

External Public Debt and Economic Growth in Bangladesh: A Co-Integration Analysis

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Abstract

External Debt (ED) is considered as a significant source of income for developing countries. Bangladesh relied on foreign debt to finance its balance of payments deficit and saving investment gap. This paper tried to investigate the impact of foreign debt on growth in Bangladesh. Rudimentary objective of this paper is to explore the relationship between external debt and Gross Domestic Products in Bangladesh for the period of 1972-2012, using time series econometric technique. We took a point of glance of external debt and economic performance of Bangladesh. The results show that there is a significant adverse effect of debt on growth in Bangladesh. The empirical results suggest the existence of long-run relationship between GDP and ED. In Bangladesh External debt service is a burden for its nation that makes the GDP slows down. This study recommended that Bangladesh have to figure out the option of debt cancellation and focus on to increase human development as well as infrastructure development. Debt management should be effective, fair,. Exports, FDI and . Remittances are the key element for the economic growth of Bangladesh and effective, fair debt management are recommended according to the research findings.

Keywords: External Debt (ED), Gross Domestic Product (GDP), Unit Root, Granger Causality, Johansen Co-integration. Remittance

1. Introduction:

Foreign aid and external debt was considered a significant source of income for developing countries. External debt has an impact of growth and fulfills the deficit of developing countries. It also has negative effect the growth and basic reason of negative effect is the restriction of donor agencies (Faioz, 2010). In many other countries the effect is positive because the external debt will increase capital inflow and it is used for investment and can increase the growth. It is not only the accumulation of capital but it also managerial, technological, technics experts for economic growth. In 1990 many policymakers and researcher increased their concern about high external debt in many developing countries limited growth. Many researchers also find out a non-linear relationship between growth and external debt. And this type of analysis increased the policy makers' attention about the impact of debt on growth. In the past war period developing countries were diversify their economy from agriculture to industrial and they borrow a lot of finance. But industrial policy gave them poor return and at the same time agricultural price fall and leading to lower tax revenue. Another reason is oil crisis and oil price for borrowing. During last 50 years the external debt is a problem faced by developing countries. On the other hand external debt is related to many other economic components statistics show how it is growing and how it is affect any other components. A high level debt can cripple the government operations because debt burden is long term cost that cannot be reduce times of fiscal stress. According to the IMF Bangladesh ranked as the 47th largest economy in the world in 2010 in PPP terms and 57th largest in nominal terms with a gross domestic product of US\$ 269.3 billion in PPP terms. But improvement outcomes are not quite good. Because Bangladesh has low savings, low investment depends on external sources, low income, depends on import goods, low export, political instability, unsustainable development.

Conceptually External debt is a part of the total debt in a country that owed to lenders outside the country. The debtors can be the government, corporations and citizens of that country. It is said that external debt is an important financial tools and it is a powerful tool of an economy if it is used prudently in investment or development of a country. It can enhance investment levels and increase growth rate in the economy, if the debt servicing cost is low from the returns of the investment, if the cost is high it is slow the growth. Developing countries are facing deficient finance and it have encouraged them to borrow from developed countries, international organizations, and international finance institution. They mainly borrowed to boost their economic growth and for macroeconomic reason like higher investment, higher consumption and education, health. However all of country in the world may choose to go into foreign debt including infrastructure, development or economic stimulation. In 2009 the total external debt for all over the world is about \$56.9 trillion (USD). Raising of modern

civilization it is very reasonable to borrow money from mutual territories. And global use of external debt established many international institutions. Governments of generally in quantities incur external debt of a developing country by government's ability to repay.

In case of Bangladesh it has many problems like savings investment gap, budget deficient and so on and they borrow from internal and external sources to fill up gap. In fiscal year 2010-2011 total external debt of amount USD 21347.44 million that is 24.24% of GDP. Each year a major portion of its budget expenditure get expanded interest payment so the interest payment impact on growth negatively. From survey for unstable Exchange rate and overseas debt increased the countries per capita debt liability the by about \$2.3 a year on average (2010). In 2008-2009 per capita debt obligation rises \$151.21 where in 2003-2004 is \$136.92 Zaid Bakth said that the debt obligation was rising without the citizens knowing why or how the loans are taken.

Figure 1.1: trend of external debt in Bangladesh



Total debt service on external debt in US dollar. Bangladesh was last measured at 2012, according to World Bank. Total debt service is the sum of principal repayments and interest actual paid in foreign currency, goods, or services on long-term debt, interest paid on short-term debt and repayment to the IMF. This type of questions is making importance this study. A high level debt can cripple the government operations because debt burden is a long term cost that cannot be reduce times of fiscal stress. Debt burden is shifting and welfare loss in countries. Developments studies suggesting developing countries external assets can fill the savings investment gap and it boost their growth. If debt size is too small it cannot effective or it is too large it can also to various economic problems. The donor agencies also impose many restrictions it is a burden for an economy it may causes negative effect. This study tries to establish a relationship between debt and growth. The particular objectives are given below:

1. To investigate the impact of external debt on economic growth in Bangladesh.
2. To figure out how external debt is burden for Bangladesh economy.
3. To investigate the debt sustainability and debt management policy in Bangladesh.
4. To find out the determinants of debt and how it differ from others country.

2. Literature review

Rahman and Bashir (2012) concluded that Bangladesh depends on external debt to fulfill the budget deficit and savings investment gap. They examined the relationship between external debt and GDP by using the data of period 1972-2010. They found a strong positive correlation between GDP and debt and results are statistically significant. Rabia Atique and Kamran Mallik (2012) compared the impact of external debt and domestic debt on the economic growth in Pakistan separately over period 1980 to 2010. They used OLS approach to cointegration, unit root test, serial correlation test, heteroskedasticity and CUSUM test. They found that external debt amount slows down economic growth more as compared to domestic debt amount. The reason is that debt servicing of external debt. Muzna Gohar, Niaz Ahmed Bhutto, Falahuddin Butt (2010) tried to review and analyze the impact of external debt serving on the growth and development of low income countries. They took annual panel data from 1990 to 2008 of thirty six low income countries and used least square multiple regression method with six variables i.e. growth, external debt servicing, interest rate, savings, net exports, foreign direct investment. Their analysis suggests that the external debt servicing has no direct impact on the growth itself rather it effect the other important factor which is directly responsible for growth and that is investment. They find that external debt servicing has a negative impact on the growth.

M.c. Ekperiwre and S.I. Oladeji (2011) dissected the structural break relationship between external

debt and economic growth from 1980 to 2009 in Nigeria. Debt relief in 2005 significantly reduces the external debt and external debt services in Nigeria. Nigerian exchange rate, education output, growth significantly developed by debt relief in 2005 as debt relief made resources available for economic growth in Nigeria. Chow test shows that there is a structural change during debt relief in 2005. They also argued that chow test method didn't give the sources of structural break and they recommended that debt relief is better for stable growth. By using panel data of 93 developing countries Catherine Pattillo et.al (2011) attempted to analyze the non-linear impact of external debt on growth. They got hump-shaped relationship between debt and growth when the debt burden is measured relative to GDP. They proclaimed that their paper attempts to provide an analytical answer for policy makers. They concluded that debt has an impact on growth and it is stylized in fashion. Their results suggest stronger evidence of a hump-shaped relationship between debt and growth in the case of the debt-to-GDP indicator than in the case of the debt-to-exports variable. Uzun, Karakoy and Buran (2011) examine the relationship between debt and growth in transition countries. They analyzed by panel autoregressive distributed lag model (ARDL). In 1991 the transition countries have started market-based economy and they need external sources. In this study they investigate the relationship between GDP and external debt to GNI between 1991 and 2009 in the transition countries. They found a positive relationship between debt and growth rate of the countries in the long run and the transition countries are still at the positive slope side of the debt Laffer curve. Kasidi and Makame (2013) try to examine the relationship of external debt and debt servicing on economic growth and also the long-run co-relationship between debt and growth of Tanzania for the period (1990-2010). They concluded that the positive impact of debt on growth and negative impact of debt servicing on growth, and there is no long run relationship between them also no autocorrelation. They suggest that in future take an external debt that is highly sustainable and the rate of return of debt is higher than the service payment rate. The main policy implication is that the govt. should pay more attention to the debt management policy.

Ademola and Olaleye (2013) tried to investigate the relationship between external debt on sustainable growth over the period 1980 to 2010. They conclude that Nigeria debt service payments are a serious problem and it is a main hindrance to inflow of external resources. Because Nigerians are not capable to pay debt service. Some external factors like World oil price shocks rising real interest terms and decline terms of trade are deteriorate the external debt. Finally, they suggest that the Govt. should take steps to proper use of debt and address the problem about debt. Ali and Mustafa (2013) attempts to analyze the long run and short-run impact of external debt on economic growth by using time series data. Their result shows that debt impact on growth negatively, which is significant in short run as well as long run. They come up with a decision that external debt effect in Pakistan is permanent as well as transitory and the overhang happens in the short run and also long run. The negative effect of short run is stronger than the long run. Faioz (2012) argues that the developing countries are not capable to finance all of its developments expenditure that's why they borrow from external resources. Developing countries foreign debt effect on consumption and spending, savings, investment, monetary policy. For this reason many countries are facing many problems. This crisis affected the LDCs deeply but now many LDCs are trying to rid of this problem. Researcher also suggests that developed countries should help the developing countries to grow their economy.

By using time series data of 24 developing countries over the period of 1976 to 2003 (2005) Safia Shabbir (2011) examines the relationship between external debt and economic growth and highlights the external debt stock leads to crowding out. The result suggests a negative relationship between debt and growth. Their findings suggest that if developing countries' debts are not sustainable it may affect adversely on growth. It also affects private investment and causes crowding out. So developing countries should efficiently use the external and it can create new investment and external investors are also interested to invest in developing countries. Applying OLS method Aminu, Ahmadu and Salihu (2012) tried to establish the relationship between economic growth, external debt, and domestic debt in Nigeria of the period 1970 to 2011. They found a negative co-efficient of external debt is insignificant and it is inconsistent with theory on the other hand domestic debt is consistent and has a positive impact on GDP also significant. They strongly claimed that perfect domestic debt management can grow the economy. They also recommend that GOVT should encourage about domestic savings and domestic investment. Another study about Nigerian economy Boboye and Ojo (1994) made an empirical analysis using OLS on secondary data. In 1992 World Bank declared Nigeria an indebted low-income country because of inability of debt service payment of Nigerian. Some external factors like oil price collapse of commodity prices are effect external debt. For private lending the debt service payment became unmanageable in 1983. All of external and internal factors are given a highly burden of external debt and it creates devaluation of National currency. Their suggestion is debt service should not be allowed to rise than foreign exchange earnings.

Rehana and Malik (2010) indicate that external debt in most developing countries has increased in after 1980s. Increasing debt affects the growth rate. They investigate the impact of rising debt burden on economic growth of South Asian countries. They claimed that their regression supports that there is a non-linear relationship between growth and all other indicators of debt burden. All of indicators of debt burden show that the importance of improving the economic management and by improving this the debt burden can be reduced. According to

Barbara and Michael (1997) Uganda is a indebted low-income country like many other countries in Sub-Saharan Africa. Uganda borrows from multilateral creditors. Uganda is a indebted low-income country and it borrows for external and internal factors. This paper is about debt source, stricter internal and external factors affecting debt and debt servicing capacity of the nation. They use cum debt model and Cohen model. It borrows from external sources for internal and external factors affecting. They concluded that Uganda should increase domestic savings and invested in productive sector for high growth. Dr Currie (2005) made an empirical analysis test of a new theory of economic growth i.e. relationship between external debt and economic development. He concluded that debt is not used in productive sector that's why country faces debt crisis. He suggests to qualifying every failure or success and developed the system in terms of debt levels. And of course it could grow economy faster.

Aktham, Omet and Fadwa (2007) investigate the threshold effect of debt on growth .Many of debt indicators increases the debt level and it is effect the growth . The important result in their regression is effect of external debt. It has a positive relation with growth when debt level is below threshold level and it is statistically significant. On the other hand when debt levels cross the threshold level the impact of debt becomes negatively. They suggests that increase of export can make the capacity of payback its external debt Safia (2012) states an long run relationship between debt and economic growth in developing countries. She used 70 developing countries over period 1976 -2011. She argues that increase in external debt slows down the economic growth and reduce the level of private fixed capital formation. The regression result of this paper implies that external debt has a long run relationship with growth and affects adversely and it also investigate the debt overhang theory. Albert , Brian and Palitha (2003) made an cointegration analysis between Economic growth and external debt service over the period 1952 to 2002 . They also investigate the existence of debt overhang in Sri-Lanka. Their analysis implies external debt service have negative effect on GNP though it is insignificant in the long run. They did not found short-run relationship among debt service and GNP and existence of overhang theory. Thy concluded that last 50 years in Sri-Lanka has not major obstacles to growth because of total external indebtness is not too high.

Ayadi (2008) argus that when internal savings is not sufficient for development it is needed to external finance. This paper suggests that debt overhang and crowding out theory is in both economies. He concluded that external debt is efficient in South Africa than in Nigeria as South Africa has a better management for its external debt obligations. He also suggests that debtor country should avoid short term financing when floating interest rate exist. According to Medani (2007) Sudan is a highly indebted country and he argues that many debt indicators shows that debt sustainability is difficult to achieve for economic and political condition of local and international. The external debt and debt services have negative effect on growth that means overhang and crowding out effect both are exist in Sudan. He concluded that if Sudan invested in productive sector and perfectly allocates resources than could be reduced poverty and raising the growth rate of the per capita of income.

Dr Majed (2005) tries to examine the effect of the twin deficit on external debt (twin deficit i.e. deficit of govt budget and deficit in current account) over period 1977 to 2004. Their results imply that budget deficit has a positive effect on debt and all of results are significant. Current Account Index also negative impact on debt. He recommended that Jordan economy should reduce external debt high level of GDP by good controls in debt and it also reduces debt burden by cutting govt. unnecessary spending, encourage private savings, and borrow from local sources. Safaqt (2007) made an comparison in Pakistan and Bangladesh economy. They examine thirteen factors impact on GDP by using thirty-four years data. Their regression suggests that Bangladesh is in better position than Pakistan. In Pakistan GNE, export, savings, consumption expenditure have positive effect on GDP , only the total debt stock and debt service export have negative effect on GDP. In Bangladesh GNE, debt stock, total import, export have positive effect and consumption expenditure have negative effect.

Table 2.1:Summary of literature review: External public debt and economic growth in Bangladesh

Author	Data	Country	Results
Kaisidi	1990-2010	Tanzania	Negative impact of debt service on growth.
Mustafa	1970-2010	Pakistan	Negative impact of short term is strong than long-term.
Ademola	1980-2010	Nigeria	Not capable to pay debt service.
Rahman	1972-2010	Bangladesh	Strong positive co-relation between debt and growth.
Rabia	1980-2010	Pakistan	Negative impact of debt on growth.
Gohar	1990-2008	Low income countries	Negative impact of debt servicing on growth.
Pattiloo		93 developing countries	Hump-shaped relationship of debt on growth.
Uzun	1991-2009	Transition countries	Positive relationship between debt and growth
Alfredo		20 Latin and carribians countries	Negative relationship.
Safia	1976-2003	24 developing countries	If debt not sustainable it may effect adversely growth.
Aminu	1970-2011	Nigeria	Negative relationship.
IMF	1970-1999	Highly indebted countries	Worse effect of debt on growth.
Javed	1983-2002	Turkish	Positive on growth and negative on investment.

3. Data & Methodology

The data for this regression were collected from secondary sources. The data added GDP as a dependent variable and investment, employment, external debt as independent variable. Our study is empirically investigates the effect of external debt on growth in Bangladesh over period 1972 to 2011. Our study depends on secondary data. Secondary data is reliable to increase the validity of the information. Secondary data is modest research. Common sources of secondary data for social science include censuses; organizational records and data collect through qualitative methodologies or researches. Secondary data is useful as it allows the researcher to see the prevailing thoughts about his/her area of study. Secondary data also saves time. We have used time series data for our analysis. We collect data from different sources. Our study is macroeconomic based. So we use time series data for model specification. We collect data over period 1972 to 2011 from different sources.

The prime object of this study is to estimate the impact of debt on growth in Bangladesh. For this data is collected for WDI . The period is from 1972 to 2010 .To check the relationship annual data has been used to check the exact relationships. This study select (ARDL) model to investigate the relation. In economics ARDL model is used for lagged values of the explanatory variables. Because the dependent variable responds to X with a lapse of time and it is called lag(gujrat). The current growth is respond with the lagged value of debt ,employment and investment.

4. Analysis of Result

4.1: Unit Root Test of the Variables

We use the ADF (Augmented Dickey-Fuller) test by EViews7 to check the unit root of the time series. The test procedure given below:

$$H_0 = \text{GDP series have a unit root (time series is non-stationary)}$$

$$H_1 = \text{GDP series have not a unit root (time series is stationary)}$$

If we can reject the null hypothesis than the series is a stationary time series. On the other hand accept null hypothesis the series is a non-stationary time series. ADF test statistics is the value of the trend coefficient. If the computed t statistics is less then the critical value of tau statistics then accept the null hypothesis. That means there is a unit root and the time series are non-stationary.

Table 4.1: The results of the unit root test of the variables:

Variable	Computed t statistics I(0)	Critical value of t at 5% level	Decisions	Computed t statistics I(1)	Decisions
GDP	2.86	- 3.53	H_0 accept	- 4.14	H_0 reject
EMP	- 1.57	- 3.53	H_0 accept	- 5.66	H_0 reject
DEBT	- 4.47	- 3.53	H_0 reject	- 1.97	H_0 accept
INV	4.16	- 3.53	H_0 accept	2.72	H_0 accept

Here dependent variable GDP and independent variable EMP, INV are non-stationary at I (0) that is they have a unit root. Only the independent variable DEBT is stationary at I(0). GDP and EMP are stationary at I (1) . INV is stationary at I(2). The non-stationary variable and their regression may produce a spurious regression. But if the independent variables are co-integrated with the dependent variable then the regression will not spurious. So we need to check the Co-integration among the variable.

4.2: Co-integration test:

Kwiatkowski- Philips Schmidt- Shin test (1992)

$$H_0 = \text{The residual series is stationary}$$

$$H_1 = \text{The residual series is not stationary}$$

Table 4.2 : The Results of Co-integration of all data series

Model residuals	Test statistics value	Critical value of 5% level	Results
Constant	- 3.35	- 2.94	Reject H ₀
Conclusion	The residuals series does not have a unit root , then decision is that the independent variables are co-integrated with the dependent variable .		

So we can say that the variables are co-integrated. Despite of the non-stationary if they are co-integrated the regression may not spurious.

4.3. Models Analysis:

Model 1:

$$\ln(gdp_t) = \beta_0 + \beta_1 \ln emp_t + \beta_2 \ln emp_{t-1} + \beta_3 \ln emp_{t-2} + \beta_4 \ln emp_{t-3} + \beta_5 \ln debt_t + \beta_6 \ln debt_{t-1} + \beta_7 \ln debt_{t-2} + \beta_8 \ln debt_{t-3} + \beta_9 \ln inv_t + \beta_{10} \ln inv_{t-1} + \beta_{11} \ln inv_{t-2} + \beta_{12} \ln inv_{t-3} + e_t \quad \dots(4.1)$$

Here,

$\ln emp_t$ = Employed person, $\ln emp_{t-1}$ = One year lagged of Employed person, $\ln emp_{t-2}$ = Two year lagged of Employed person, $\ln emp_{t-3}$ = Three year lagged of Employed person, $\ln debt_t$ = External debt, $\ln debt_{t-1}$ = One year lagged of External debt, $\ln debt_{t-2}$ = Two year lagged of External debt, $\ln debt_{t-3}$ = Three year lagged of External debt, $\ln inv_t$ = Investment, $\ln inv_{t-1}$ = One year lagged of Investment, $\ln inv_{t-2}$ = Two year lagged of Investment, $\ln inv_{t-3}$ = Three year lagged of Investment

Table 4.3. The result of the model (1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\ln emp_t$	-0.203514	0.150909	-1.348589	0.1901
$\ln emp_{t-1}$	0.991322	0.212408	4.667058	0.0001
$\ln emp_{t-2}$	-0.400366	0.262126	-1.527382	0.1397
$\ln emp_{t-3}$	0.015940	0.149268	0.106786	0.9158
$\ln debt_t$	-0.229627	0.209385	-1.096676	0.2837
$\ln debt_{t-1}$	0.341887	0.276758	1.235326	0.2287
$\ln debt_{t-2}$	-0.490067	0.233743	-2.096603	0.0467
$\ln debt_{t-3}$	0.136611	0.092448	1.477713	0.1525
$\ln inv_t$	1.790791	0.296267	6.044512	0.0000
$\ln inv_{t-1}$	-1.623817	0.425978	-3.811975	0.0008
$\ln inv_{t-2}$	0.969408	0.280671	3.453891	0.0021
$\ln inv_{t-3}$	-0.582461	0.175337	-3.321950	0.0029
<i>c</i>	8.036056	1.129448	7.115031	0.0000
R-squared	0.993775	Mean dependent var		24.22312
Adjusted R-squared	0.990662	S.D. dependent var		0.619819
S.E. of regression	0.059894	Akaike info criterion		-2.522628
Sum squared resid	0.086096	Schwarz criterion		-1.956630
Log likelihood	59.66862	Hannan-Quinn criter.		-2.323087
F-statistic	319.2765	Durbin-Watson stat		1.089231
Prob(F-statistic)	0.000000			

Dependent Variable: LNGDP

Method: Least Squares

Sample (adjusted): 1975-2011

Included observations: 37 after adjustments

The table shows the regression result of the model. The goodness of fit R^2 means that the independent variables can be explained 99% of the variation in the dependent variable. Table shows that the beta values, t-values, p-values. Beta values are the co-efficient of the variable means the impact of independent variable on the dependent variable. The co-efficient of many variables are not expected signs, and many variables are not statistically significant. One and three years lag of emp ,recent and two year lag of debt , recent year and two year lag of inv are have expected sign. Most significant variables are $\ln emp_{t-1}$, $\ln debt_{t-2}$ $\ln inv_t$, $\ln inv_{t-1}$, $\ln inv_{t-2}$, $\ln inv_{t-3}$. View this problem we have run another model. We dropped the insignificant variables and got a model which is more efficient from original model. The parsimonious model have significant variables and reasonable R^2 .

5. Parsimonious model analysis:

The insignificant variables are dropped and the parsimonious model was specified. For correct standard error we use HAC for parsimonious model. The results are given below:

Model: 2

$$\ln(gdp) = \beta_0 + \beta_3 \ln emp_{t-2} + \beta_4 \ln emp_{t-3} + \beta_7 \ln debt_{t-2} + \beta_{12} \ln inv_{t-3} + v_t \dots\dots\dots(5.1)$$

Table 5.1. The Result of the Model 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\ln emp_{t-2}$	0.894153	0.201875	4.429239	0.0001
$\ln emp_{t-3}$	0.373139	0.124500	2.997101	0.0052
$\ln debt_{t-2}$	-1.318291	0.195548	-6.741520	0.0000
$\ln inv_{t-3}$	0.867639	0.086088	10.07855	0.0000
c	10.04735	1.486217	6.760352	0.0000
R-squared	0.971086	Mean dependent var		24.22312
Adjusted R-squared	0.967472	S.D. dependent var		0.619819
S.E. of regression	0.111787	Akaike info criterion		-1.419352
Sum squared resid	0.399884	Schwarz criterion		-1.201661
Log likelihood	31.25802	Hannan-Quinn criter.		-1.342606
F-statistic	268.6873	Durbin-Watson stat		1.535023
Prob(F-statistic)	0.000000			

Dependent Variable: LNGDP

Method: Least Squares

Sample (adjusted): 1975 2011

Included observations: 37 after adjustments

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

In parsimonious model all variables have expected sign and they all are statistically significant. R^2 is also good. 0.89, co-efficient of two years lag of employment means that a one percent increase in employment will increases the GDP by .89 percent. Same three years lag of employment a one percent increase in employment will increases the GDP by .37 percent and the co-efficient 1.31 of two years lag of debt implies that a one percent increase in debt will decrease the GDP by 1.31 percent. Similarly the three years lag of investment co-efficient .86 means that a one percent increases in investment will increase the GDP by .86 percent. According to debt overhang theory the co-efficient of debt has negative sign. In case of Bangladesh debt impact on GDP negatively and high level of debt makes GDP slow down. In addition, the investment and employment have a positive impact on GDP. The p-values of the variables are significant and they are less then 0.01. The F-statistic (268.68) prob (0.00) is also significant and its mean the overall significant of the model. The Durbin-Watson (1.53) is about 2. So the regression model is given below:

$$\ln gdp = 10.04 + 0.894 \ln emp_{t-2} + 0.373 \ln emp_{t-3} - 1.318 \ln debt_{t-2} + 0.867 \ln inv_{t-3}$$

This result shows that emp, inv and debt directly effect the GDP. The debt is highly negative impact on growth in Bangladesh. Investment which is most important factor of GDP and impact positively also significantly, and the employment of Bangladesh has positive effect on GDP.

F-test for significant

$$H_0 = \beta_1 = \beta_2 = \beta_5 = \beta_6 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = 0$$

$$H_1 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} \neq 0$$

$$F = \frac{R^2_{new} - R^2_{old} / df}{(1 - R^2_{new}) / df}$$

$$R^2_{new} = 0.971$$

$$R^2_{old} = 0.993$$

Computed F is 2, F critical value at 5% level 2.35, 10% level 3.36 and 25% level 2.77 with df (8,24). So we cannot reject the null hypothesis. We conclude that if we drop a group of variables from the original model, R^2 decreases from .993 .971. But it is seen that the drop ed a group of variables does not significant decreases the explanatory power of parsimonious model.

6. Diagnostic test

6.1. Autocorrelation test:

Our estimate model is

$$\ln(gdp)_t = \beta_0 + \beta_1 \ln emp_{t-2} + \beta_2 \ln emp_{t-3} + \beta_3 \ln debt_{t-2} + \beta_4 \ln inv_{t-3} + \rho e_{t-1} + v_t \dots\dots\dots 6.1$$

The p-value is greater than 0.05 and the t=0.935 so we can accept the null hypothesis that is there is no autocorrelation of the model.

H_0 =there is no serial autocorrelation

H_1 = there is serial autocorrelation

Table 6.1: Autocorrelation test

Models	F calculative value	Critical value of F – statistics 5% level	Results
Constant	0.875943	4.15962	Accept H_0

6.2: Heteroskedasticity test:

Using Breush-Pagan-Godfrey test:

H_0 = there is no heteroskedasticity

H_1 = there is heteroskedasticity

Table 6.2: Heteroskedasticity test (Breush-Pagan-Godfrey test)

Models	Calculative F-statistics	Critical value of F-statistics at 5 % level	Results
Values	2.20	2.66	Accept H_0
Decision	There is no heteroskedasticity		

6.3. Normality test (Histogram & Normal P-P plot):

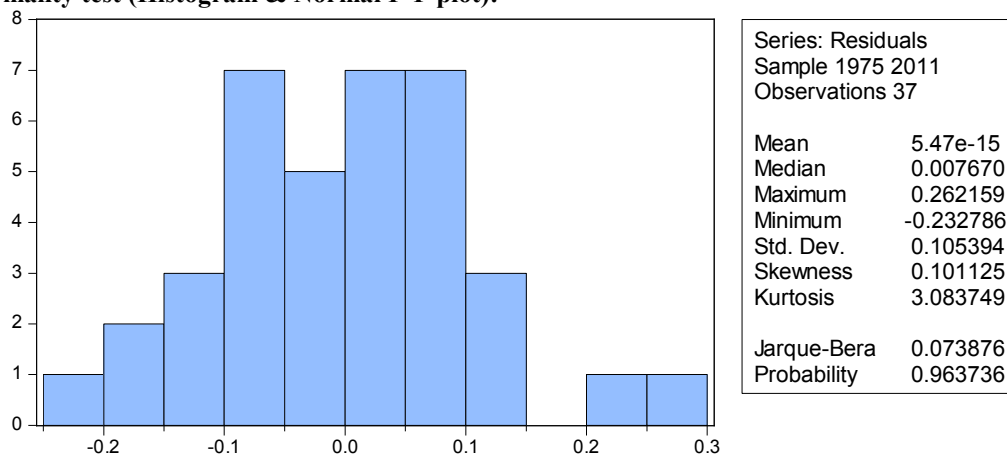


Figure 6.1. Histogram of residuals

We can see that the probability is 96 percent. Therefore we do not reject the hypothesis that the error terms are normally distributed. But we should keep in mind that the sample size 37 may not be large enough. The

error terms are normally distributed.

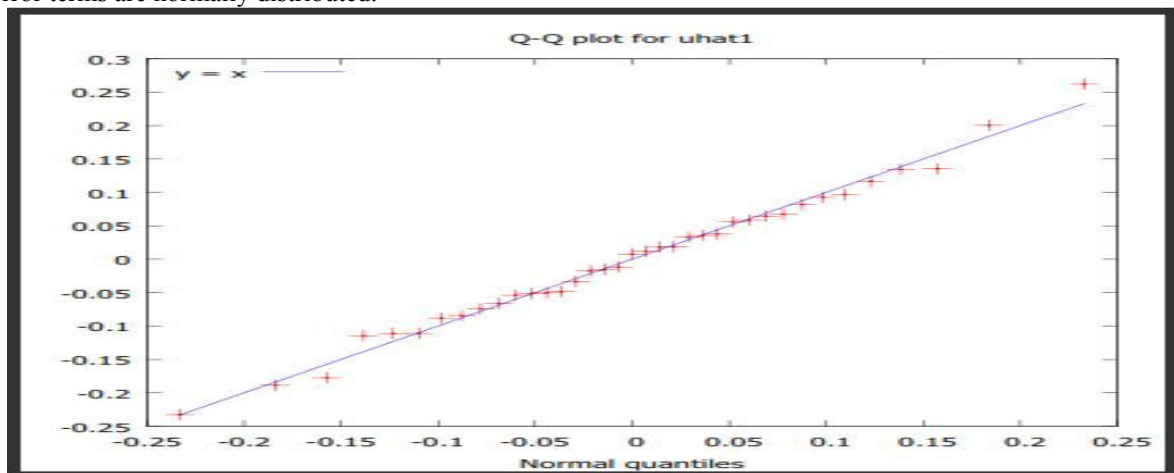


Figure 6.2. Normal P-P Plot of Regression Standardized Residual

If the variable is normally distributed the NPP will be approximately a straight line. And our residuals P-P plot indicate that the normality assumption is exist.

6.4. JB test for the Normality

$$JB = n [S^2/6 + (K-3)^2/24]$$

n = sample size, s = skewness, k =kurtosis. Residuals skewness and kurtosis in our model is 0.101 and 3.08. The computed $\lambda^2 = 0.24$ and the critical value of λ^2 at the 5% level of significance is 5.99. Here the critical value is greater then the calculative value so we can accept the null hypothesis that is the residuals are normally distributed.

6.5. Specification test of the model:

We use the Ramsey reset test that model is given below:

$$\ln(gdp) = \beta_0 + \beta_3 \ln emp_{t-2} + \beta_4 \ln emp_{t-3} + \beta_7 \ln debt_{t-2} + \beta_{12} \ln inv_{t-3}$$

With the FITTED² model is run and the model is:

$$\ln(gdp) = \beta_0 + \beta_3 \ln emp_{t-2} + \beta_4 \ln emp_{t-3} + \beta_7 \ln debt_{t-2} + \beta_{12} \ln inv_{t-3} + \delta_1 FITTED^2$$

δ_1 Is statistically insignificant, so we can say that there is no problem with the functional form and the omitted variables. It is significant at 80% level of significance. It is not statistically significant.

7. Executive Summary

In this section three models are run to find the exact result. The first models variables are not significant and the co-efficient sign are not perfect. So there is a chance to run another model. Is an improved result compared with rejected models? It shows every variable significant at 1% level. The regression analysis shows that there was a negative relationship between External debt and GDP by 1.3%. It indicates when External debt is increases 1% there was a decrease of GDP by 1.3% because of the debt services. That is higher level of debt discourages economic growth. The debt service is collecting from resources than on investments. High level of debt will decrease the public services or infrastructures. Investment and employed labor increase the level of output in the country. Being developing countries the debt is not perfectly work in Bangladesh.

8. Conclusion & Policy implication

The main contribution of the paper is to empirically investigate the relation between economic growth and external debt in Bangladesh with the up-to-date time series econometric method. The paper uses time series econometric tools to investigate the relationship among the variables. The ADF, PP Test, Granger Causality Test and Co-integration Models are employed taking care of stochastic properties of the variables. The unit root test results that both the variables are integrated of order 1. The co-integration analysis suggested that there is a long-run equilibrium relationship between income and external debt.

We have a sophisticated result that shows that external debt stock adversely affect the GDP growth. So the external debt needs special care about taken. Debt is need for development and growth in Bangladesh but it is urgent to be more concern about its uses and the services of debt. In our study we find the external debt costs

heavily to the poor people. But in this country the peoples need a healthy and prosperous life. A healthy life can promote development and development brings welfare and faster growth. For MDGs target every year Bangladesh need extra finance. This amount is more than aid and loans. If Bangladesh achieve the MDG then the debt is more effective. Every year debt service has major allocation in budget but Bangladesh needs more allocation in education and health sector. So Bangladesh need must debt relief and writes-off. Because of increasing trend of external debt is a mirror of increasing of burden. It impact growth adversely. The debt service affects the economic growth of Bangladesh because the infrastructure sector is very poor and it takes a long time to implement the main objective of debt. And the debt service payment is collect from another sector. It is clear that high-level external debt discourage the economic growth. Capital formation and employed population have positive affect on the economic growth. Bangladesh hasn't effective debt management and utilization of external debt. According to this paper some recommendation is provided to solve the negative impact of external debt on growth. External debt policy in Bangladesh should be long-term and effective and exports should be diversified for foreign currency.

The debt management should find out the optimum return sector of debt. The savings should be properly invested it is a best option of alternate of debt. Bangladesh should reduce dependency on impact and use the nation's resources properly. More research should be done for best use or policy of external debt. Debt management should take policies and make several strategies to ensure sustainable debt. In addition, Bangladesh should ensure basic needs of people. Then equal distribution of resources, strong infrastructure, reduces poverty, achieving MDG. Some policy can be undertaken to attract FDI and Bangladesh should create favorable environment for investment of foreigners. Country has to mobilize and channelize their. People of Bangladesh should have to focus on to increase domestic savings for higher investment. Especially in Bangladesh political stability is must needed. On the other hand the corruption should reduce by close monitoring. The country needs to channelize their external debt in a way that can create new opportunity of investment and attract more investors in country or fully debt cancellation to achieving the MDGS.

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