External Debt, Inflation and Growth in Bangladesh: An Empirical Study

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Abstract:

This study investigates the relationship of external debt, inflation and economic growth in Bangladesh by applying Johansen's Co-integration test, Vector Error Correction Model (VECM) and Granger Causality using macroeconomic data from 1989 to 2021 in Bangladesh. The growth rate of GDP is used as a proxy for economic growth and external debt stock of the country is used as external debt. Co-integration indicates that there is a long-run relationship between the factors examined in this research and economic growth. Economic growth is impacted by external debt as shown using the Vector Error Correction Model (VECM). However, inflation has been found to be insignificant. Finally, it has been found that long-run causality exists between economic growth and external debt.

Keywords: External debt, Economic Growth, Inflation, Cointegration, Vector Error Correction Model (VECM).

DOI: https://www.doi.org/10.61607/JFB.V20N1-2.A5

Article Info: Submission Date: March 13, 2023; Acceptance Date: November 12, 2023.

1.0 Introduction

When the total of a government's planned expenditures for a particular fiscal year exceeds the total of its expected public earnings for that same fiscal year, it is considered to be a deficit budget. All developing countries face the problem of a budget deficit, sometimes called a fiscal gap, although the deficit is much worse in those countries that are in the process of making the transition to being developed. Because of their lack of domestic resources, developing countries need to rely on external funding, most notably in the form of development aid from international organizations (such as IMF) and more prosperous countries (Amin and Murshed, 2018). Analyzing the macroeconomic effects of external debt is an important topic resulting in a variety of studies that examine the relations that exist between external debt and other relevant macroeconomic variables. (Burdekin and Langdana, 2015).

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However, when it comes to explaining the economies of having a DEF, there has not been any anonymity. Some research has argued in favor of DEFs and related them to economic development, particularly in emerging nations. Such a perspective is consistent with the Keynesian-inspired export-led growth hypothesis from 1970, which cited DEF as a necessary condition for economic expansion (Oladipo and Akinbobola, 2011). This theory proposed that in favor of economic expansion, the government should prioritize energizing aggregate demand via massive public investment programs. Thus, governments that adopted this growth theory were eager to propose huge spending budgets despite having inadequate income to fund such demands for public investment.

On the other hand, there is evidence that DEF could have harmful effects on the economy as a whole (Biza, Kapingura and Tsegaye, 2015). For instance, traditional economics hypotheses argue against deficit budget nations by claiming that a growing imbalance between government spending and income increases the incentive to increase the money supply, which might lead to an increase in the inflation rate. Monetary policy instruments are sometimes mentioned as being useless in preventing internal inflation.

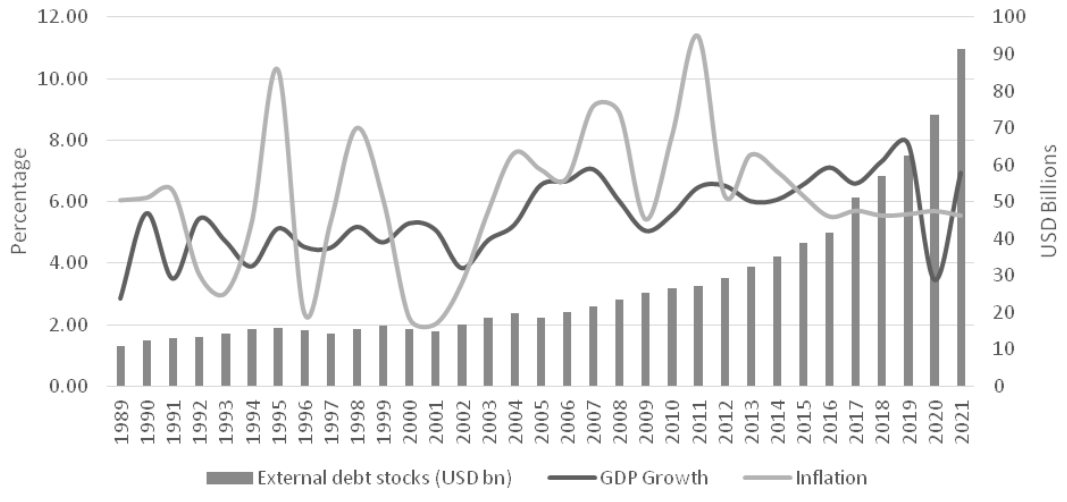
Inflation, external debt, and money supply have each been the subject of many studies because of their importance as macroeconomic variables. Government DEF and the calculation of government debt have been a constant source of worry for nations of all economic standings. The link between DEF and other macroeconomic factors is the subject of much empirical and theoretical research on a wide range of countries throughout the globe. Recession-related reductions in tax income are a potential root cause of DEF (Biza, Kapingura and Tsegaye, 2015). Another factor that could also contribute to the growth of DEF in emerging nations is the rising cost of servicing the public debt incurred by these countries' governments.

Government deficits, increasing debt, and rising inflation have all been persistent problems for Bangladesh throughout the years. Although the economy is expanding, rising government spending in comparison to tax increases is a common problem. Since the rate at which revenues are collected is lower than total expenditures, a greater amount of borrowing and external credit is needed to finance the budget deficit (Amin and Murshed 2018).

The Bangladesh Economic Review (2022) estimated a gross budget deficit (including grants) of BDT 2,04,500 for FY 2017-18 or almost 5.1 percent of GDP. The government relies on both domestic and foreign financing to cover its budgetary imbalance. The share of funding from domestic sources for this gap is expanding. In recent years, the government's NSC (National Savings Certificate) sales have resulted in a dramatic increase in tax revenue. Nonetheless, there has been a significant declining trend in the use of bank loans.

Figure-1 shows the increasing trend of external debt in Bangladesh which has been proxied by the external debt stock. The increasing economic growth in Bangladesh calls for a greater need for foreign financing. Moreover, recent inflationary pressures and financing from international monetary organizations such as the IMF raise the need to study whether external debt and inflation impact economic growth in the long run.

Figure-1 : Historical Trend of GDP Growth, Inflation and Foreign Financing



Source: World Bank, Annual Budget

2.0 Literature Review

The study of macroeconomic variables and economic growth relationship is widely conducted and cited in the field of economics. Many of the scholars have conducted research in developed and developing economies using panel data as well as a single-country analysis.

2.1 Budget Deficit

Implementation of the budget typically depends on the appropriate mobilization of locally available resources, such as the collection of tax income from the sources of direct, and indirect taxes, as indicated by Ahmed (2019), who analyzed the reasons and remedies for the budget deficit in Bangladesh.

Finland's budget deficit was analyzed by Lamichhane (2018) showing that economic development had a crucial role in helping the state to cover its budget gap. A beneficial factor in reviving economic growth would be steps taken to improve jobs, investments, exports as well as spending on education, empowerment, and health sector development. The study of the surrounding environment revealed that the effects of a budget deficit were many, including a rise in unemployment, a reduction

in living standards, a rise in private savings, a fall in public savings, an increase in debt and last but not least, a rise in financing costs. Tung (2018) used the Error Correction model to investigate the fiscal deficit's effect on Vietnam's GDP growth. Vietnam's budget deficit and GDP growth cointegrated as a consequence of the experiments. In both the short and long term, the research found that a budget imbalance stifles economic expansion.

Furthermore, Nepal's budget deficit was studied by Sutihar (2016), who looked at its causes and potential solutions. To help fund public expenditures, the government devised a crucial tool called shortfall financing. Deficit funding can come from a variety of sources, including loans from the government, borrowing from private lenders, or a negative cash flow. In addition, Kenya's macroeconomic performance and budget deficits were the subjects of an experimental study by Kosimbei (2009). For instance, systemic issues and rising public spending both contributed to Kenya's fiscal deficit gap. The purpose of the review was to investigate possible methods for filling budget holes. It seems from the inquiry that the administration did not have much external debt. Moreover, since Pakistan is stuck in a never-ending cycle of underdevelopment, Nayab's (2015) investigation of the causes and effects of budget deficit financing in the country established the link of deficit financing for boosting economic growth.

The Keynesian school of thought held that a positive relationship existed between the two arrangements whereas the neo-classical school of thought held that there was no such relationship, and lastly, the Ricardian perspective found that there was an unbiased interconnection between a country's budget deficit and economic growth. The presence of a budget deficit is influenced by several variables, one of the most prominent being the magnitude and makeup of governmental expenditures. In order to manage the economy and spur faster development, as well as to pay for publicly delivered goods and services, governments use fiscal instruments including taxing, spending, and borrowing. Foreign debt financing is becoming more contentious in practically all emerging nations. (Getinet and Ersumo, 2020)

2.2 Inflation and Economic Growth

The effects of macroeconomic factors including broad money, external debt financing, and inflation on a country's economic development have been studied by many researchers. (Fischer, 1993; Gylfason and Herbertsson, 2001; Vuyyuri, 2005) According to Kormendi and Meguire (1985), there is a negative correlation between inflation and economic growth. They found that an increase in inflation of 1% leads to a reduction in the economic growth of 0.57% throughout a research period of 1950–1977 in 47 sample nations. This is a crucial link that must be investigated in the context of Bangladesh because, if it exists, it will offer a dilemma for the nation's monetary authorities. In order to accomplish economic growth, a potentially difficult

trade-off must be struck between reducing inflation and not restricting the money supply to the point where the economy contracts. Aboudi And Khanchaoui (2021) found that low inflation levels result in difficulties in the repayment of debt financing and, consequently, lead to reduced economic growth in Morocco; arguing that inflation is a stimulant of economic activity without creating economic distortions. Using an augmented autoregressive distributed lag model, Sarker and Khan (2020) found a significant relationship between foreign direct investment and economic growth in the long run.

There is vast research available that examines the connection between external debt and economic growth as well as the relationship between inflation and economic growth individually. Few researchers, nevertheless, have used a model that examines the interrelationships of these three factors. Further research is required to determine how these factors interact from the standpoint of Bangladesh's economy.

3.0 Methodology

3.1 Description of Variables and Descriptive Statistics

In this paper, a secondary time-series dataset from 1990 to 2021, collected from various sources including the Bangladesh Bank economic database, World Bank database, etc. has been used to examine the impact of external debt and inflation on the economic growth of Bangladesh. The dependent variable is real GDP which is used as the proxy for economic growth. The independent variables are INF (inflation) and FIN (foreign financing). Two more variables RES (total reserves) and FDI (net foreign direct investments) are used as control variables. The definition of the variables used in the study is summarized as follows.

Table-1 : Definition of Variables

Notation	Definition of Variables
GR	Log of the growth rate of real GDP
FIN	Log of external debt stocks (in USD)
INF	Log of inflation rates
RES	Log of total reserves including gold (in USD)
FDI	Log of net inflow of foreign direct investment (in USD)
BM	Log of broad money (current LCU)

Source: Authors' calculations

First, to acquire a broad sense of the distribution and type of the variables investigated in this research, descriptive statistics have been presented. Descriptive

statistics also make it possible to determine the range, kurtosis, and skewness of our data variables. As seen in Table-2, Bangladesh's GDP has grown by 5.5% during the previous 33 years, with a meager 1.23% volatility. This stable trend is evident in Figure-1 of this paper. With a standard deviation of almost $19.4 billion, the average external debt stock has been $27.8 billion. This variable has been in an increasing trend as shown in Figure-1. The average inflation during the period under study has been an astounding 6.09%, which is extremely close to the growth rate of the GDP. Moreover, 2.17% volatility is also quite similar to that of GDP growth. The following table shows the descriptive statistics for all other variables.

Table-2 : Descriptive Statistics

Statistics	GDP growth rate	External debt	Inflation	Total reserves	Net FDI inflows	Broad money
Mean	5.513775	2.78E+10	6.093146	1.15E+10	8.87E+08	4.88E+12
St. Deviation	1.237484	1.94E+10	2.171524	1.38E+10	9.30E+08	5.84E+12
Variance	1.531368	3.75E+20	4.715515	1.91E+20	8.65E+17	3.41E+25
Skewness	-0.2041901	1.75157	0.175123	1.215291	0.708141	1.267285
Kurtosis	2.347463	5.466066	3.16967	3.084946	2.132559	3.389511

Source: Authors' calculations

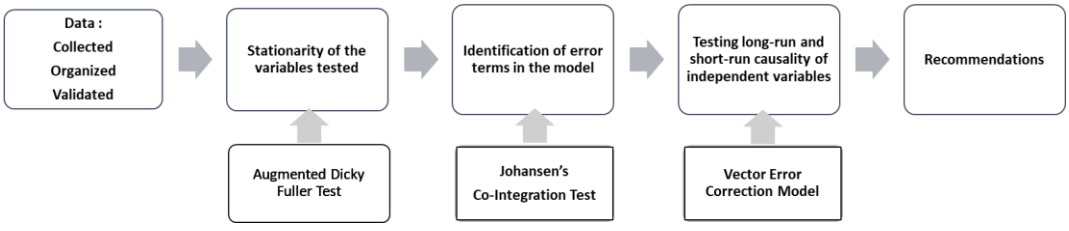
3.2 Research Framework

Observing several macroeconomic indicators, such as GDP and other trade statistics, reveals that they display a nonstationary pattern. Non-stationary variables exhibit an upward or downward trend, indicating that their fundamental characteristics vary with time. In contrast, the fundamental characteristics of a stationary time series remain constant across time. If variables are not stationary, the standard assumption underlying asymptotic analysis is erroneous. Hence, we tested whether or not the variables have unit root (Granger and Newbold, 1974). In this investigation, unit roots were determined using the Augmented Dickey–Fuller test. The variables under the study must be non-stationary at level and stationary at first difference if Johansen's co-integration test and the VECM (Vector Error Correction Model) or VAR (vector autoregressive) test are to be used. This is required because the VECM model changes the variables to 1st difference before calculating the causality's significance. Consequently, the first difference must be stationary. The ADF test is implemented by adding the lagged values of the dependent variable using the following equation.

$$\Delta y_{t-1} = \alpha+\beta t_{t-1}+\delta y_{t-1}+\Sigma\gamma_t\Delta y_{t-1}+\varepsilon_t$$

Where α is a constant term, t is a linear time-trend; three slope coefficients are β, δ and γ, and the error term is ε. For the Augmented Dickey–Fuller test, the minimum AIC (Akaike's information criteria) was used to select the lag length, n.

Figure-2 : Research Framework



Next, the model's error terms are discovered using Johansen's Cointegration test. The variables that are checked for Co-Integration must have the same order of integration. (Engle and C. W. J. Granger, 1987) Consequently, in the context of this research, if GR, INF, FIN, RES and FDI are individually I(1), it is possible that any linear combination of the aforementioned variables will likewise be I(1). The research assesses the long-run correlations between GR, INF, FIN, RES and FDI after establishing that all of these variables have the same integration order. For the evaluation of our empirical models, the Co-Integration equation has been reformulated with a consistent term as follows:

$$GR = \beta_0 + \beta_1 FIN + \beta_2 INF + \beta_3 RES + \beta_4 FDI + \beta_5 BM + \varepsilon_t \ldots\ldots\ldots\ldots\ldots \text{(eq. 1)}$$

Finally, the Vector Error Correction Model is utilized to assess the long run causality between independent variables and dependent variables. The VAR model depicts the dynamic interrelationships between stationary variables. After beginning the time series analysis, it is necessary to examine the stationarity of the variables. If the variables are not stationary at level, the stationarity of the variables' first difference must be examined. If the level or log levels of the variables are not stationary, the first difference is often stationary. For a consistent estimate of the relationships between variables in a series, the model must be somewhat adjusted if the variables are not stationary at level. VECM is only a variant of the VAR. If the variables are cointegrated, then the VEC model is used; otherwise, the VAR model is employed. The VEC model is advantageous as it takes each system variable as endogenous and then links each variable to its previous values and the past values of all other variables. If the VECM term is negative and the probability is statistically significant, it indicates that the dependent variables have a long-run connection with the independent variable. However, if the VECM value is positive or the likelihood is not statistically significant, it indicates that there is no long-term association and the short-term relationship is examined.

The Error Correction Model can be modeled as follows:

$GR = \beta_0 + \Sigma\beta_{1t} GR + \Sigma\beta_{2t} FIN + \Sigma\beta_{3t} INF + \Sigma\beta_{4t} RES + \Sigma\beta_{5t} FDI + \Sigma\beta_{6t} BM + \Sigma\beta_{7t} EC_{t-1} + \varepsilon_t$ … … … … … (eq. 2)

5.0 Empirical Analysis and Findings

5.1 Augmented Dicky Fuller Test

The ADF test has been used to verify this, and a model with a lag of 3 has been chosen based on post-estimation tests using AIC criteria. The following are the hypotheses being tested:

H0 : The variable is non-stationary (has unit root)

H1: The variable is stationary (does not have a unit root)

The test statistic must be larger than the critical value for the variable to be considered stationary, and it must be less than the critical value for the variable to be considered non-stationary. The term L1, which comes just before the lag term, must be negative, which is a crucial factor to keep in mind. The model can provide inaccurate results if this is not the case. The following table summarizes the test results:

Table-3 : ADF Test Results Summary

Variables	Test for Unit Root in	ADF Test Statistic *(Number of Lags)	Critical Value (5%)	p-Value	Remarks
GR	Level	-1.636 (3)	-2.989	0.465	Non-Stationary
	First Difference	-11.226 (0)	-2.983	0.000	Stationary
FIN	Level	4.134 (3)	-2.989	1.000	Non-Stationary
	First Difference	-3.198 (0)	-2.983	0.020	Stationary
INF	Level	-1.835 (3)	-2.989	0.363	Non-Stationary
	First Difference	-6.394 (0)	-2.983	0.000	Stationary
RES	Level	0.106 (3)	-2.989	0.967	Non-Stationary
	First Difference	-4.058 (0)	-2.983	0.001	Stationary
FDI	Level	-2.059 (3)	-2.989	0.261	Non-Stationary
	First Difference	-6.394 (0)	-2.983	0.000	Stationary
BM	Level	-0.534 (3)	-2.989	0.885	Non-Stationary
	First Difference	-4.205 (0)	-2.983	0.001	Stationary

Source: Authors' calculations

The dependent variable along with all the independent variables in the ADF test demonstrates to be non-stationary at level and stationary at first difference. This

indicates that the null hypothesis cannot be ruled out for the variables at level but it is rejected for the first difference. The variables are non-stationary at the first difference but stationary at the level, which satisfies the requirements for conducting the cointegration test.[3]

5.2 Optimal Lag Length Selection Test

Prior to undergoing Johansen's Co-Integration test and the Vector error correction model test, the Optimal Lag length has been chosen. Based on the Likelihood ratio and Akaike's information criterion (AIC), a lag duration of three is ideal for the study. Therefore, a lag duration of 3 has been chosen. Below are the findings of the lag selection test:

Table-4 : Optimal Lag Length Selection Test

Lag	LR	df	p	FPE	AIC	HQIC	SBIC
0				0.000021	6.24874	6.33734	6.53163
1	378.77	36	0.000	5.60E-10	-4.32968	-3.7095	-2.34946*
2	114.75	36	0.000	1.80E-10	-5.80374	-4.65197*	-2.12618
3	76.144*	36	0.000	5.00E-10	-5.94662*	-4.26327	-0.57173
4	.	36	.	-1.1e-42*	.	.	.

Source: Authors' calculations

5.3 Johansen's Co-integration test

The existence of a long-run relationship between the dependent and independent variables has then been tested using Johansen's Co-integration test. If the Co-Integrating rank displays a number output after being applied, it suggests the variables are highly correlated with one another. Larger numbers indicate stronger long-term causation. Two statistics, the Trace statistic and the Max statistic, are used in the cointegration test to determine whether or not the variables are co-integrated. If the value of the trace statistics exceeds the critical value, then we accept that the variables do not have zero co-integration among them. The procedure is then repeated for the next set of integers.

[3] The basic characteristics of a non-stationary variable vary with time when it exhibits an upward or downward trend. On the other hand, the basic characteristics of a stationary time series remain constant across time. Our standard asymptotic analysis assumption will be false if the variables are not stationary. Thus, the "t-ratios" won't conform to a "t-distribution".

Table-5 : Johansen's Co-integration test result

Maximum Rank	Eigen Value	Trace Statistic	5% Critical Value	Max Statistic	5% Critical Value
0	.	148.7419	94.15	71.9716	39.37
1	0.9092	76.7704	68.52	39.744	33.46
2	0.73414	37.0264*	47.21	18.5083	27.07
3	0.46041	18.5181	29.68	14.3681	20.97
4	0.38056	4.15	15.41	3.808	14.07
5	0.11921	0.342	3.76	0.342	3.76
6	0.01134				

Source: Authors' calculations

Since both the trace statistics and the max statistics conform to the existence of two cointegrating equations at a significance level of 5%, two cointegrating equations have been identified. Co-integration indicates that there is a long-run link between the macroeconomic factors and economic growth.

5.4 Vector Error Correction Model:

It is necessary to assess the long-term link between the variables. This has made using the Vector Error Correction Model (VECM) in this study justifiable. The cointegrating equations results were found after running the following Vector Error Correction Model:

Table-6 : 1st Normalized Cointegrating coefficients from VECM

	GR	INF	FIN	RES	FDI	BM	Constant
Coefficient	1	0	-85.2858	-20.051	-18.4051	74.90186	770.5634
Standard Error	.	(omitted)	24.42211	5.456957	2.952987	13.12226	.
z	.		-3.49	-3.67	-6.23	5.71	.
P>|z|	.		0.000	0.000	0.000	0.000	.
_ce1 L1.	-.9022514 P>|z| = 0.033						

Source: Authors' calculations

From the above table, a Normalized long-run equation can be written as follows:

GR= 770.5634 + 0.000*INF+85.2858*FIN+20.051*RES+18.4051*FDI-74.90186*BM … … … (eq. 4)

The overall model is found to be significant as shown in Table-6. In the long run, GR can be impacted by INF, FIN, RES, FDI and BM. All the variables under study except INF have been found to be significant. Shown below are the expected and actual directional relationships between the dependent and the independent variables:

Table-7 : Expected and Actual Directional Relationship

Variables	Expected Sign	Actual Sign
FIN	+	+
INF	-	-
RES	+	+
FDI	+	+
BM	+	-

Source: Authors' calculations

5.5 Normality of Error Term

The Jarque-bera test for normality assumption has been run for the model. The p-value is 0.136 which is higher than the 5% significance level. Hence, the error terms are normally distributed.

5.6 Granger Causality Test

Next, it was determined whether there is a unidirectional or bidirectional relationship between the relevant variables. Below are the outcomes of the Granger Causality test for GR, INF, and FIN.

Table-8 : Granger Causality Test Results

Dependent Variable	Independent Variable	Chi**2**	p-value
GR	FIN	3.7069	0.295
FIN	GR	10.239	0.017
GR	INF	3.7811	0.286
INF	GR	5.6959	0.127

Source: Authors' calculations

It is evident from the table that external debt (FIN) doesn't granger cause economic growth (GR) but economic growth (GR) can cause external debt (FIN); this implies that the directional relationship goes from GR to FIN and not FIN to GR. Moreover, It is evident from the table that inflation (INF) doesn't granger cause economic growth (GR) but economic growth (GR) can cause inflation (INF); this implies that the directional relationship goes from GR to INF and not INF to GR.

6.0 Conclusion and Policy Implications

This study focuses on the macroeconomic relationship of external debt, inflation, and economic growth in Bangladesh using a dataset from 1989 to 2021 in Bangladesh. The statistical analysis in this study shows that there is a long-run relationship between the macroeconomic factors (external debt, inflation, total reserves, net foreign direct investment inflows, and money supply) and economic growth. This has been concluded using Johansen's Co-integration test. Using the Vector Error Correction Model, we found that all variables except the money supply conform to the expected relationship as per the literature. Money supply as proxied by the broad money has shown a negative relationship with economic growth. According to the findings, an increase in the money supply might be beneficial to the economy in the short run, but it might lead to inflation in the long run. In order to avoid potential inflation scenarios, policymakers and central banks may not want to make excessive use of the expansionary monetary policy. Moreover, external debt taken by the government may aid the economic growth of Bangladesh in the long run as such financing will be used to stimulate consumption, investment, and infrastructural development and boost net exports. The Vector Error Correction Model demonstrates that external debt can have an effect on economic growth (VECM). Furthermore, it has been found that a long-run causality does exist between the expansion of the economy and external debt. This is true in the sense that higher growth will require more financing from external countries or international organizations due to the nature of the tax environment in Bangladesh. If the current situation of lower tax revenues continues, external debt might be a great contributor to the economic growth in Bangladesh.

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