The Impact of export revenue on Gross domestic product (GDP): Evidence from Bangladesh.

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Abstract

For Bangladesh, export revenue is a concerning issue in the recent years. Hence, understanding the impact of export revenue on the macroeconomic variables such as GDP (gross domestic product) is essential for the policy makers of the recipient economy. The main objective of this study is to investigate the relationship between export revenue and GDP in Bangladesh. To test stationary, correlogram test is used. This study uses Granger causality and then co-integration test to investigate the long run relationship between GDP and export revenue in Bangladesh during the period of 1981-2015.The maximum lag length of the model is found by using Vector Autoregressive (VAR) lag order selection criteria. To analyze the data the model is formed by taking GDP as dependent variable and three variables (remittances, foreign direct investment, export revenue) as independent variables. Result of the correlogram test indicate that all the variables are non-stationary at level. But when these four variables are tested at first difference then the problem of non-stationary has disappeared and hence they become stationary at first difference .Granger causality test indicates that there is bidirectional causality from export revenue to GDP in Bangladesh. Johansen co-integration test confirms the existence of the long –run equilibrium relationship between the variables of the model. The VECM presents that there is no statistically significant long run positive relationship between export revenue and GDP. But Bangladesh has indicated a statistically significant short run positive relation between export revenue and GDP.

Keywords:

Export revenue, GDP, VAR, Co-integration, Vector Error Correction Model (VECM).

1. Introduction:

Role of export revenue in Bangladesh: Bangladesh is a developing country. It has a lot of natural resources. But proper utilization of our natural resources is not possible, because we do not have enough capital and technology. So we are dependent on foreign trade. It is a process of creating economic relationship with other countries. Export is a potential weapon of developing the Bangladesh economy and can play an important role to reduce poverty. Growth of an economy is directly related to export. If export increase at a faster pace as compare to imports, nothing can stop an economy from being developed one. Exports are component of aggregate demand (AD). Rising exports will help increase AD and cause higher economic growth. Growth in exports can also have a knock on effect to related 'Service industries'. The strength of exports has a large role in determining the current account deficit. In a capital-poor country like Bangladesh, export can emerge as a significant factor to build up physical capital, create employment opportunities, develop productive capacity and help integrate the domestic economy. Bangladesh's export earnings are mostly determined by the export of readymade garments (RMG) to North American and European countries with 75% of total export earning coming from this sector. Readymade garments are the largest export industry and determine the dynamics of total export earnings for Bangladesh. It is still growing at a satisfactory rate.

The RMG sector contributes around three quarters of total export earnings. An estimated 4.2 million people are employed in the sector, most are women, half of whom come in from rural areas and villages.
By 2013 there were approximately 5000 factories, part of Bangladesh's US$19 billion a year export-oriented RMG industry has revolutionized the country in terms of its contribution to GDP growth. Bangladesh export goods and services to UK, USA, Canada, Japan, Australia, New Zealand and Russia etc. Markets are also opening up in the Middle East, Latin America and Africa.

Role of Remittances in Bangladesh: The role of remittances in the economies labor sending countries like Bangladesh is assuming increasing importance. The effects of remittance on the macro economy of a country are universally proved. The incoming foreign exchange helps receiving countries to pay import liabilities, improve their position in balance of payments, strengthen foreign exchange reserves and finance external debt. Studies indicate that remittances may raise per capita income and reduce poverty in our country. For example a 10% increase in the share of remittance to GDP in a given country would lead to a 1.6% decline in the share of people living in poverty. Remittances advance human development outcomes. Studies based on household surveys exhibit that children from remittance receiving households have a lower school dropout rate and three households spend more on private tuition for their children. Remittance also play an important role in smoothening household consumption basically respond positively in case of adverse shocks relating to natural disasters, crop failure, job loss and health crisis. Remittance can diminish poverty through augmenting the income of recipient households, through indirect multiplier effects and through their macroeconomic effects. The Keynesian multiplier theory suggests that even if the remittances are totally spent on consumption there will still be benefit to the receiving economy, to the extent the funds are spent on local goods and services. As one of the Least Developed Countries (LDC), foreign currency is needed for socio-economic development. Remittances help Bangladesh to make investments for industrial development, modernize its industries by importing high-tech machineries for export-oriented manufacturing, modernize its agriculture, invest in education, etc. On the other hand, these factors create more employment in the country to increase its export of manufactured goods as opposed to agricultural products, raw materials, low quality finished products etc., as they were in the past.

Role of FDI in Bangladesh: Foreign direct investment (FDI) is defined as a long-term investment by a foreign direct investor in and enterprise resident in an economy other than that in which the foreign direct investor is based. As a developing country, Bangladesh needs FDI for its ongoing development process. The total inflow of FDI has been increasing over the years. In 1972, annual FDI inflow was 0.090 million USD and after 33 years, in 2005 annual FDI came to 845.30 million USD and to 989 million USD in 2006. FDI promote competition in the domestic input market. Profits generated by FDI contribute to the corporate revenue in the host country. Operation of new ventures by FDI leads to employee learning in the host countries that learn how to manage and operate the business. This contributes to human capital development of the host country. FDI allows transfer of capital and technology, which is not possible through financial investment in goods and services. Profits generated by FDI contribute to tax revenue in the host country like Bangladesh. FDI is recognized as a powerful engine for economic growth. It enables capital poor country like Bangladesh to build up physical capital, create employment opportunities, develop productive capacity, enhance skills of local labor through transfer of technology and managerial know-how, and help integrate the domestic economy with the global economy.

In Bangladesh, FDI inflows are reported under the capital and financial account of the country's Balance of Payments (BOP) which provides the direct effect on the BOP. Thus the inflow of FDI plays an important role in determining the surplus/deficit in the capital and financial account of the BOP statement. So the impact of FDI on Bangladesh's BOP is positive. Some positive sides of FDI are given below:

a. Increase productive efficiency due to competition from multinational subsidiaries.
b. Improve the quality of the factors of production including management in other firms, not just the host firm.
c. Increase the export revenue.
d. Increase the savings and investment.
e. Certain faster growth and employment.

2. Literature review:

Afaf Andull J. Saaed and Majeed Ali Hussain (2015) showed that there is unidirectional causality between exports and economic growth. These results provide that growth in Tunisia was propelled by a growth –led import strategy as well as export led import. Imports are thus seen as the source of economic growth in Tunisia. Muhammad A. Quddus and Ikram Saeed (2005) examined if export and GDP are co-integrated by the using Johansen approach; whether export Granger cause GDP growth; whether Granger cause investment. A positive Granger causal relationship running from export to economic growth is suggested by the test results for the long-run period. Majeed A. Hussain (2014) found that there is Granger causality relationship between exports and economic growth in Pakistan. The relationship between exports and economic growth has long been a subject of great interest in the development literature. Zahoor Hussain Javed, Imran Qaiser Anam Mushtaq Saif-ullaha, Ashraf Iqbal (2012) Proved that explanatory variable (export) has positive and significant impact on the economy of Pakistan. The results also showed that international trade may play an important role to enrich the economy of Pakistan. Mushfica Akter(2015) revealed that the impact of export on economic growth found as positive and an opposite scenario is investigated in the case of import. Haydory Akbar Ahmed and Md. Gazi Salah Uddin(2009) examined that time series analysis indicate exports, imports and remittances cause GDP growth in the short run but has no long run impact. The causal nexus unidirectional long run GDP growth causes short run income growth but this affect is once again unidirectional. Using Johansen's multivariate approach to co-integration, and using imports and remittance as additional variables, findings suggest that real GDP, real exports, real imports and real remittance are co-integrated for Bangladesh, implying a long run relationship amongst all three variables. Sri-Lankan economist Velnampy. T and Achchuthan.S(2013) showed that, the export and import have the significant positive relations with each other, and also, both export and import have the significant impact on the economic growth. Aisha Ismail, Khalid Zaman, Rao Muhammad Atif, Abida Jadoo and Rabia Seemab(2010) examined a long-run relationship between the variables (export and GDP) has been found by Johansen's co-integration test. The error correction model has been applied to streamline of the variables on economic growth. Dr. Sushil Kumar Rai, Ms. Purvashree Jhala (2015) showed that, there is a positive relationship between growth rate and exports. Rummana Zaheer, Sanam Wagma Khattak, Huma Ashar and Khanzaib (2014) indicated that both variables exports and imports have significant relationship with growth rate. So government should move towards more exchange rate liberalization policy in order to increase its economic growth. In this paper I want to investigate the relationship between export revenue and its impact on GDP in Bangladesh using the time series analysis.

3. Methodology:

Since the issue of causality is at the foundation of any study that examines an economic relationship, the empirical analysis starts with the Granger-causality tests to determine if export revenue Granger –causes GDP and/or inversely GDP Granger-cause export revenue. Correlogram test is used for testing the time series data are stationary or not. For optimal lag length selection I used Vector Autoregressive (VAR) model. To test the long run relationship between GDP and export revenue Johansen co-integration test is run. Also error correction model is used to verify short run dynamics with long-run equilibrium. There are techniques for error correction model, such as the VECM which is more significant for multivariate framework. All of the econometric tests are done by Eviews-7 and SPSS-20.

4. Data Sources:

Annual data of the variables of the model over the 1981-2015 periods in Bangladesh are collected from various secondary sources. Data on GDP is taken from World Bank. Data on remittances and export revenue are collected from Bangladesh Economic Review. The data on FDI is taken from various kinds of sources like Bangladesh Bank, and Bangladesh Bauru of Statistics.

5. Model Specification:

In order to examine the impact of export revenue on GDP, I have specified following econometric model. The independent variables are remittance, FDI, export revenue, while the dependent variable is GDP. The model is stated as follows:

$$GDP = f(remittance, FDI, export\ revenue)$$

$$Or\ GDP_t = \alpha + \beta Rem_t + \delta FDI_t + \sigma Exr_t + U_t$$

Where, GDP = Gross Domestic Product, Rem = Remittances, FDI = Foreign Direct Investment, Exr = Export revenue. All the variables are counted in Million $US. α,β,δ,σ =parameters to be estimate, U = Stochastic term, and t =1,2,3,……..35(time period from 1981-2015).

5.1. Testing for stationary/Non-stationary:

One simple test of stationary is based on the so-called autocorrelation function (ACF). The ACF at lag *k*, denoted by ρ_k , is defined as

$\rho_k = \frac{\gamma_k}{\gamma_o}$ = covariance at lag *k*/Variance.

Since both covariance and variance are measured in the same units of measurement, ρ_k is unit less, or pure, number. It lies between -1 and +1, as any correlation coefficient does. If we plot ρ_k against *k,* the graph we obtain is known as the population correlogram. If we have a realization of a stochastic process, we can only compute the sample autocorrelation function (SAFC), $\hat{\rho}_k$. To compute the sample covariance at lag *k*, $\hat{\gamma}_k$,and the sample variance, $\hat{\gamma}_o$, which are defined as

$$\hat{\gamma}_k = \frac{\sum (Y_t - \bar{Y})(Y_{t+k} - \bar{Y})}{n}$$

$$\hat{\gamma}_o = \frac{\sum (Y_t - \bar{Y})^2}{n}$$

Where n is the sample size and $\bar{Y}$ is the sample mean. Therefore, the sample autocorrelation function at lag *k* is $\hat{\rho}_k = \frac{\hat{\gamma}_k}{\hat{\gamma}_o}$

Which is simply the ratio of sample covariance (at lag *k*) to sample variance. A plot of $\hat{\rho}_k$ against *k* is known as the sample correlogram.

5.2. The Granger Causality test:

For Granger Causality test, we will consider the often asked question in Macroeconomics: Is it GDP "causes" the export revenue or is it the export revenue that ''causes'' GDP. The Granger causality test assumes that the information relevant to the prediction of the respective variables, GDP and export revenue, is consider solely in the time series data on these variables. The test involves estimating the following pair of regressions:

$$GDP_t = \sum_{i=1}^{n} \omega_i \, Exr_{t-i} + \sum_{i=1}^{n} \varphi_i \, GDP_{t-i} + u_{1t} \ldots\ldots\ldots\ldots (1)$$

$$Exr_t = \sum_{i=1}^{n} \lambda_i \, Exr_{t-i} + \sum_{i=1}^{n} \nu_i \, GDP_{t-i} + u_{2t} \ldots\ldots\ldots\ldots (2)$$

Equation (1) postulates that current GDP is related to past values of itself as well as that of Exr, and (2) postulates a similar behavior for Exr. It is assumes that the disturbances u_{1t} and u_{2t} are uncorrelated.

5.3. Johansen Co-integration test:

Co-integration analysis helps to indentify long-run relationship among the variables. Two variables are said to be co-integrated, if they have same stochastic trend. This test depends on his Maximum Likelihood (ML) estimator of the parameters of the following VEC model of two co-integrating variables. For determining the number of lags in the co-integration test (VAR), we use the FPE: Final Prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion and the HQ: Hannan-Quinn information criterion. To indentify the number of co-integrating vectors present, we use the trace and maximal eigenvalue tests. We then estimate the VECM for all the endogenous variables in the model and use it to carry out tests such as Granger causality tests over the short and long run. Furthermore, for understanding the interactions of the variables we carry out variance decomposition tests. Johansen-Juselius Multivariate Co-integration Model under vector autoregressive environment,-

$$\Delta X_t = \sum_{i=1}^{p-1} \mu_i \, \Delta X_{t-i} + \eta X_{t-1} + \varepsilon_t \ldots\ldots\ldots (3)$$

Where, X_t is the (2*1) vector respectively, Δ is a symbol of difference operator, ε_t is a (2*1) vector of residuals. The vector error model has information about the short and long-run adjustment to changes in X_t, via the estimated parameters μ_i and, respectively. Here, ηX_{t-1} is the error correction term and η can be factored into two separate matrices α and β, such as $\eta=\alpha\beta$ where β denotes the vector of co-integrating parameters while α is the vector of error-correction co-efficient measuring the speed of convergence to the long-run steady state.

5.4. Vector Error Correction Model (VECM):

There can be a long-run relationship between two series in a bivariate relationship, if each series is integrated of the same order or have the same stochastic trend. If co-integration has been detected between the series, then there exists a long-run equilibrium relationship between them. So we apply VECM in order to evaluate the short run properties of the co-integrated series. In case of no co-integration VECM is no longer required and we directly precede to Granger causality tests to establish causal links between variables. The regression equation form of VECM is as follows:

$$\Delta Y_t = \alpha_1 + p_1 e_1 + \sum_{i=0}^{m} \beta_i \, \Delta Y_{t-i} + \sum_{i=o}^{m} \delta_i \, \Delta X_{t-i} + \sum_{i=0}^{m} \gamma_i \, \Delta Z_{t-i} \ldots\ldots\ldots (4)$$

$$\Delta X_t = \alpha_2 + p_2 e_{i-1} + \sum_{i=0}^{m} \beta_i \, \Delta Y_{t-i} + \sum_{i=0}^{m} \delta_i \, \Delta X_{t-i} + \sum_{i=0}^{m} \gamma_i \Delta Z_{t-i} \ldots\ldots\ldots\ldots (5)$$

6. Results and Discussion:

6.1. Correlogram Test:

Correlogram test is used to check the variables are stationary or not. The results have shown that all the variables are non-stationary at level. But when these variables ate tested at first difference then the null hypothesis is accepted and the alternative hypothesis is rejected. Because all variables p-values > 0.05 (5%). That means all variables are stationary at first difference and their integrated order is one or I(1).

6.2. Optimal Lag Length Selection:

After the correlogram test, the maximum lag length of the model is found by using Vector Autoregressive (VAR) lag order selection criteria. The results are shown into the Table-1 and it has confirmed that the maximum lag length of the model is '3' and it is selected on the basis of the minimum value of each criterion and based on that the maximum number of 'lag 3' should be chosen. All criteria are asking to take 3lag. So our optimum lag would be '3' and we should use it in Johansen co-integration test and vector error correction model.

Table: 1

VAR Lag Order Selection Criteria
Endogenous variables: GDP REM FDI EXR
Exogenous variables: C
Date: 12/30/16 Time: 04:54
Sample: 1 35
Included observations: 32

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1159.305	NA	4.43e+26	72.70658	72.88979	72.76731
1	-1049.686	184.9827	1.29e+24	66.85537	67.77145	67.15902
2	-1017.410	46.39651	4.90e+23	65.83813	67.48708	66.38471
3	-948.0863	82.32190*	2.01e+22*	62.50539*	64.88721*	63.29490*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

6.3. Granger causality test:

The study examines the relationship between GDP and export revenue first using Granger causality analysis for Bangladesh over the period 1981-2015. The Granger causality approach provides a plausible technique to consider both lagged and endogenous relationship. The results of causality between GDP, Rem, FDI and Exr are contained in table-2. The empirical result shows a bidirectional relationship between GDP and Export revenue in Bangladesh. The results of the test are given below:

Table: 2

Pairwise Granger Causality Tests

Date: 01/05/17 Time: 11:58

Sample: 1 35

Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
D(REM) does not Granger Cause D(GDP)	31	1.30757	0.2949
D(GDP) does not Granger Cause D(REM)		15.5761	8.E-06
D(FDI) does not Granger Cause D(GDP)	31	1.59136	0.2175
D(GDP) does not Granger Cause D(FDI)		8.83668	0.0004
D(EXR) does not Granger Cause D(GDP)	31	38.1572	3.E-09
D(GDP) does not Granger Cause D(EXR)		26.6660	8.E-08
D(FDI) does not Granger Cause D(REM)	31	4.22304	0.0156
D(REM) does not Granger Cause D(FDI)		5.44588	0.0053
D(EXR) does not Granger Cause D(REM)	31	9.77387	0.0002
D(REM) does not Granger Cause D(EXR)		6.24278	0.0028
D(EXR) does not Granger Cause D(FDI)	31	5.64386	0.0045
D(FDI) does not Granger Cause D(EXR)		19.8485	1.E-06

6.4. Johansen Test of co-integration:

The precondition for Johansen co-integration test is, the variables must be non-stationary at level but when we convert all the variables into first difference, then they will become stationary. Only then we can run the Johansen co-integration test. Here all of my variables are stationary at first difference, so we can run co-integration test. Table-3 shows the presence of co-integration for the variables adopted in this study, where it is statistically valid. This implies that there is a long-run relationship amongst GDP, remittance, FDI and export revenue. Max Eigenvalue test indicates 1 co-integrating equation at the 0.05 level. Trace indicates 1 co-integrating equation at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. The results of the Trace tests indicate the presence that the two variables are co-integrated vectors.

Table: 3

Date: 12/30/16 Time: 04:56
Sample (adjusted): 5 35
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: GDP REM FDI EXR
Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.953238	118.9662	47.85613	0.0000
At most 1	0.433196	24.02277	29.79707	0.1995
At most 2	0.153862	6.422759	15.49471	0.6455
At most 3	0.039319	1.243513	3.841466	0.2648

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.953238	94.94344	27.58434	0.0000
At most 1	0.433196	17.60001	21.13162	0.1455
At most 2	0.153862	5.179246	14.26460	0.7190
At most 3	0.039319	1.243513	3.841466	0.2648

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

6.5.Vector Error Correction Model:

As the four variables are co-integrated we can run VECM model. In the previous test, we have seen that the variables are co-integrated and there is a long run relationship among the variables. So in this case we can run VECM. In this paper I used multivariate framework, which is given below:

$$\Delta GDP_t = \alpha_{10} + \alpha_{GDP}\hat{e}_{t-1} + \sum_{i=1}^{m}\alpha_{11}(i)\Delta GDP_{t-i} + \sum_{i=1}^{m}\alpha_{12}(i)\Delta \mathrm{Re}\, m_{t-i} + \sum_{i=1}^{m}\alpha_{13}(i)\Delta FDI_{t-i} + \sum_{i=1}^{m}\alpha_{14}(i)\Delta Exr_{t-i} + \varepsilon_{(GDP)t} \quad \text{.....(6)}$$

The other three equations in the ECM model system are:

$$\Delta \mathrm{Re}\, m_t = \alpha_{20} + \alpha_{\mathrm{Re}\, m}\hat{e}_{t-1} + \sum_{i=1}^{m}\alpha_{21}(i)\Delta GDP_{t-i} + \sum_{i=1}^{m}\alpha_{22}(i)\Delta \mathrm{Re}\, m_{t-i} + \sum_{i=1}^{m}\alpha_{23}(i)\Delta FDI_{t-i} + \sum_{i=1}^{m}\alpha_{24}(i)\Delta Exr_{t-i} + \varepsilon_{(\mathrm{Re}\, m)t} \quad \text{.....(7)}$$

$$\Delta FDI_t = \alpha_{30} + \alpha_{FDI}\hat{e}_{t-1} + \sum_{i=1}^{m}\alpha_{31}(i)\Delta GDP_{t-i} + \sum_{i=1}^{m}\alpha_{32}(i)\Delta \mathrm{Re}\, m_{t-i} + \sum_{i=1}^{m}\alpha_{33}(i)\Delta FDI_{t-i} + \sum_{i=1}^{m}\alpha_{34}(i)\Delta Exr_{t-i} + \varepsilon_{(FDI)t} \quad \text{.....(8)}$$

$$\Delta Exr_t = \alpha_{40} + \alpha_{Exr}\hat{e}_{t-1} + \sum_{i=1}^{m}\alpha_{41}(i)\Delta GDP_{t-i} + \sum_{i=1}^{m}\alpha_{42}(i)\,\mathrm{Re}\, m_{t-i} + \sum_{i=1}^{m}\alpha_{43}(i)\Delta FDI_{t-i} + \sum_{i=1}^{m}\alpha_{44}(i)\Delta Exr_{t-i} + \varepsilon_{(Exr)t} \quad \text{.....(9)}$$

Where, $\hat{e}_{t-1}$ is the error- correction term, which is the co-integrating, vectors and α_i is the adjustment coefficient indicating the weight of adjusted disequilibrium in the past. If the variables have long-run relationship, the co-efficient of α_i must be statistically significant. α_{10}, α_{GDP}, andα_{11} (i) are the parameters, an ε_{it} is the white-noise disturbance terms. In table-4 C(1) is the speed of adjustment towards long run equilibrium but it must be significant and the sign must be negative. From our results (Table-4) we can see that C(1) is negative(-0.0220220) but the p-value, (0.8523)> 0.05. So, there is no long run causality from the three independent variables (Rem, FDI, Exr). Meaning that Rem, FDI and Exr have no influence on the dependent variable GDP in the long run. In other words there is no long run causality running from Rem, FDI and Exr to GDP. The results are given below:

Table: 4

Dependent Variable: D(GDP)
Method: Least Squares
Date: 12/30/16 Time: 04:59
Sample (adjusted): 5 35
Included observations: 31 after adjustments
D(GDP) = C(1)*(GDP(-1) - 26.5640629593*REM(-1) + 229.12319484*FDI(
-1) - 4.70907382612*EXR(-1) + 2237.39742401) + C(2)*D(GDP(-1)) +
C(3)*D(GDP(-2)) + C(4)*D(GDP(-3)) + C(5)*D(REM(-1)) + C(6)*D(REM(
-2)) + C(7)*D(REM(-3)) + C(8)*D(FDI(-1)) + C(9)*D(FDI(-2)) + C(10)
*D(FDI(-3)) + C(11)*D(EXR(-1)) + C(12)*D(EXR(-2)) + C(13)*D(EXR(-3))
+ C(14)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.022020	0.116494	-0.189026	0.8523
C(2)	0.144955	0.194823	0.744033	0.4670
C(3)	0.067075	0.226821	0.295719	0.7710
C(4)	0.046506	0.588714	0.078996	0.9380
C(5)	-4.582433	4.269568	-1.073278	0.2981
C(6)	-4.023298	4.945088	-0.813595	0.4271

C(7)	-0.416980	4.623882	-0.090180	0.9292
C(8)	0.746194	24.52954	0.030420	0.9761
C(9)	0.862665	16.92070	0.050983	0.9599
C(10)	-15.02848	17.49347	-0.859091	0.4022
C(11)	1.408499	2.245559	0.627238	0.5388
C(12)	-0.400249	1.750651	-0.228629	0.8219
C(13)	10.42977	2.043848	5.103004	0.0001
C(14)	-660.5104	1303.875	-0.506575	0.6190

R-squared	0.938037	Mean dependent var	5536.903
Adjusted R-squared	0.890654	S.D. dependent var	11442.86
S.E. of regression	3783.867	Akaike info criterion	19.61733
Sum squared resid	2.43E+08	Schwarz criterion	20.26494
Log likelihood	-290.0687	Hannan-Quinn criter.	19.82844
F-statistic	19.79682	Durbin-Watson stat	1.946862
Prob(F-statistic)	0.000000		

6.6. Wald test:

I used Wald Statistics to check the short run causality. Here, the null hypothesis is, H_o: C(11)=C(12)=C(13)=0(There is no short run causality from export revenue to GDP). According to test results (Table-5), we can reject the Null hypothesis, because our p-value (0.000) < 0.05. So there is short run causality from export revenue to GDP. The results of the test are given below:

Table: 5

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	13.11311	(3, 17)	0.0001
Chi-square	39.33934	3	0.0000

Null Hypothesis: C(11)=C(12)=C(13)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(11)	1.408499	2.245559
C(12)	-0.400249	1.750651
C(13)	10.42977	2.043848

Restrictions are linear in coefficients.

7. Conclusion:

The main objective of this study was to investigate the impact of export revenue on GDP in Bangladesh. Annual time series data for the period of 1981-2015 are used in the study, co-integration and error correction models are used to find the long run and short run relationship between the export revenue and GDP for Bangladesh. The methodology is employed in the study include the regression analysis to examine the impact; stationary test is carried out using the correlogram test. The empirical results suggest that, there exists bidirectional causality in Granger causality test. There is a long run relationship among the variables in co-integration test but short run causality in vector error correction model form export revenue to GDP. So Government needs to take proper steps for improving exports to increase our economic growth.

Appendix:

Correlogram of D (GDP)

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |** |	. |** |	1	0.338	0.338	4.2336	0.040
. |** |	. |** |	2	0.310	0.221	7.9092	0.049
. | . |	.*| . |	3	0.067	-0.106	8.0873	0.044
. | . |	. | . |	4	0.054	-0.008	8.2055	0.084
. | . |	. | . |	5	0.046	0.058	8.2934	0.141
. | . |	. | . |	6	0.038	0.009	8.3578	0.213
. | . |	. | . |	7	0.034	-0.001	8.4096	0.298
. | . |	. | . |	8	0.018	-0.001	8.4253	0.393
. | . |	. | . |	9	0.014	0.004	8.4352	0.491
. | . |	. | . |	10	-0.002	-0.012	8.4355	0.586
. | . |	. | . |	11	-0.016	-0.020	8.4485	0.673
. | . |	. | . |	12	-0.019	-0.008	8.4694	0.747
. | . |	. | . |	13	-0.023	-0.008	8.4994	0.810
. | . |	. | . |	14	0.024	0.046	8.5349	0.860
.*| . |	.*| . |	15	-0.105	-0.140	9.2471	0.864
. | . |	. | . |	16	-0.044	0.000	9.3771	0.897

Correlogram of D (Rem)

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.119	0.119	0.5266	0.468
. |** |	. |** |	2	0.297	0.287	3.9116	0.141
. | . |	. | . |	3	0.024	-0.039	3.9347	0.269
. | . |	. | . |	4	0.038	-0.051	3.9933	0.407
. |*. |	. |*. |	5	0.086	0.101	4.3021	0.507
. | . |	. | . |	6	-0.043	-0.062	4.3811	0.625
.*| . |	.*| . |	7	-0.137	-0.203	5.2378	0.631
**| . |	.*| . |	8	-0.212	-0.170	7.3624	0.498
.*| . |	. | . |	9	-0.116	0.016	8.0250	0.532
.*| . |	. | . |	10	-0.090	0.019	8.4390	0.586
. | . |	. | . |	11	-0.047	-0.015	8.5550	0.663
. | . |	. | . |	12	-0.047	0.006	8.6774	0.730
. | . |	. | . |	13	-0.060	-0.011	8.8899	0.781
.*| . |	.*| . |	14	-0.098	-0.124	9.4773	0.799
. | . |	. | . |	15	0.001	-0.024	9.4773	0.851
. | . |	. | . |	16	-0.040	-0.031	9.5841	0.887

Correlogram of D (FDI)

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
**| . |	**| . |	1	-0.294	-0.294	3.1956	0.074
. | . |	.*| . |	2	-0.046	-0.144	3.2757	0.194
. | . |	. | . |	3	0.011	-0.053	3.2801	0.350
. | . |	. | . |	4	0.022	0.003	3.3001	0.509
. | . |	. | . |	5	-0.025	-0.020	3.3274	0.650
. |** |	. |** |	6	0.255	0.275	6.1793	0.403
**| . |	. | . |	7	-0.219	-0.063	8.3475	0.303
. | . |	.*| . |	8	-0.025	-0.079	8.3774	0.397
. |*. |	. |*. |	9	0.162	0.125	9.6657	0.378
. | . |	. | . |	10	-0.026	0.040	9.6990	0.467
. | . |	. | . |	11	-0.031	-0.003	9.7488	0.553
.*| . |	**| . |	12	-0.130	-0.230	10.686	0.556
. | . |	.*| . |	13	-0.033	-0.100	10.751	0.632
. |*. |	. | . |	14	0.092	0.039	11.268	0.665
. | . |	.*| . |	15	-0.034	-0.111	11.343	0.728
. | . |	. | . |	16	0.016	0.044	11.361	0.787

Correlogram of D (Exr)

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.099	0.099	0.3605	0.548
. | . |	. | . |	2	0.009	-0.001	0.3636	0.834
. | . |	. | . |	3	0.054	0.053	0.4770	0.924
. | . |	. | . |	4	0.033	0.022	0.5202	0.972
**| . |	**| . |	5	-0.296	-0.306	4.2286	0.517
. | . |	. |*. |	6	0.059	0.131	4.3828	0.625
. | . |	. | . |	7	-0.001	-0.026	4.3828	0.735
. | . |	. | . |	8	-0.048	-0.020	4.4913	0.810
.*| . |	.*| . |	9	-0.092	-0.076	4.9080	0.842
.*| . |	.*| . |	10	-0.071	-0.170	5.1664	0.880
. | . |	. | . |	11	-0.043	0.059	5.2666	0.918
.*| . |	.*| . |	12	-0.066	-0.083	5.5111	0.939
. | . |	. | . |	13	0.004	0.026	5.5121	0.962
. | . |	. | . |	14	0.055	0.022	5.6953	0.974
. | . |	.*| . |	15	-0.030	-0.116	5.7546	0.984
. | . |	. |*. |	16	0.017	0.079	5.7743	0.990

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