THE IMPACT OF KEY MACROECONOMIC FACTORS ON THE ECONOMIC GROWTH OF BANGLADESH: AN AUTO REGRESSIVE DISTRIBUTED LAG BOUNDS TESTING APPROACH

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Abstract: *Economic growth is a foremost factor in determining the well-being of the people in a country. This study analyzes the impact of key macroeconomic factors on economic growth of Bangladesh from the period of 1990 to 2020. The aim of the study is to examine the long run and short run relationship between the economic growth and various macroeconomic variable by using Auto Regressive Distributed Lag (ARDL) model. The widely-used Akaike Information Criterion (AIC) is used for the selection of lag length of the model.* The result of the ARDL model shows that inflation rate, exchange rate and trade openness have positive and significant impact on Bangladesh economic growth while foreign direct investment has insignificant impact on economic growth of Bangladesh**.** *As the country's GDP is increasing, it is more productive which leads to more people being employed. This increases the wealth of the country. Economic growth also helps to improve the standards of living and reduce poverty, but these improvements cannot occur without economic development.*

Keywords: FDI, GDP, CPI, TO, EX.

1.Introduction

Economic growth is considered as one of the most important parameter for the development of a country. Bangladesh is one of the fastest growing economies in the world.

Bangladesh is classified among the next eleven emerging market middle income economies and a frontier market. Bangladesh is among the three fastest growing economies in the world, according to the International Monetary Fund (IMF).Regarding the concept economic growth have dealt many famous world economists trying to find and explain the role and what are the instruments that influence the economic growth of a country. Despite great interest of researchers in the field that has to do with economic growth as an indicator of macro fiscal policy, in the economic theory and practice there are not yet final determinants which show the reasons why some countries develop faster and some slower.

There has been a huge economic progress in Bangladesh since its independence. None can dare to call it a "bottomless basket" anymore. Rather many countries in the world borrow from this basket. Bangladesh is one of the world's fastest growing economies. In the decade since 2004, Bangladesh averaged a GDP growth of 4.5% that has been largely driven by its exports of readymade garments, remittances and the domestic agricultural sector. The agricultural production also plays as a stimulus for the economic growth throughout 1990s. In 1990s the Bangladesh observes rapid economic growth with significant improvement in the poverty situation. It also helps to channel and mobilize funds to government, enterprise, individual and works as most constructive source of investment in the economy. Besides, it is also considered one of the vital factor for promoting and maintaining economic growth of a country. Bangladesh has made significant strides in its economic sector performance since independence in 1971. Although the economy has improved vastly in the 1990s, Bangladesh still suffers in the area of foreign trade in South Asian. During the last 15 years, India's population growth has actually been more than that of Bangladesh. Hence faster GDP growth in the past five years, coupled with slower population growth, has ensured that Bangladesh has overtaken India in per capita terms. The government might focus on required reforms and policy implications to make foreign investment more beneficial. Realizing the importance of foreign investment, a new industrial policy was adopted by the government of Bangladesh (GOB) in 1999 to achieve the goal of rapid industrialization, by offering investment friendly incentives to foreign investors (Foreign Investment, 2009).

There are many macroeconomic variables that can affect economic growth. The present study is concentrate on four macroeconomic variables namely; inflation rate, exchange rate, foreign direct investment and trade openness affect the economic performance of the Bangladesh economy. Economic growth can be expressed as the change of production of goods and services, compared from one period to another. Any developing country's economy can be improved by their performance in exports; this would indicate the strength of industries and international competitiveness as well. On the other hand, exchange rate would indicate the value of our currency in terms of US dollars; therefore the value of our currency would indicate the purchasing power of imports, but also the value of our exported items. Trade liberalization policy in 1990 opened up the opportunity for the Bangladesh economy to enhance economic growth and foster overall development. Trade openness can have a positive effect on economic growth, exports, imports, FDI and remittance of a country. The history of Bangladesh's economy starts in the 1960s, where the East Pakistan's economy grew by an annual average rate of around 4 percent. Lastly foreign investment especially FDI inflows are very important for any developing or underdeveloped countries' economic growth. GDP is a very strong measure to gauge the economic health of a country. It is used as an indicator by almost all the governments and economic decision-makers for planning and policy formulation. However, there has been minimal empirical work that specifically looks into macroeconomic factors that may accelerate the growth of developing economies in recent years. This study is to identify the key macroeconomic factors that determine economic growth in Bangladesh.

2.Objectives of the Research

- To analyse the growth and trend of economic growth of Bangladesh.

- To know the impact of major macroeconomic indicators like inflation rate, exchange rate, foreign investment and trade openness on economic growth.

- To suggest significant policy implications for efficient economic growth.

3.Research Hypothesis:

H_1 = There is a significant impact of inflation on the economic growth.

H_2 = There is a significant impact of foreign investment on the economic growth.

H_3 = There is a significant impact of currency exchange rate on the economy.

H4= There is a significant impact of trade openness on the economic growth.

4.Research Methodology

This study carried out analytical and empirical in nature which emphasis the relationship between economic growth and its determinants of Bangladesh. In this research the Gross domestic product is dependent variable but interest rate, exchange rate, FDI inflows and inflation are independent variables of the model.

4.1Data Source

This research paper is mainly concentrated on secondary data from 1990-2020. The GDP growth, inflation, exchange rate and foreign direct investment are collected from the World Bank website. E-Views 7 software is used for this analysis purpose.

4.2 Data Analysis

To examine the determinants of macro-economic indicators of economic growth in Bangladesh is analyzed through Auto Regressive Distributed Lag (ARDL) model. For checking the stationary properties and unit root of the data series Augmented Dicky Fuller (ADF) test is used. Akaike Information Criteria (AIC) suggest the optimal lag length for ARDL model.

5.Review of literature

To examine the impact of macroeconomic variables on economic growth in perspectives of different countries, numbers of studies have been conducted. There is no debate in literature on the relationship between inflation and economic growth but there is a serious debate about the sign of relationship between inflation and economic growth. Literature shows that it may be positive or negative related to economic growth. Inflation has multiple economic implications for an economy and most of the countries try to maintain a sustained high economic growth with low inflation. Inflation raises the price level of commodities, services and

other factors thus creates economic difficulties for a country. It causes the deterioration in purchasing power of money, therefore, value of money also decreases simultaneously. This price level increase and decline in value of money triggered by inflation affect the growth of an economy. Higher inflation also causes high interest rate. The increase in interest rate leads to decrease in economic growth of a country and vice versa. Malik and Chowdhury (2001) estimated that inflation and economic growth are positively related with each other in India, Pakistan, Bangladesh and Sri Lanka. However there are so many other studies which pointed out negative relation between inflation and economic growth. Ghosh and Phillips (1998) argued that there is no doubt about the fact that high inflation is bad for growth. They observed that there is a significant inverse relationship between inflation and economic growth. But Levine and Zervos (1996) concluded that the moderate inflation was not harmful to the economic performance of the countries. According to Anyanwu (2014) inflation is negatively related to economic growth in Africa. However, Awan (2010) found that in Pakistan inflation is positively related with economic growth.

Foreign Direct Investment is also considered the macroeconomic variable in empirical studies. According to neoclassical theorists, FDI influences economic growth by increasing the amount of per capita capital. It does not influence long-run economic growth because of diminishing returns to capital. They argue that long run growth can only arise because of technological progress or population growth which are completely exogenously determined. They also claim that FDI can affect growth if it has positive and permanent impact on technology. On the contrary, recent endogenous growth theory states that FDI expands long-run growth endogenously by increasing Total Factor Productivity (TFP) in the production process. The impact of foreign direct investment on economic growth in developing countries leads to positive relationship. FDI generally has a positive impact on economic growth in developing countries as it helps to build physical capital, create employment opportunities, develop productive capacity and enhance skills of local labor. Vijayakumar et al. (2009) analyzed the relationship between economic growth and foreign direct investment in BRICS Countries by using Johansen-Cointegration and VECM Test. The result shows that economic Growth guides foreign direct investment bi-directionally for Brazil, Russia and South Africa and foreign

direct investment guide growth unidirectional for India and China respectively. Miankhel et al.(2009) also examined the relationship between foreign direct investment and economic growth in six emerging countries like India, Pakistan, Mexico, Malaysia, Chile, and Thailand. The result shows that there is bi-directional relation between economic growth and foreign direct investment in Thailand and India. But in case of Malaysia, there is no relationship between foreign direct investment and economic growth.

Theoretical literature on exchange rate volatility nexus economic growth is still a big debate among economists. Exchange rate has momentous impact on economy. Because exchange rate appreciation and depreciation maintains an economy's inflow and outflow of funds and affect the economic performance of the host economy. It may be positively or negatively affected. Exchange rate fluctuations have momentous implications for economic performance in Bangladesh. This is why fluctuation in exchange rate brings about changes in trade balance by influencing the country's export and import. Exchange rates may reason the price level to change and, as a consequence, it may change the income and wealth distribution of the economy.(Jaher, 2007). According to Islam and Hossain (2014) studied the relationship between the exchange rate and economic growth in Bangladesh from the period of 1981 to 2013. By using Regression Analysis, the exchange rate and the export income was considered as independent variable and the gross domestic product was treated as dependent variable. The result shows   that the exchange rate positively impacted on the economic growth of Bangladesh. In addition Schnabl (2008) argued that exchange rate volatility can enhance economic growth by way of increasing international trade, foreign direct investment, and macroeconomic stability. But Campa and Linda (1995) examined the effect of exchange rate volatility in US manufacturing sectors, it reported a negative effect on investment because the industries with high markup absorb fluctuation of the exchange rate by refusing real investment.

Another macroeconomic variable used in this study is trade openness or trade liberalization. In narrow mind by removing trade barriers with other countries, an economy may achieve their goal easily with effortless manner. Basically trade openness is needed to run after considering local trader's interest. Hang and Mendy (2012) also examined the effects of trade

openness on economic growth in Africa focusing on 36 countries using the total amount of exports and total amount of imports and the ratio of exports plus imports to GDP as proxies for trade openness. Karras (2003) investigated the effect of trade openness on economic growth using panel data analysis covering the periods 1951 to 1997 for 56 different countries. The result of this study found that trade openness had a significant positive effect on economic growth. Makun (2017) examined the effects of trade openness on economic growth in Malaysia for the period 1980–2013 and found that trade openness had a significant positive effect on economic growth. On the other hand, a study conducted in Bangladesh by Adhikary (2011) found that trade openness had a negative but diminishing influence on economic growth during the period 1986–2008.

Chowdhury et al. (2019) analyze the impact of macroeconomic variability on Bangladesh's economic growth, considering the GDP growth rate (GDP) as representative of economic growth. In addition, inflation (INF), real interest rate (INT), exchange rate (EXR) and growth in household consumption expenditure (HCE) are selected to represent macroeconomic variability. Correlation and Multiple Regression analysis are performed to evaluate the data. In the correlation analysis, GDP has a positive correlation with all variables except INT. In the Regression Analysis, GDP is selected as the dependent variability and INF, INT, EXR and HCE are considered independent variability. If we keep the independent variability they explain 75.60% of the GDP variability and the relationship if it is still statistically significant at the 95% confidence level. Therefore, this study concluded that macroeconomic variability did not have a significant effect on Bangladesh's economic growth.

There are many factors which contribute simultaneously to maintain sustainable economic growth of a nation. Therefore, the measurement of economic growth of a particular country is complex as so many determinants of growth are contributed simultaneously to gross domestic product. For that reason, this study will particularly investigate the impact of inflation, exchange rate, trade openness and foreign direct investment on economic growth and to examine their contribution toward economic development of Bangladesh.

Table 1: Correlation Matrix of Macroeconomic Variables of Bangladesh

	GDP	CPI	FDI	TO	EX
GDP	1	0.29	0.70	0.63	0.75
CPI	0.29	1	0.31	0.42	0.26
FDI	0.70	0.31	1	0.80	0.89
TO	0.63	0.42	0.80	1	0.85
EX	0.75	0.26	0.89	0.85	1

Source: Author's calculation

The Table 1 presents the result of correlation coefficient analysis of the macroeconomic variables of the study. From this correlation matrix , it can be seen that exchange rate has a strong positive correlation coefficient of 0.75 with GDP followed by FDI of 0.70. Trade openness has also a positive relationship with GDP. But inflation has a weak positive correlation coefficient of 0.29 with GDP.

6.Model Specification

To examine the relationship between key macroeconomic variables and economic growth in Bangladesh, we have specified following econometric model. The independent variables are inflation rate, exchange rate, foreign direct investment and trade openness, while the dependent variable is GDP growth as a proxy of economic growth.

GDP = F (CPI, FDI, TO, EX, ε)

GDP = Gross Domestic Product

FDI= Foreign Direct Investment

TO= Trade Openness

CPI= Consumer Price Index

EX= Exchange Rate

ε=Error Term

Gross domestic product is an accepted parameter to measure the performance of an economy. The graph shows the trend of real GDP for the country for the period 1990-2020. It was observed that there were wide fluctuations in the growth rate of GDP over the period (Figure 1). The average value for Bangladesh during that period was 5.69 percent with a minimum of 3.49 percent in 1991 and a maximum of 8.15 percent in 2019.

Figure 1: Gross Domestic Product of Bangladesh

GDP_P
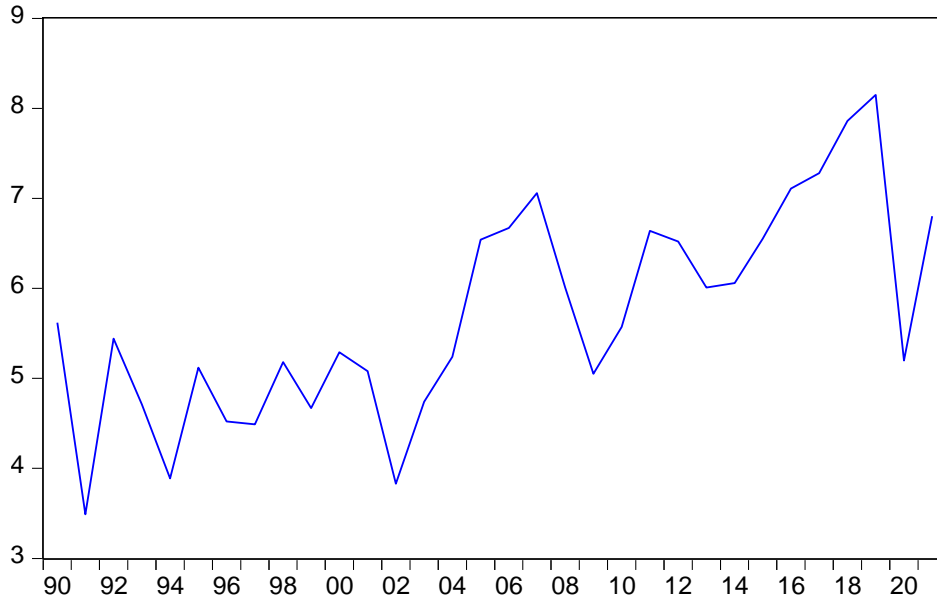
Unit Root Test

To check the stationary of the variables in a robust manner, two alternative unit root tests are used. The Augmented Dickey-Fuller (ADF) test and Phillips–Perron (PP) test was applied to try out the stationary properties of the data. Table 2 shows that consumer price index (CPI) is integrated of order I (0) i.e. Stationary at level. Foreign Direct investment (FDI), Exchange Rate (ER), Economic Growth (GDP), Trade openness(TO) are integrated of order I (1) i.e., non-stationary at levels but stationary at first differences. Therefore, all the series considered for estimating the model, are not integrated of the same club.

Table 2: **Augment Dickey Fuller Unit Root Test**

Variables	Stationary
CPI	I(0)
FDI	I(1)
TO	I(1)
EX	I(1)
GDP	I(1)

Source: Author's calculation

Optimum Lag Criteria: FPI and Macroeconomic Variable in India

Akaike Information Criterion (AIC) is the initial measures that can be taken up when choosing the appropriate 'lag length' in a time series. The lower the AIC, the better the model. Figure 2 shows the 20 best model with lowest AIC values. As seen in Figure 3, the lowest AIC value shows that the optimum lag length is ARDL (4, 4, 4, 4, 4).

Figure 2: Optimum Lag Length Criteria

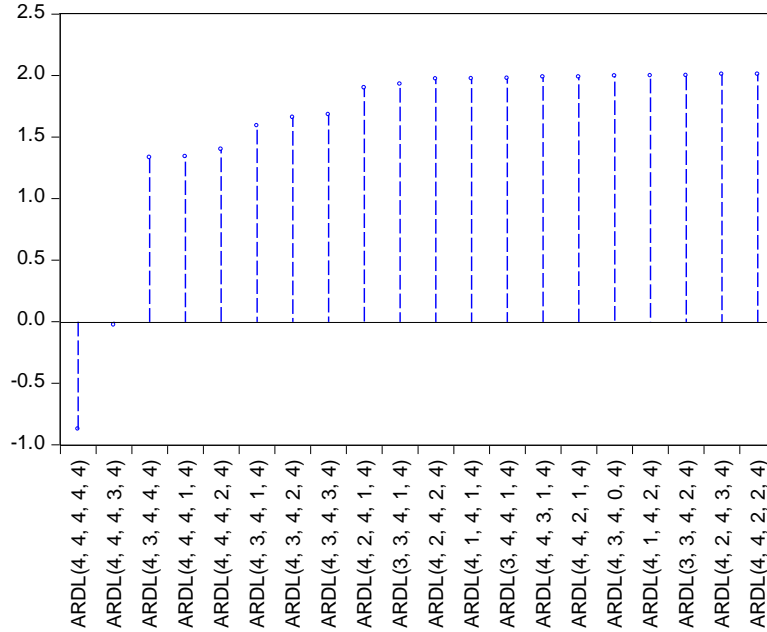Akaike Information Criteria (top 20 models)

Table 3: ARDL Model: Macro Economic Variables and Economic Growth in Bangladesh

Dependent Variable: GDP_P

Method: ARDL

Dynamic regressors (4 lags, automatic): CPI FDI TO EX

Fixed regressors: C

Number of models evalulated: 2500

Selected Model: ARDL(4, 4, 4, 4, 4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GDP_P(-1)	-0.274833	0.248610	-1.105477	0.3496
GDP_P(-2)	-0.589897	0.229677	-2.568380	0.0826
GDP_P(-3)	-0.299242	0.204209	-1.465370	0.2391
GDP_P(-4)	-0.662339	0.170691	-3.880348	0.0303
CPI	-0.220705	0.087759	-2.514896	0.0866
CPI(-1)	0.391031	0.090843	4.304492	0.0231
CPI(-2)	0.128254	0.066072	1.941133	0.1475
CPI(-3)	0.366563	0.093734	3.910676	0.0297

CPI(-4)	0.232920	0.096786	2.406535	0.0953
FDI	0.200464	0.396546	0.505525	0.6480
FDI(-1)	0.421494	0.330084	1.276928	0.2915
FDI(-2)	-1.524676	0.473379	-3.220832	0.0486
FDI(-3)	-0.254484	0.306223	-0.831041	0.4669
FDI(-4)	0.777486	0.297149	2.616485	0.0792
TO	-0.056971	0.061039	-0.933354	0.4195
TO(-1)	-0.358469	0.101700	-3.524776	0.0388
TO(-2)	0.264937	0.087725	3.020088	0.0568
TO(-3)	-0.292658	0.084340	-3.469992	0.0403
TO(-4)	-0.049844	0.065411	-0.762020	0.5015
EX	0.003102	0.051612	0.060108	0.9559
EX(-1)	0.106225	0.066011	1.609211	0.2059
EX(-2)	0.115634	0.097235	1.189215	0.3199
EX(-3)	-0.228435	0.108944	-2.096818	0.1269
EX(-4)	0.369419	0.101635	3.634751	0.0359
C	5.804820	1.191418	4.872196	0.0165

R-squared	0.994141	Mean dependent var	5.947500
Adjusted R-squared	0.947273	S.D. dependent var	1.232825
S.E. of regression	0.283086	Akaike info criterion	-0.134007
Sum squared resid	0.240414	Schwarz criterion	1.055461
Log likelihood	26.87610	Hannan-Quinn criter.	0.229625
F-statistic	21.21120	Durbin-Watson stat	3.018409
Prob(F-statistic)	0.013908		

*Note: p-values and any subsequent tests do not account for model
   selection.

The Auto Regressive Distributed Lag model is applied to examine the co-integration relationship between economic growth and macro-economic variables in Bangladesh and to estimate simultaneously the short run dynamics and long run coefficient of the various determinants of economic growth of Bangladesh. The Adjusted R-squared value of the model is 94 percent.

ARDL Bound Test Model

The Auto Regressive Distributed Lag is a technique that allows to simultaneously estimate the short-run and long-run coefficients of our model. To prove the existence of the long - run relationship among the variables in the model, Pesaran et al (2001) introduced Auto Regressive Distributed Lag (ARDL) model. The primary function of estimating ARDL model is employed for applying bound test. We apply ARDL bound test to investigate the long-run relationship among variables in the model. In bound testing, the null hypothesis is that there is no long run relationship between macro-economic variables and economic growth in Bangladesh. Now we can conduct the F - statistic test to check the significance of the co-efficient of the variable at a level with lag values. The resolutions of the bound test are described in Table 4. The computed F-statistic is 5.67 which is more than the upper bound at 5 percent level. It indicates a long term relationship between variables of this model. Therefore our study conclude that there exist there is a long run relationship or co-integration between economic growth and its determinants in Bangladesh.

Table 4: ARDL Bounds Test

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	5.676969	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Source:
Author's   calculation

Table 5: Estimated Co-integrating Form and Long-run coefficients

ARDL Cointegrating And Long Run Form
Dependent Variable: GDP_P

Selected Model: ARDL(4, 4, 4, 4, 4)

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP_P(-1))	1.551478	0.414317	3.744664	0.0332
D(GDP_P(-2))	0.961581	0.287403	3.345758	0.0442
D(GDP_P(-3))	0.662339	0.170691	3.880348	0.0303
D(CPI)	-0.220705	0.087759	-2.514896	0.0866
D(CPI(-1))	-0.128254	0.066072	-1.941133	0.1475
D(CPI(-2))	-0.366563	0.093734	-3.910676	0.0297
D(CPI(-3))	-0.232920	0.096786	-2.406535	0.0953
D(FDI)	0.200464	0.396546	0.505525	0.6480
D(FDI(-1))	1.524676	0.473379	3.220832	0.0486
D(FDI(-2))	0.254484	0.306223	0.831041	0.4669
D(FDI(-3))	-0.777486	0.297149	-2.616485	0.0792
D(TO)	-0.056971	0.061039	-0.933354	0.4195
D(TO(-1))	-0.264937	0.087725	-3.020088	0.0568
D(TO(-2))	0.292658	0.084340	3.469992	0.0403
D(TO(-3))	0.049844	0.065411	0.762020	0.5015
D(EX)	0.003102	0.051612	0.060108	0.9559
D(EX(-1))	-0.115634	0.097235	-1.189215	0.3199
D(EX(-2))	0.228435	0.108944	2.096818	0.1269
D(EX(-3))	-0.369419	0.101635	-3.634751	0.0359
CointEq(-1)	-2.826311	0.575930	-4.907387	0.0162

Cointeq = GDP_P - (0.3178*CPI -0.1344*FDI -0.1744*TO + 0.1295*EX + 2.0539)

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	0.317751	0.045775	6.941546	0.0061
FDI	-0.134350	0.129652	-1.036240	0.3763
TO	0.174434	0.019916	-8.758658	0.0031
EX	0.129478	0.008723	14.842678	0.0007
C	2.053850	0.313796	6.545187	0.0073

Source: Author's   calculation

The primary aim of this econometric test is to find out major determinants of economic growth of Bangladesh. ARDL model estimate the macroeconomic determinants of economic growth

and analyses the short run and the long run effect on economic growth in Bangladesh. The results illustrated in Table 5 indicate that three explanatory variables like inflation, exchange rate and trade openness have positive and statistically significant for influencing the economic growth of Bangladesh. Furthermore, the remaining variable like foreign direct investment is statistically insignificant for influencing the economic growth of Bangladesh.

The Short Run Coefficient and Error Correction Term

The short-run coefficient and error correction term of the macroeconomic variables and economic growth of Bangladesh is presented in Table 5. The result shows that inflation, exchange rate, trade openness and foreign direct investment have statistically significant for influencing the economic growth of Bangladesh in short run.

The signboard of the coefficient of Error Correction Term is negative (-2.80) as anticipated, and it is highly significant at 1 percent level (Prob. 0.0162). The error correction term guides the variables of the model to regenerate back to equilibrium from a previous period's disequilibrium. Thus, it validates that a long-term relationship exists among variables in the original model. The coefficient of the error correction term (ECT) is highly significant with expected sign, which confirm the result of bound test for co-integration. The bigger the error correction coefficient the faster will be the return to balance. The equilibrium correlation coefficient is estimated -2.82 is highly significant at one percent. It too indicates the speed of adjustment towards long run equilibrium. In other words nearly 280 percent of any disequilibrium between these variables is corrected within one period. (One year). The system is getting adjusted towards long run equilibrium at the speed of 280 percent.

7.Conclusion

The study focuses on the consequences of impacts that have been exerted by the selected macroeconomic variables like inflation rate, exchange rate, trade openness and foreign direct investment on economic growth rate of Bangladesh. There are number of macroeconomic

variables that influence the growth performance of any country. The econometric result   shows that there is a positive relationship among GDP growth rate with exchange rate, inflation and trade openness in Bangladesh. On the other hand FDI have no significant impact on the GDP. FDI is considered to be a significant factor for a country for economic growth but our study reveals that it is insignificant for the economic growth of Bangladesh.

8.Policy Implications

Exchange rate has positive impact on the economy of Bangladesh. A strong exchange rate leads low cost of production and also helps to control inflation due to low prices of foreign goods and services. Therefore study suggests to the policy makers to maintain high exchange rate in order to boost up the economy of Bangladesh.

Inflation has significant positive impact on GDP. This implies that if the money supply increases in considered that price level of goods and services will be increased in Bangladesh. That's why, for supplying money in the market Bangladesh bank should control on price level and production condition of the economy.

Trade openness has positive relationship with economic growth. So, as possible as to make the Bangladesh trade barrier free with sovereign. And making sure that the potential local traders are protected.

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