

# An association amongst Foreign Direct Investment (FDI), Interest rate and Economic growth of Bangladesh from 1978 to 2020

Shahnaz Parvin

## Abstract

This study aims at analyzing the effect of the Foreign Direct Investment (FDI) and interest rate on the Gross Domestic Product (GDP) as well as the nature of them in Bangladesh from 1978 to 2020 years. For accomplishing the objectives, this study uses the Auto Regressive Distributed Lag (ARDL) co-integration approach. The bound test provides a long run relationship of the explanatory variables with the dependent variable. The result of error correction representation of the short run dynamics reveals that a self – adjusting mechanism of -0.452 exists. In the long run, FDI has a positive impact on the GDP which is statistically significant at 1% level. On the contrary, FDI, interest rate and the lagged GDP have significant influence on the economics growth which is also statistically significant ( $p < 0.05$ ). This study finds a higher FDI leads to better economic growth as well as higher interest rate may lead decline in the GDP. So, policy makers should adopt policies in favor of the positive FDI for having higher economic growth although it has many conflicts between higher GDP and economic wellbeing.



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## 1. Introduction

The Foreign Direct Investment (FDI) can generally be considered as a tool for foreign investors to invest long-term cash and cash equivalents in the host country (Bairagi, 2017). It contributes the host country's economic progress through direct or indirect coordination, efficiency, cost reduction, and increase productivity. FDI is regarded as a key source of capital, job creation, technology transfer, management capacity growth, and improving market efficiency in any developing country like Bangladesh. To meet the economic growth a country need more investment. Developing countries have always scarcity of enough capital for investment. That is how FDI contributes the host country's national income by providing this additional capital requirement. By creating new investment opportunity host country increase more job opportunity through establishing new economic zone, industry etc. Per capita income and GDP also increases for that particular country by alleviation of poverty. A country also gets different assets from the FDI. Those assets are advance technology, marketing and management skills which is essential for economic development (Li & Liu, 2005). The host country's interest has an impact on FDI. The interest rate is defined as a return received or paid by investors on investment. If a country's current rate of interest is lower than other country, people are not willing to invest of that particular country. Rational investors will shift their investments where they get higher return (Banu et al, 2021). That's how a country's interest rate attracts foreign investors. So the higher rate of interest leads more FDI for a country (Boahen et al., 2014).

We know Bangladesh is a developing country whose economy depends much on high volume of imports. Our country faces much capital deficit. So the FDI can helps to meet our saving-investment gap. FDI is considered as an essential and important part of Bangladesh's long-term growth (Sarker and khan, 2020). It has both direct and indirect effects on our economic growth. It helps our government to rise revenue, increase balance of payment, create new job opportunity, introduce new technology, enhance GDP contribution, reduce dependency on imports, make capital formation etc. (Joynal, 2015). That is how FDI contributes in our economy. Although Bangladesh has comparative advantage relating to labor-stimulating production, investment-friendly policies and regulations, establishment of EPZ in various suitable locations and other facilities, the inability to accelerate the flow of foreign direct investment is cause for serious concern. According to the Bangladesh Bank website the current amount of FDI in the year ended 2020 was 1510 million in USD dollar. Which is lower than the year 2019 that amount was 2650 million in USD dollar? China is the major contributor of FDI in Bangladesh. This study tries to evaluate the relationship amongst foreign direct investment, interest rate and economic growth of Bangladesh. This study aims at fulfilling the following objectives. (i) To determine the nature and present status of the Foreign Direct Investment (FDI) and Gross Domestic Product (GDP); & (ii) To analyze the effect of FDI on GDP

## 2. Literature review

Sarker and khan, (2020) purposed to determine the link between FDI inflows and Economic growth in Bangladesh. To measure the long-run connection they utilize ARDL model, and Granger Causality test for directional relationship. Their study also uses numerous diagnostic tests such as unit root test, Augmented Dickey-Fuller generalized least square (DF-GLS), Lee-Strazicich (LS) and Kwiatkowski-Philips- Schmidt-Shin (KPSS) test. They collect data from the WDI (World Development Indicator) database for the time period 1972 to 2017. Applying the methodology of Vector Error Correction Model (VECM) based Granger causality, Unit Root Test, Autoregressive Distributive Lag (ARDL) bound test (Islam et al., 2019) want to evaluate the causality and directional connection among financial deepening, FDI and economic growth in Bangladesh. They use some robustness techniques such as Dynamic Ordinary Least Square (DOLS), Canonical Co-integration Regression (CCR), and Fully Modified Ordinary Least Square

(FMOLS). They obtain their data set from World Development Indicator in World Bank for the time frame 1980 to 2017. (Faroh, 2015) aim to measure the effect of interest rate (IR) on FDI over the time frame 1985 to 2012 in Sierra Leone. To test the stationary and multicollinearity in the time series data they employ Augmented Dickey-Fuller (ADF), and the Ordinary Least Squares (OLS) for measuring the relationship. The data set of their study obtains from WDI indicator, International Financial Statistical Year book, and Bank of Sierra Leone. By utilizing trend analysis, simple statistics, and regression analysis, (Islam, 2014) objects to examine the key role of FDI in Bangladesh economy by stimulating domestic investment, and GDP. His study employs time series data for the year 1996 to 2010 from the secondary sources like Board of investment in Bangladesh, Economic Trend, Bangladesh Bank Bulletin, and World Investment Reports. Using the secondary data from Ghana Statistical Service, Accra and Bank of Ghana in the time period 1970 to 2005, (Boahen et al., 2014) find the impact of interest rate and exchange rate volatility on FDI in Ghana. They practice Augmented-Dicky Fuller (ADF) test, co-integration test, and vector autoregressive (VAR) model. For applying pairwise Granger Causality test they divide the time period in three phases such as 1970 to 2005, 1970 to 1983, and 1984 to 2005. The study, (Tabassum & Ahmed, 2014) pursues to examine the nexus between FDI and economic growth of Bangladesh. Applying multiple regression model their study considers time series data for the time period of 1972 to 2011. Data sets come from the different secondary sources such as World Bank's website, Socio Statistics publications, Bangladesh Bank's annual reports, and monthly economics bulletin. (Rahman, 2016) identifies the relationship between FDI and same selected macroeconomic variables such as Balance of Payment, GDP, and inflation rate. His study applies Multiple Regression analysis where FDI is the independent variable and macroeconomic indicators are dependent variables. He examines time series data from the Bangladesh bank's website for time period of 1999 to 2013. To explore the causal connotation and co-integration between FDI and economic growth in Bangladesh, India, and Pakistan both in long and short run (Hossain and kamal, 2012) use Vector error correction model (VECM), Co-integration test, and Augmented Dickey-Fuller (ADF) test. They also apply Granger Causality (GC) test for determining the directional connection between GDP and FDI. Their study considers FDI and real GDP time series data for the period of 1972 to 2008. Applying the methodology of Autoregressive Distributed Lag (ARDL) model, Engle Granger model, Bound test, and unit root test the study of (Shimul et al., 2009) seek to identify the long run relationship between FDI and GDP in Bangladesh. Their study takes into account the time series data over the time period 1973 to 2007. Mensah and Mensah (2021) studied on the FDI and output growth volatility of the manufacturing industries of the OECD countries from 1990 to 2015. They found positive and significant relation between the FDI and the output growth volatility of the manufacturing sectors of the studied countries. Faisal et al., (2021) studied on investigating the nexus between GDP, oil prices, FDI, and tourism for Turkish economy from 1995 to 2017 where they used the autoregressive distributed lag model. They identified a causal relationship among FDI, GDP and tourism of the country. This study found also significant relation among them and suggests the Turkish government should facilitate their tourism sector to raise FDI. Kafi et al., (2007) applies content analysis approach to observe the ins and outs behind the low inflow, and prospects of FDI in Bangladesh for the time period 1995-2006. For this purposes they rely on the different secondary sources such as Bangladesh Board of Investment, Economic Review, statistics Dept. of BB, and annual reports of BB. Collecting the data from WDI (Kabir, 2007) assess the nexus between FDI and economic growth in Bangladesh over the time period 1972 to 2005. He applies the ordinary least squares (OLS), granger causality test, augmented Dickey-Fuller (ADF) test, autoregressive integrated moving average (ARIMA) model, and unit root test.

There are many studies which all tried to link FDI with other macroeconomic variables but no major study had been done on the interest rate of Bangladesh. That is why this study may help

the policy makers to adopt steps regarding interest rate as well as provides a clear picture of how the FDI, Interest rate, economic growth are related each other for Bangladesh perspective.

### 2.1 Present status of FDI, GDP, and Interest rate

FDI inflow represents the value of foreign investment made by the foreign companies or entity. High inflow rate indicate higher amount of investment made thorough the investor, while lower rate indicates decrease the investment amount. The trend of FDI inflow shows in the table 1 below.

**Table 01:** Present status of FDI, GDP, and Interest rate in Bangladesh (2000-2020)

Year	GDP	FDI Inflow	Interest Rate
2000	3.26	0.53	9.00
2001	3.11	0.15	9.26
2002	1.96	0.10	8.39
2003	2.94	0.45	5.88
2004	3.55	0.69	5.58
2005	4.97	1.17	5.76
2006	5.24	0.64	5.47
2007	5.75	0.82	5.79
2008	4.81	1.45	4.66
2009	3.88	0.88	6.15
2010	4.39	1.07	4.74
2011	5.25	0.98	5.06
2012	5.30	1.19	5.34
2013	4.80	1.74	5.99
2014	4.86	1.47	6.89
2015	5.37	1.45	5.51
2016	5.95	1.05	3.45
2017	6.14	0.72	3.07
2018	6.73	0.88	3.84
2019	7.05	0.63	4.88
2020	1.35	0.70	2.64

**Source:** World Development Indicator (WDI), 2021

Table 1 showed that the inflow of FDI fluctuates repetitively over the period of 2000 to 2020. The highest inflow rate of 1.74% earns in the year 2013. After 2013 it gradually start to decline. Then in the year of 2018 its value increases at 0.88%. Last 2020 rate 0.70% is far better than 2019.

Gross Domestic Product (GDP) represents a country's economic condition. It also considers as a financial indicator of a country that refers the market value of all final goods and services produced in a particular time. In this study annual growth rate of GDP takes as economic growth for Bangladesh. The trend of GDP growth in Bangladesh is presented in the above table 1. The highest GDP growth rate is 8.15% in Bangladesh in the year 2019. The average GDP growth for this country is 4.60% over the period 2000 to 2020. In the year 2007 it starts to fall at a decline rate. At the period 2009 to 2013 it follows an increasing rate. But in the year 2020 GDP Growth dropped significantly for the COVID-19 crisis. So we can see the trend is unstable in nature.

A countries real interest rate examines the effect of inflation on the value of the money. It also determines how the cost of lending and borrowing money is affected. The table 1 also shows the trend of real interest rate in Bangladesh from 2000 to 2020 year. The average real interest rate for Bangladesh is 5.58%. In the year 2001 the rate 9.26 is higher among 2000 to 2020.

After 2001 it reduces at a decreasing rate. Again in 2014 it reaches at 6.89% which is highest after 2014. Then again down word the trend line up to 2017. It becomes upward in 2018 and 2019. At present in the year of 2020 the rate dropped significantly and is 2.64%.

**3. Methodology**

**3.1 Data sources and Description of Variables**

This study uses the annual time series data on the economic growth, Foreign Direct Investment (FDI) and interest rate of Bangladesh capturing period from 1978 to 2020. These data had been collected from WDI as a secondary source.

The main variables: economics growth was measured by the real GDP per capita indicated by symbol Y in the model, FDI was taken as the real gross foreign direct investment to GDP ratio and the third variable was real interest rate adjusted for inflation.

**3.2 Specification of Model**

For achieving the objective 2, the economic growth function of the variables mentioned earlier can be represented as below:

$$Y = f (FDI, IR, Y_{t-1}) \dots\dots\dots(1)$$

This implies that the economic growth as a function of the foreign direct investment, interest rate and the lagged gross domestic product.

By taking log-log linear form, the function is;

$$\ln GDP_t = \alpha_0 + \alpha_1 \ln GDP_{t-1} + \alpha_2 \ln FDI_t + \alpha_3 \ln IR_t + U_t \dots\dots\dots(2)$$

Where, ln is the natural logarithmic function; GDP = Real Gross Domestic Product and the lag of it is GDP<sub>t-1</sub>; FDI = Foreign Direct Investment; IR = Interest Rate; U = NID (0, σ<sup>2</sup> ε) denotes Independent Normal Distribution with E[ε<sub>t</sub>] = 0 mean and variance of V[ε<sub>t</sub>] = σ<sup>2</sup> ε. Having constant parameters, identical distribution holds at every point of time t. α's are the unknown parameters to be estimated.

The ARDL version of the model is formatted in equation (3) below.

$$\ln GDP_t = \sum_{i=1}^k \alpha_{1i} \ln GDP_{t-i} + \sum_{i=1}^k \alpha_{2i} \ln FDI_{t-i} + \sum_{i=1}^k \alpha_{3i} \ln IR_{t-i} + \mu_t \dots\dots\dots(3)$$

Estimation the long run relationship between economic growth and the foreign direct investment is the prime concern of this study that will visualize the short run dynamic effects in examining that relation requires an error correction theme (Osakwe JO, 1983; Onwioduokit & Adenuga, 2000 and Imimole & Enoma, 2011)

In accordance with Pesaran et al., (2001), the ARDL model indicated by equation of (3) can be represented with ECM version as below equation 3.

$$\Delta \ln GDP_t = \alpha_0 + \sum_{i=1}^k \alpha_1 \Delta \ln GDP_{t-i} + \sum_{i=1}^k \alpha_2 \Delta \ln FDI_{t-i} + \sum_{i=1}^k \alpha_3 \Delta \ln IR_{t-i} + \delta_1 \Delta \ln GDP_{t-1} + \delta_2 \Delta \ln FDI_{t-1} + \delta_3 \Delta \ln IR_{t-1} + \varepsilon_{1t} \dots\dots\dots(4)$$

Where, α's represent the short run dynamic coefficients and the parameters of δ's reflect the long run multipliers in the model of ARDL.

**3.3 Unit Root Test**

Unit root test or stationary test is a must before any time series analysis. In this study, Augmented Dickey-Fuller (ADF) test was used for identifying stationary present in data that is shown in below result. In the below table 2, except FDI, other two variables are stationary at level I(0) which are less than 5% level of significance.

**Table 2:** Result of unit root test with level and intercept

Variables	Level of Test	t-stat	P- value	Critical value at 5%	Decision
Ln(GDP)	Level and intercept	-2.366**	0.020	-1.706	Unit root doesn't exist
Ln(FDI)	Level and intercept	-2.102	0.544	-3.508	Unit root exists
Ln(IR)	Level and intercept	-3.422***	0.003	-1.701	Unit root doesn't exist

**Note:** \*\* and \*\*\* refers to 5% and 1% level of significance respectively

However, table 3 shows the unit root test for first difference. Here, all the variables are stationary at first difference which clearly rejects the null hypothesis of unit root existence.

**Table 3:** Result of stationary test with 1<sup>st</sup> Difference

Variables	Level of Test	t-stat	P- value	Critical value at 5%	Decision
Ln(GDP)	Level and 1 <sup>st</sup> Difference	-6.989***	0.000	-3.584	Unit root doesn't exist
Ln(FDI)	Level and 1 <sup>st</sup> Difference	-5.389***	0.000	-3.584	Unit root doesn't exist
Ln(IR)	Level and intercept	-3.422***	0.003	-1.701	Unit root doesn't exist

**Note:** \*\* and \*\*\* refers to 5% and 1% level of significance respectively

### 3.4 ARDL Bound test for co-integration

To see whether the long run co-integration was existed, the bound co-integration test was done. The null hypothesis is that there is no long run relationship exist in the equation whereas the alternative hypothesis is oppose if it. The F-statistics is 4.323 based on the below ARDL Bound test which is greater than the lower bounds but is less than the upper bound (table 4). This result clearly indicates the rejection of null hypothesis and supports the existence of the long run relationship among the variables. So based on the unit root test and the bound test, this study model is applicable to analyze the long run relation of the variables as well as for the Vector Error Correction(VEC) short run dynamic effect.

**Table 4:** ARDL Bound test

Test Statistics	Value	k
F- Statistics	4.323	2

Critical value bounds

Level of Significance	I(0)	I(1)
1%	5.15	6.36
5%	3.79	4.85
2.5%	4.41	5.52
10%	3.17	4.14

**Source:** Authors' own calculation

## 4. Result and Discussion

### 4.1. Skewness and Kurtosis

The below table 5 shows the descriptive summary statics of the study variables. GDP has mean value of 1.266, standard deviation of 0.473, minimum value of 0.101, maximum value of 1.952 and skewness is not zero implying that the data are not normally distributed. Similarly, FDI has mean value of -1.262, standard deviation of 1.810, minimum value of -5.40 and maximum value of 0.551. The skewness is 0.008 indicating a closer to normal distribution. The interest rate (IR) has a mean value of 1.774, standard deviation of 0.506, minimum value of zero and maximum value of 2.620 with skewness of around zero which implies a normally distributed variable.

**Table 5:** Result of Descriptive Statistics

Variables	Mean	Standard Deviation	Minimum	Maximum	Skewness	Kurtosis
GDP	1.266	0.473	0.101	1.952	0.113	0.921
FDI	-1.262	1.810	-5.40	0.551	0.008	0.716
IR	1.774	0.506	0.00	2.620	0.003	0.005

**Source:** Author's own calculation

#### 4.2. Estimated Result of ARDL Model

Table 6 shows the long run effect result of ARDL model where R squared of 0.537 is an indication of the goodness of fit that 53.7 percent of variation in the explained variables is captured by the explanatory variables. Foreign direct investment has a positive coefficient with 1% level of statistically significant. It reveals a positive robust impact on the economic growth of Bangladesh in the long run. This also implies a one percent increase in the foreign direct investment will lead to a 17.6% increase in the GDP of Bangladesh in the long run. Interest rate (IR) has a negative coefficient but not statistically significant in the long run analysis.

**Table 6:** Estimated result of long run effect using by ARDL approach

Variables	Coefficients	Standard Error	t-statistics
Constant	1.568***	0.504	3.11
Ln(FDI)	0.176***	0.054	3.22
Ln(IR)	-0.073	0.150	-0.49
R-squared	0.537		
Adjusted R-squared	0.427		
Log likelihood	-5.332		
F	4.88***		
Number of Observation	30		

**Note:** \*, \*\* and \*\*\* refers to 10%, 5% and 1% level of significance respectively

Table 7 shows the estimated result of ARDL model with error correction representation where goodness of fit is 0.428 indicating a satisfactory goodness. Durbin-Watson statistics of 1.86 implies the model is unaffected of first order serial correlation. From the result it has been seen that the lagged GDP of one year period has a positive coefficient of 0.627 which is statistically significant at 5 % level. In the short run, FDI and IR have statistically significant effect on the GDP found by at 5% level of significance. FDI has a coefficient of 0.284 that implies a 1% increase in FDI will cause to lead a 28.4% increase in the economic growth or GDP of Bangladesh. Conversely, the interest rate has a coefficient of -0.359 that also indicates 1 % increase in the interest rate will lead to a fall in GDP by 35.9% on average.

**Table 7:** Error Correction Representation for selected ARDL model

Variables	Coefficients	Standard Error	t-statistics	P value
dConstant	0.142	0.147	0.97	0.342
dLn(GDP)	0.627 **	0.265	2.36	0.027
dLn(FDI)	0.284**	0.125	2.270	0.034
dLn(IR)	-0.359**	0.174	-2.070	0.051
ECM(-1)	-0.453**	0.185	-2.45	0.023
R-squared	0.428			
Adjusted R-squared	0.292			
Log likelihood	-11.30			
Number of Obs.	30			
DW statistic	1.86			

**Note:** \*, \*\* and \*\*\* refers to 10%, 5% and 1% level of significance respectively

The coefficient of error correction model is -0.453 which is statistically significant at 5% level of significance. This is a clear indication that a deviation of the equilibrium situation will cover up by the 45.5% in the next year. This proves the self adjusting mechanism of the model belonging to the variables from short run to long run recovery. In addition, the coefficient of the lagged GDP indicates that a 1% rise of GDP in the present year may cause to rise of it by 62.7% in the next year which is really very high and notable. This result is similar to the study of Islam et al, (2019) who concluded that Bangladeshi economy is positive and significantly associated to FDI in the short and long run. This estimation also supports Bibhutisarker and Farid khan, (2020) who found causality for the long run among the variables, Adu Boahen Emmanue and NtimAdjei, (2014) provides evidence that interest rate volatility affects the FDI in long run. This study result is also against of the studies including NafeesaTabassum and Samiul Parvez Ahamed, (2014) and Afzalur Rahman, (2015) who found non-significant relationship between foreign direct investment and economic growth whereas, MahfuzKabir, (2007) also doesn't find any positive relation FDI and GDP. Moreover, Anowar Hossain and mohammad kamal (2012) and shimul, abdulillah and Siddique (2009) found no co-integration relationship between FDI and GDP in long run.

### 4.3. Diagnostic test

Table 8 shows the results of specific diagnostic post-estimation that includes serial correlation test, heteroskedasticity test and specification error test in the model. For serial correlation test, Breusch-Godfrey serial correlation test has been run where null hypothesis is no-existence of the serial correlation. The result of the test is  $\chi^2 = 0.245$  ( $p > 0.05$ ) which indicates the acceptance of the null hypothesis. Similarly, for heteroscedasticity test, Breusch-Pagan heteroskedasticity test has been used which has a null hypothesis of homoscedasticity. The result of the test is  $\chi^2 = 0.15$  ( $p > 0.05$ ) which indicates the acceptance of the null hypothesis that is the absence of heteroscedasticity in the model.

**Table 8:** Results of diagnostic test

Specific Test	$\chi^2$ Statistic	Probability
Breusch-Godfrey Serial Correlation test	0.245	0.620
Breusch-Pagan Heteroskedasticity test	0.15	0.697
Ramsey RESET Test	2.09	0.12

Source: Authors' calculation

For testing the errors in variables, Ramsey RESET test has been run where null hypothesis is no specification error in the model. The result of the test is  $\chi^2 = 2.09$  ( $p > 0.05$ ) which indicates the acceptance of the null hypothesis that the model is free from specification bias.

### 5. Conclusion

This study conducts the examination of period from 1978 to 2020 year based on the relation of FDI, GDP and Interest rate. This study finds the existence of long run relation among the variables by bound co-integration test. The ECM (-1) of short run dynamics proves a self-adjusting mechanism of the model for fluctuation from ideal condition. The implication of this study is that a better FDI leads to a better economic situation as well as a higher GDP. That is why; policy makers should give more attention towards favorable policies regarding positive foreign direct investment. Most of the past studies consider economic growth and FDI with inflation, exports and output gap but this study considers the interest rate with the long run analysis whereas most of the studies focused on short run. Therefore this study has better implication of error correction estimation over the past studies. However, this study did not consider other relative factors such as labor and capital which have also great influence on the economic growth of a country. This study can be further improved by considering the



comparison between countries in the south Asia or other regions or by taking consideration of a large data such as data from developing countries etc. However, policies should be taken by the policy makers in such a way to shift the falling trend of economic growth and foreign direct investment observed in last two years.

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