δ LFGC does not Granger Cause Δ LFHC	39	5.491	0.009	Rejected
Δ LFHC does not Granger Cause Δ LFGC	39	3.226	0.053	Rejected
Δ LEXP does not Granger Cause Δ LFHC	39	20.418	0.000	Rejected
Δ LFHC does not Granger Cause Δ LEXP	39	4.566	0.018	Rejected
Δ LEXP does not Granger Cause Δ LFGC	39	2.723	0.080	Rejected
Δ LFGC does not Granger Cause Δ LEXP	39	0.188	0.829	Accepted

Appropriate Lag: 2

4.6. Results of Vector Autoregression Model

The results of vector autoregression model are presented in Table 6. In the present study three periods lag have been used because LR, FEP, AIC, SC, and HQ criteria give the minimum value in case of three periods lag which is shown in appendix in Table A.1. Considering the LGDP equation, it is found that one and two lag of LFHC has negative and significant effect on LGDP, whereas two lag of LFGC and one lag of LEXP have positive and significant effect on LGDP. In equation

LFHC, two lag of LGDP has a positive but three lag of LGDP has negative effect on LFHC. On the other hand, only three lag of LFGC and two lag of LEXP have positive and significant effect on LFHC. Again, in LFGC equation, two lag of LGDP, one lag of LFHC, two lag of export have positive and significant effect on LFHC. In LEXP equation, one lag of LGDP and LFGC has negative effect on LEXP where as two lag of LGDP, one lag of LFHC, one lag of LFGC, and one and two lag of LEXP have positive and significant effect on LEXP.

Table 6. Vector Autoregressive Analysis.

Variables	LGDP	LFHC	LFGC	LEXP
LGDP(-1)	0.400[2.064]	0.625[1.469]	1.081[0.193]	-2.511[-1.905]
LGDP(-2)	0.438[2.452]	0.749[1.911]	7.083[1.708]	2.794[2.304]
LGDP(-3)	0.319[2.099]	-0.710[-2.131]	-1.795[-0.410]	0.616[0.596]
LFHC(-1)	-0.201[-1.929]	-0.083[-0.363]	0.121[12.100]	1.453[2.046]

Variables	LGDP	LFHC	LFGC	LEXP
LFHC(-2)	-0.211[-1.898]	-0.165[-0.674]	-2.297[-0.716]	-0.674[-0.891]
LFHC(-3)	0.06[0.556]	0.303[2.196]	0.473[0.151]	-0.167[-0.226]
LFGC(-1)	0.001[0.106]	0.013[0.831]	0.542[2.638]	-0.071[-1.868]
LFGC(-2)	0.014[3.500]	0.016[0.867]	0.055[0.222]	-0.051[-0.875]
LFGC(-3)	0.008[0.851]	0.112[5.600]	-0.034[-0.130]	0.004[0.062]
LEXP(-1)	0.072[2.446]	0.079[1.210]	1.091[3.724]	0.560[2.782]
LEXP(-2)	-0.042[-1.346]	0.167[2.421]	-0.869[-0.958]	0.390[1.823]
LEXP(-3)	-0.011[-0.387]	0.002[0.027]	-1.148[-1.413]	-0.283[-1.475]
Constant	2.733	5.289	6.615	-18.322

Note: Value in [] indicates 't' statistic

4.7. Results of Impulse Response Function

Impulse response functions are used to explore the response of variables to each other in the present study. Variables of same orders are used in the impulse response functions because of having sensitivity. The impulse response function is derived from the unrestricted VAR model and is presented in Figure A.1 in Appendix A. The figure shows the reaction of one standard deviation shock in one variable on the other variables of the system. Assuming one standard deviation shock in LGDP, initially the reaction is decreasing for two periods of forecast and then it is increasing for remaining periods. The response of LGDP to LFGC is increasing for two periods of forecast and it is showing a decreasing trend for remaining periods. The response result of LGDP to LFHC shows the fluctuations for five periods and after five periods, it shows constant trend whereas, the response of LGDP to LEXP shows fluctuation for two periods of forecast and for remaining periods it shows an upward trend. The standard deviation shock in LFGC shows the decreasing trend for whole periods of forecast. On the other hand, the response of LEXP to LEGC indicates decreasing trends for five periods and it increases after five periods and becomes negative after the end of two periods. Again, the responses of LFHC to LGDP, LFHC to LFGC, LFHC to LEXP and LFGC to LGDP show upward trend for whole forecast periods whereas the response of LFGC to LFHC shows nearly constant trend for all periods of forecast. The standard deviation shock in LFHC indicates fluctuation for five periods of forecast and it shows decreasing trends for remaining periods of forecast. The trends of response of LEXP to LFHC and LEXP to LGDP fluctuate for three

periods and become upward after three periods whereas the response of LFGC to LEXP fluctuates for eight periods and become constant after eight periods

5. Conclusion and Policy Suggestions

The present study has explored the causal relationship between domestic demand, exports and economic growth in the context of Bangladesh using data on real GDP, real exports, final household consumption and final government consumption over the period 1971–2011. The results of the tests suggest that a positive long-run equilibrium relationship exists among domestic demand, exports and economic growth. There has been a significant bidirectional relationship between final household consumption and economic growth, and a significant unidirectional relationship running from final government consumption to economic growth and export to economic growth for Bangladesh during the study period. The findings of causal relationship between domestic demand, export and economic growth support both the domestic demand-based and the export-led growth in Bangladesh. Thus, it can be concluded that a successful and sustained economic growth need enough domestic demand. Moreover, direct effect of exports on growth means that exports affect economic growth. Therefore, it should be clear from Bangladesh's case that domestic demand and export sustain the country's long-run economic growth. Therefore, the government of Bangladesh should come forward with proper domestic demand and export oriented policies, and act properly to promote exports and domestic demand.

Appendix A

Table A. 1. VAR Lag Order Selection Criterion.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	124.48	NA	1.28E-09	-6.29	-6.07	-6.21
1	405.79	473.78	1.79E-15	-19.78	-18.49	-19.32
2	471.61	93.54	2.25E-16	-21.93	-19.56	-21.08
3	547.34	87.69*	1.89E-17*	-24.59*	-21.15*	-23.37*

*indicates lag order selected by the criterion: LR = Sequential modified LR test statistic; FPE = Final prediction error; AIC = Akaike information criterion; SC = Schwarz information criterion; HQ = Hannan-Quinn information criterion.

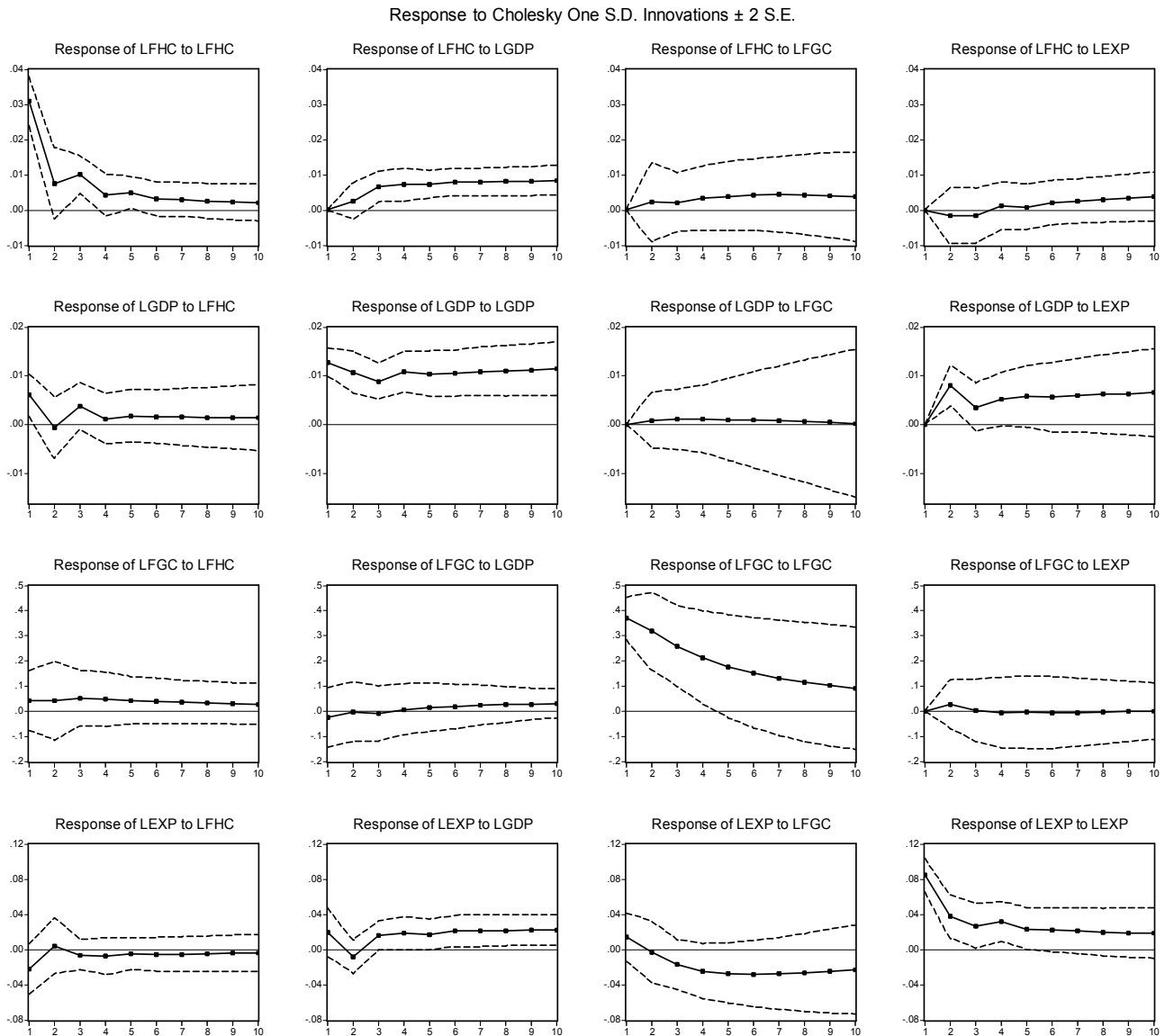


Figure A. 1. Impulse Response Functions.

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