Impact Analysis of Policies on the Economic Growth of Bangladesh: An ARDL Approach

Refat Ferdous[1]
Md. Imran Khan[2]

Abstract

The impact of the policies on sustainable economic development and ensuring the stability of economic welfare is the focal point of all kinds of macroeconomic controversies among economists and policymakers around the world. This paper is designed in such a way, which able to explain the impact of policies on the economic growth of Bangladesh. This paper is embedded in an intensive, and comprehensive enquires in the fiscal policy and monetary policy instruments from the year 1980 to 2017 and tries to make a rational study on their impacts on the real economic variables. An Autoregressive Distributed Lag (ARDL) approach is used to measure the impression of fiscal and monetary policies on the real economic growth of Bangladesh. To expedient the impact of short-run and long-run influence on the economic growth of Bangladesh, the Wald test is used in this empirical calligraphy. In this study, it has been found that in short run both policies have the positive impact on the economic influx of Bangladesh but in long-run monetary policy has the positive impact on the growth of real economic output of Bangladesh.

Key Words: ARDL; Economic Growth; Fiscal Policy; Monetary Policy; Wald test;

1. Introduction

From the last decade Bangladesh is one of the fastest growing nations in not only South-East Asia and as well as the world. Recently this country has achieved the rank of developing nation across the world. To achieve the target of the middle-income nation within 2021, the Government of People's Republic of Bangladesh has taken the 7th five-year plan from the fiscal year 2016 to 2020. To fulfill this target the policymakers have taken different actions and policies to ensure the economic stability and rapid economic growth because the rapid economic growth is one of the pre-requisite to ensure the sustainable economic development of Bangladesh. The ultimate target of the policymakers is to achieve major macroeconomic goals such as the price level stability, lower rate of unemployment and higher growth of real GDP. The monetary authority would like to attain those goals simply adjusting monetary policy instruments. The fiscal authority, on the other hand, has also its objective to

[1] Assistant Professor, Department of Economics, University of Barisal, Barisal-8200, Bangladesh E-mail: refateco@gmail.com

[2] Research Assistant and Graduate Student, Department of Economics, University of Barisal, Barisal-8200, Bangladesh

reach the highest attainable growth path by using fiscal policy. In this situation, an efficient policy-mix framework is necessary to ensure rapid economic growth within the shortest time as possible. Such a framework can be ensured by harmonizing monetary and fiscal policy and avoid possible inconsistencies.

The fiscal policy deals with public expenditures and revenues. Pragmatic and efficient fiscal stance promotes economic growth without inflation pressure, low levels of fiscal deficit and public debt and narrow budget imbalances in situations of a high fiscal deficit and public debt etc. Forward-looking governments participate in almost every part of social and economic life is reflected through the fiscal policy. The fiscal policy measures are taken by influencing aggregate demand and supply, attempting to create better employment conditions and acceptable inflation level, leading the policy of steady trade balance and supporting sustainable economic growth.

Monetary Policy deals with the discretionary control of the money supply by the central bank. It is mostly focused on achieving stability of prices through targeting inflation rates, stimulating exchange rate leading towards the positive balance of payment, and acceptable level of employment. Additionally, it influences the output level and economic growth rate, and moderates excessive aggregate liquidity in the economy.

Both monetary and fiscal policies have been proved to have roles in the economic stabilization within developing countries. In the literature, there are two groups arguing over the relative effectiveness of the two policies in the macroeconomic stabilization of a country. The monetarist Economists Friedman and Meiselman (1963), Anderson and Jordan (1968), Carlson (1978) believes that monetary policy is more powerful than fiscal policy in achieving various economic goals. The other group lead by Keynes (1964), however, tends to believe in fiscal actions. Generally, there are certain situations where monetary policy is effective and others in which fiscal policy achieves better macroeconomic performances.

In this paper by using advanced econometrics method, it has been tried to develop an empirical inquiry by which it has been determined which policy has more contribution to achieving the rapid economic growth in Bangladesh. This research manuscript is designed into several sections in section 2 an intensive literature review has appeared, in section 3 the research gaps and objectives of the study have been demonstrated, section 4 focus on the data and Sources, section 5 illustrates research methodology, section 6 presents empirical results and finally, the conclusions and recommendations are given in section 7 of this study.

2. Literature Review

The impact of monetary and fiscal policy actions is a debatable and extensive topic. Several authors have examined the relative impact of monetary and fiscal policy on various macroeconomic aggregates and economic activities in both developed and developing countries. The earlier studies show that the effectiveness varies with situation, time and regional based on diversification. Some paper shows that monetary policy is more effective than fiscal policy as well as some shows that fiscal policy is more effective than the monetary policy for macroeconomic development.

Kaya (2015) by using Structural Vector Autoregressive (SVAR) model on Turkey, he found that both monetary and fiscal policies do have significant effects on growth. However, monetary policy is more effective than fiscal policy in stimulating growth. More specifically, the interest rate is the most potent instrument in affecting growth. Then the budget deficit becomes the second important variable after interest rate. These findings suggest that although the relative effectiveness in boosting growth is different, both policies significantly influence growth, suggesting that they should be used jointly but in an efficient manner.

Falade (2015) suggests that there is a long run relationship between fiscal and monetary variables and economic growth. However, it found that the current level of the exchange rate and its immediate past level, domestic interest rate, current level of government revenue and current level of money supply are the appropriate policy instrument mix in promoting economic growth both in the short and long run. He concluded that fiscal and monetary politics are still complementary.

Jayaraman (2012) confirmed the hypothesis that for a small open economy such as Vanuatu without a fully developed financial sector, fiscal policy is a more important policy tool than monetary policy in stimulating economic growth, especially in the short run. In the long-run, it is clear innovations in monetary aggregateu found to have a more significant effect on the output growth over all the time horizons in Vanuatu.

Haq (2016) explains the Trace test and Maximum Eigenvalue validate the existence of co-integration among fiscal policy, monetary policy and economic growth in case of Pakistan which found that both fiscal and monetary policies positively affect the growth of GDP per capita in the long run.

Johansen cointegration reveals that monetary policy has a greater long-run positive impact on economic growth over fiscal policy in Bangladesh (Hasan 2016). VECM show that there is a weak long-run causality running from monetary and fiscal policies to economic growth. It also finds that GDP, M2, and TR play a part to adjust any disequilibrium, while TR picks up the disequilibrium rapidly and guides the variables of the system back to equilibrium. Granger causality test results show that M2 is the leading indicator with respect to economic growth in Bangladesh in the short run. Moreover, economic growth is a leading indicator with respect to fiscal policy in the short run. Thus, it concludes that monetary policy is more effective than fiscal policy to promote economic growth in the short run and long run in Bangladesh.

Younus (2012) indicates that both the monetary and fiscal policies have significant as well as positive impact on real output growth in Bangladesh with varying degree. The outcomes of the study demonstrate that monetary policy has a relatively stronger impact than that of fiscal policy in altering output growth in Bangladesh.

This paper investigates the policy effectiveness which is methodologically and significantly different from the previous studies on Bangladesh. Firstly, the using dataset is more recent and covers a wider span of time producing more degrees of freedom and power that helps to get more efficient parameter estimates. Secondly,

this paper uses sophisticated econometric techniques, such as Jacque-Bera normality test, unit root test, Autoregressive Distributed Lag (ARDL) Model that address most of the criticisms associated with the variables and equations.

3. Research Gaps and Objectives of Study

The impact of policies (monetary and fiscal) on the real economic growth is not very unusual but comprehensive research study around the world since it is very common that executive authorities of countries try to adjust their policy tools to achieve some predetermine goals or to rescue the economy from unexpected fluctuations. For that point of view, it is necessary to conduct regular research to investigate the efficiency of policies on economic growth and welfare. From the investigation of past literature, it has been revealed that Vector Autoregressive Model (VAR) or Ordinary Least Square Method (OLS) or Error Correction Method (ECM) are used to empirically investigate the relationship between the policies and economic growth. Petrevski (2015), Hussain (2014), Cyrus (2014), Rahman (2009), Owoye (1994) had been used VAR model to investigate the causal relationship among the fiscal policy, monetary policy and real growth of the economy. Some researchers named Rakic (2013), Havi (2014), Jawaid (2010), Chowdhury (1988) used the OLS method on this type of study.

This paper, most advanced econometrics tools and most large and recent data set are used for impact analysis of policies on the economic growth of Bangladesh. This study Autoregressive Distributed Lag Model (ARDL) is used to investigate short run and long-run dynamic impact of policies on the economic growth of Bangladesh. In this manuscript, the Wald test and the Stability test also add a new dimension to investigate short-run and long-run causality. This paper is isolated from other research in the context of research methodology and applied techniques.

The objectives of this research are to investigate the recent impacts of monetary and fiscal policy on the economic growth of Bangladesh and adjustment of policies over time.

4. Data and Statistical Properties

This study entirely based on secondary data sources of 38 years' yearly observations covering the years ranged from 1980 to 2017. Data are collected from the World Development Indicators (WDI). It uses economic growth as a dependent variable, while monetary and fiscal policies instruments as independent variables. In this paper economic growth is reflected through the annual growth of real output of Bangladesh which is denoted by GDPg ; broad money, M2 (current local currency unit, LUC) as a proxy of Monetary Policy, as well as government final consumption expenditure (current LCU) GE as a proxy of Fiscal Policy. The data of money supply and government expenditure are converted into log transformation to reduce the unnecessary impact of those variables on the growth of Bangladesh. Each of those data series has a positive trend which is demonstrated in the following figure:

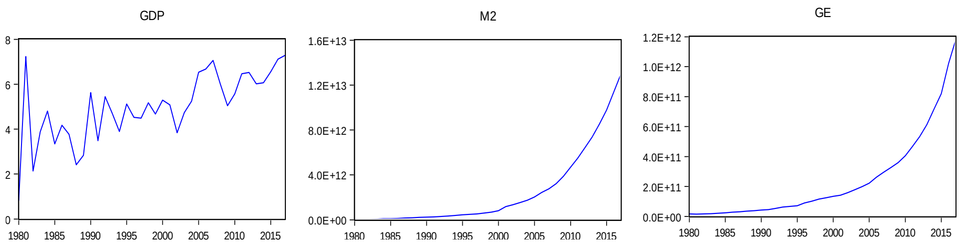


Figure-1: Graphical representation of data series.

In table 1, the common statistical parameters of the data series are given to realize the nature of the date set of this study:

Table-1: Statistical Features of the Variables.

Statistics	GDPg	LM2	LGE
Mean	4.99	27.37	25.46
Median	5.10	27.18	25.51
Maximum	7.28	30.19	27.79
Minimum	0.82	24.41	23.39

Source: Author's Calculation.

From the above table, the mean value of GDPg, LM2, and LGE are 4.99, 27.37 and 25.46 respectively. The maximum value of GDPg is 5.10, LM2 is 30.19 and LGE is 27.79.

5. Methodology

In this paper, a set of advanced and unavoidable econometrical tools are used to identify the impact of Fiscal and Monetary policies on the economic growth of Bangladesh. The components of the research methodology of this paper are explained below :

5.1 Normality Test

The assumption of normality is most essential and has great importance for the time series analysis (Gujarati, 2012). This test is conducted by the residual of OLS estimation in which skewness and kurtosis of residual are used to estimate the normal distribution of residual (Jarque, 1987). The test statistics of normality test is,

$$JB = n\left[\frac{S^2}{6} + \frac{(K-3)^2}{24}\right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . (1)$$

In here,

$n = Samplesize, S = skewnesscoefficient, K = Kutosis.$

The hypothesis statement of this test is,

$H_o = TheSeriesIsNormallyDistributed.$

$H_a = TheSeriesIsNot - NotNormallyDistributed.$

5.2 Unit Root Test

Unit root test is the window of time series analysis, because on the basis of this test the researchers take the decision about they type of econometrics model they should apply. Unit root test is the popular test to determine a series is stationary or

non-stationary (Gujarati, 2012). If a series called $\{Y_t\}$ is AR(1) process, then the series has the validity to apply unit root test (Agung, 2009). If the series $\{Y_t\}$ has a unit root, then the following model is econometric analysis : used,

$$Y_t = Y_{t-1} + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.(2)$$

$$d(Y_t) = Y_t - Y_{t-1} + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3)$$

Now following equation should be considered,

$$d(Y_t) = \delta Y_{t-1} + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..(4)$$

Now the hypothesis is,

$$H_o: \delta = 0, hasunitroot.$$

$$H_a: \delta \neq 0, hasnotunitroot.$$

The basic equation of this paper for unit root is in the following :

$$d(Y_t) = \beta_1 Y_{t-1} + \beta_2 + \beta_3 Trend + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(5)$$

5.3 Lag Length Criteria

In this paper Autoregressive Distributed Lag Model (ARDL) is used to establish the short run and long run relationship among the variables. In this situation in identify the optimal number of lag is necessary to find out the appropriate relationship in the econometrical analysis of the model. In this paper Sequential modified LR test statistics, Final Prediction Error, Akaike information criterion, Schwarz information criterion and Hannan-Quinn information criterion are used to determine the optimal number of lags of our analysis.

5.4 Autoregressive Distributed Lag (ARDL) Approach

By using Autoregressive Distributed Lag approach, long run relationship among the time series data has been identified in the case of non-stationary and stationary data series. This approach is developed by Granger (1981) and Engle and Granger (1987), Pesaran and Shin (1999). This approach is a combination of long-run and short-run coefficients. The basic model of ARDL is

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \beta_i \Delta Y_{t-1} + \sum_{i=1}^{n} \delta_i \Delta X_{t-i} + \gamma_1 Y_{t-1} + \gamma_2 X_{t-1} + u_t \dots\dots(6)$$

From the above ARDL core equation $\beta_i \& \delta_i$ represent the short-run dynamic of the model and $\gamma_1 \& \gamma_2$ measure the long run impact of the model. The error term of the model is white noise e.i

$$u_t \sim IIND(0, \sigma^2) \dots\dots\dots\dots\dots\dots\dots\dots.(7)$$

The ARDL model with error-correction term is developed from long run equation which is given below

$$Y_t = \beta_0 + \beta_1 X_t + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.(8)$$

From the above equation the error term of the model has been developed in the following manner :

$$Z_{t-1} = Y_{t-1} - \beta_0 - \beta_1 X_{t-1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.(9)$$

Now the ARDL model along with ECT or Error Correction Term is on below

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \beta_i \Delta Y_{t-1} + \sum_{i=1}^{n} \delta_i \Delta X_{t-i} + \vartheta Z_{t-1} + u_t \dots\dots\dots\dots\dots\dots (10)$$

In equation 9, ϑ is the ETC coefficient and Z_{t-1} is ECT term which also measures the speed towards equilibrium in long-run from the disequilibrium in short run dynamic.

5.5 Wald Test

Abraham Whether developed a Chi-Square distribution by which, it is easy to determine how a variable has significant impact on the dependent variable or not. After his name this test is called as Wald Teat. This test is special format of Chi-Square distribution. The test statistics is,

$$W_t = \frac{\left[\hat{\theta} - \theta_0\right]^2}{1/\ln\left(\hat{\theta}\right)} = \ln\left(\hat{\theta}\right)\left[\hat{\theta} - \theta_0\right]^2 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (11)$$

Where,

$\hat{\theta} = MaximumLikelihoodEstimation$

$\ln\left(\hat{\theta}\right) = ExpectedFisherInformation$

The statement of the hypothesis for this test are

$H_0 = EstimatedCoefficientValueIsZero.$

$H_A = EstimatedCoefficientVAlueisnotZero.$

5.6 LM Test or Serial Correlation Test

Breusch- Godfrey develops the LM test of serial correlation in the year 1979. The basic theoretical framework of the model is demonstrated below,

$$Y_t = X_t\beta + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (12)$$

$$u = \begin{matrix} u_1 \\ u_2 \\ u_3 \\ . \\ u_n \end{matrix}$$

From equation 12, the column vector of error term u is consider as the first order autocorrelation to each other, so that it has been written as,

$$u_t = \rho u_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (13)$$

Here,

$$\varepsilon_t \sim IIND(0, \delta^2) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (14)$$

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

If, $\rho = 0, Noserialcorrelation$

$\rho \neq 0, Serialcorrelation$

Now add and subtract $\rho_1 Y_{t-1}$ at right hand side at equation 12,

$$Y_t = \rho_1 Y_{t-1} - \rho_1 Y_{t-1} + X_t\beta + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (15)$$

Rewriting the equation 16,

$$Y_t = \rho_1 Y_{t-1} + (X_t - \rho_1 X_{t-1})\beta + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (16)$$

Where,

$$\varepsilon_t = u_t - \rho_1 u_{t-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (17)$$

From the up equation 17, the LM test statistics is

$$LM = \frac{n-k}{m}\frac{R^2}{1-R^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (18)$$

The statement of hypothesis of this model is

$$H_o = NoSerialCorrelation$$

$$H_a = SerialCorrelation$$

6. Result and Analysis

6.1 Normality Test Analysis

Statistical features presented in table-2 is the summary statistics whishes standard deviations, kurtosis, skewness and Jarque-Bera test for data under consideration in their log levels. It has been observed that the standard deviation of M2 is higher than other variables. It means monetary policy variables are more volatile compared to other variables. The negative skewness values of GDP indicate that GDP is skewed to the left meaning that the left tail is longer; on the other hand, the positive skewness of M2 and GE indicates that the variables are skewed to the right meaning that the right tails are longer. The calculated Jarque-Bera statistics and P-values are used to test the null hypothesis for normal distribution. The P-values reveal that the null hypothesis is accepted for all the variables meaning that they are normally distributed.

Table-2: Normality Statistics.

Statistics	GDP	LM2	LGE
Std. Dev.	1.507956	1.696394	1.290299
Skewness	-0.582548	0.010621	0.081110
Kurtosis	3.114198	1.882203	1.885407
Jarque-Bera	2.169943	1.979040	2.008668
Probability	0.337911	0.371755	0.366288

Source: Author's Estimation.

6.2 Unit Root Test

The study adopted the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) approach to identify the order of integration of the variables. The results are presented in Table-3. Considering the results of ADF and PP tests it is clearly evident that the null hypothesis of a unit root at the level are rejected only for GDP with both intercepts as well as trend and intercept term at 1 percent significance level. It concludes that GDP is stationary at level. So GDP series is found to be integrated of order zero, i.e., I(0). On the other hand, considering intercepts as well as trend and intercept term for the LM2 and LGE series, it concludes that LM2 and LGE have unit root problem in level. That means LM2 and LGE series are non-stationary in levels. To solve the unit root problem, consider ADF and PP tests at the 1st difference. The

results of ADF and PP at 1st difference indicate that LM2 and LGE are stationary with 1 percent significance level. So LM2 and LGE series are found to be integrated of order one, i.e., I(1). Based on this ADF and PP result, the condition for autoregressive distribution lag cointegration bound testing (ARDL) approach is met.

Table-3: ADF & PP unit root test results of the variables.

		GDP	LM2	ΔLM2	LGE	ΔLGE
ADF	**Intercept**	-4.966414 (0.0002)	-0.834104 (0.7974)	-4.657591 (0.0006)	2.012964 (0.9998)	-8.955058 (0.0000)
	Trend & Intercept	-8.854224 (0.0000)	-2.182145 (0.4851)	-4.652304 (0.0035)	-3.626794 (0.0411)	-8.934074 (0.0000)
PP	**Intercept**	-5.222163 (0.0001)	-0.834104 (0.7974)	-4.629839 (0.0007)	2.128201 (0.9999)	-8.834254 (0.0000)
	Trend & Intercept	-8.548039 (0.0000)	-2.182145 (0.4851)	-4.666915 (0.0033)	-3.957867 (0.0192)	-8.827128 (0.000)
Order of Integration		**I(0)**		**I(1)**		**I(1)**

Note: First bracket shows P-values & the other is t-statistic.
Source: Author's Estimation.

6.3 *Selection of Optimal Lag Length*

Autoregressive distribution lag cointegration bound testing (ARDL) approach is usually proceeded by a test of optimal lag length due to the pact that estimated results are affected by the number of lag included. This paper uses and checks five different criteria namely, Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criteria (AIC), Schwarz Information Criteria (SIC) and Hannan-Quinn Information Criteria (HQ) to determine the optimum lag lengths. Results for each criterion with a maximum of 6 lags exhibit that all criteria stand in favor of 1 lag.

Table-4: Optimal lag lengths selection criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-61.50502	NA	0.011311	4.031563	4.168976	4.077112
1	81.25443	249.8290*	2.66e-06*	-4.328402*	-3.778751*	-4.146208*
2	84.92658	5.737741	3.77e-06	-3.995411	-3.033522	-3.676572
3	88.38660	4.757523	5.57e-06	-3.649162	-2.275035	-3.193678
4	94.72597	7.528005	7.16e-06	-3.482873	-1.696508	-2.890744
5	96.62769	1.901716	1.29e-05	-3.039231	-0.840627	-2.310456
6	115.0892	14.99994	9.11e-06	-3.630572	-1.019730	-2.765152

Note: * indicates lag order selected by the criterion.
Source: Author's Estimation.

6.4 ARDL Approach

The ARDL result established an indirect short-run relationship between GDP growth and all the independent variables, which include M2 as well as GE. Using 1 lag the ARDL model can be derived as

$$\Delta GDP_t = \alpha_1 + \alpha_2 \Delta GDP_{t-1} + \alpha_3 \Delta LM2_{t-1} + \alpha_4 \Delta LGE_{t-1} + \alpha_5 GDP_{t-1} + \alpha_6 LM2_{t-1} + \alpha_7 LGE_{t-1} + u_t$$

Here, α_1 is intercept term; α_2 , α_3 & α_4 are short run coefficients and α_5 , α_6 & α_7 are long run coefficients. Estimated results of this model are given in table-5.

Table- 5: Estimated ARDL model.

Coefficient	Estimated Value of Coefficient	P-Value
α_1	-16.71	0.07
α_2	0.03	0.81
α_3	0.35	0.89
α_4	2.80	0.31
α_5	-1.07	0.00
α_6	0.14	0.91
α_7	0.70	0.67

Source: Author's Estimation.

This estimated result shows that both money supply and Government expenditure have significant effects on GDP growth. But there exist three questions as such—are those coefficients significant? Is this model free from serial correlation problem? And is this model stable for the long time period? To find the answer of those questions we use Wald test for testing significance of the coefficients, Breusch-Godfrey Serial Correlation LM Test for checking serial correlation problem and CUSUM test for stability test.

6.5 Wald test for short-run and long-run association

Wald test for short run coefficient considering Null Hypothesis: $\alpha_3 = 0$ shows in the table-6 that Chi-square probability value is 89 percent which is much higher than 5 percent. It indicates that we cannot reject null hypothesis that means in the short run money supply has no effect on GDP Growth.

Table- 6: Wald test for $\alpha_3 = 0$

Test Statistic	Value	df	Probability
t-statistic	0.137768	29	0.8914
F-statistic	0.018980	(1, 29)	0.8914
Chi-square	0.018980	1	0.8904

Source: Author's Estimation.

Now test for the coefficient of fiscal policy considering null hypothesis as $\alpha_4 = 0$ given in the table-7 shows that Chi-square probability value is 30 percent which is reasonable to accept the null hypothesis that coefficient of fiscal policy is not significant. That means in the short run GDP growth rate is independent to the fiscal policy implementation.

Table- 7: Wald test for $\alpha_4 = 0$

Test Statistic	Value	df	Probability
t-statistic	1.026826	29	0.3130
F-statistic	1.054372	(1, 29)	0.3130
Chi-square	1.054372	1	0.3045

Source: Author's Estimation.

Wald test for long-run coefficient considering the null hypothesis: $\alpha_5 = \alpha_6 = \alpha_7 = 0$. In table 8 it has shown that Chi-square probability value is less than 5 percent which indicates that we can reject the null hypothesis and conclude that long-run coefficients are different from zero. That means both monetary policy and fiscal policy have long run association to GDP growth rate.

Table- 8: Wald test for long run coefficient

Test Statistic	Value	df	Probability
F-statistic	7.066481	(3, 29)	0.0010
Chi-square	21.19944	3	0.0001

Source: Author's Estimation.

6.6 Breusch-Godfrey Serial Correlation LM Test

The Breusch–Godfrey serial correlation LM test is a test for autocorrelation in the errors in a regression model. For time series data it is known as serial correlation. The null hypothesis is that there is no serial correlation. The result of this LM test shows that probability value of Chi-square statics 0.2033 is higher than 5 percent which is reasonable to accept the null hypothesis that there is no serial correlation.

Table- 9:Breusch-Godfrey Serial Correlation LM Test

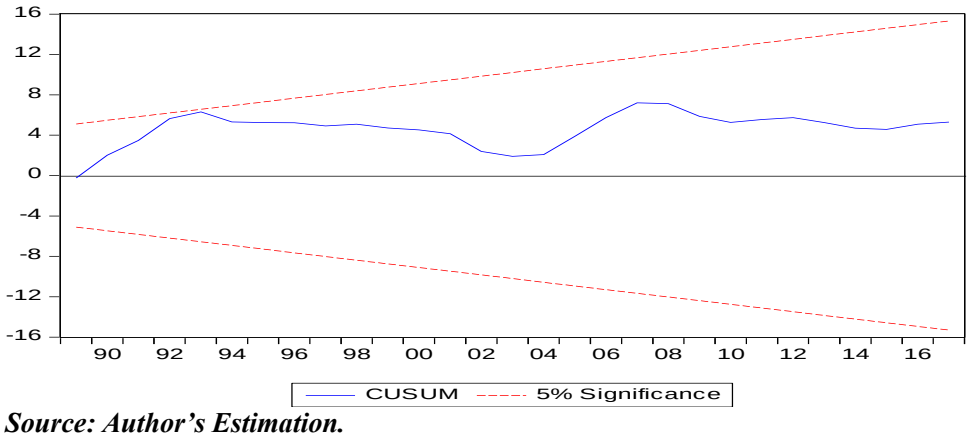
Statistics Name	Value of Statistics	P-value Name	Value
F-statistic	1.318137	**Prob. F(1,28)**	0.2606
Obs*R-squared	1.618553	**Prob. Chi-Square(1)**	0.2033

Source: Author's Estimation.

6.7 CUSUM test for stability

CUSUM tests assess the stability of coefficients in a multiple linear regression model. CUSUM line within two critical lines indicates that the model is stable for the long-run.

Figure -2: CUSUM Stability Test.



Source: Author's Estimation.

6.8 Long run model and relative effectiveness of policies with error correction term

This study found that in the short-run GDP growth is independent of both monetary and fiscal policies but both have a long-run effect on GDP growth. Now the question is—which policy more effective than another one. To analyze this question consider our long-run equation is

$$GDP = \alpha_1 + \alpha_2\, LM2 + \alpha_3\, LGE$$

Estimated result of this model indicates that the coefficient value of the money supply or monetary policy is positive that means monetary policy has a positive impact on GDP growth. On the other hand, the coefficient of Government Expenditure or fiscal policy is negative that means in the long run fiscal policy has a negative impact on GDP growth. This result can be presented as— follows :

$$GDP = -9.72 + 1.02\, LM2 - 0.52\, LGE$$
$$se = \quad (7.88)(1.17)(1.55)$$
$$t = \quad (-1.23)(0.86)(-0.33)$$

Following the coefficient value of the monetary and fiscal policy, it is easy to see that monetary policy is more effective than fiscal policy. In the long run, monetary policy can increase economic growth whereas fiscal policy taken by the government has negative effects. The coefficient of error correction term is -1.012 and it is significant at 1 percent significance level. It represents that our long-run model is convergence to the long run equilibrium.

7. Conclusion

In this paper, yearly data from 1980 to 2017 (38 years) are used to investigate the impact of fiscal and monetary policy on the economic growth of Bangladesh. The Wald test reveals that monetary policy has a long run positive impact on economic growth of Bangladesh. On the other hand, fiscal policy has a negative impact on the economic growth of Bangladesh in long-run though, in the short-run, it has a positive influence on the economic growth of Bangladesh. The coefficients of error correction terms of the first-difference of GDP, M2 and GE reveal that GDP, M2, and GE contribute to adjusting any disequilibrium, while M2 picks up the disequilibrium quickly (less than one year) and guides the variables of the system back to equilibrium. Finally, it has been concluded that monetary policy is the most effective instrument to promote economic growth in Bangladesh. That's why sound coordination of monetary policy and Fiscal is necessitated in Bangladesh to ensure more rapid economic growth.

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