African Journal of Social Issues 6(1): 2023
Available online at https://ajosing.com;
https://www.ajol.info/index.php/ajosi

DOI: https://dx.doi.org/10.4314/ajosi.vol6i1.14

p-ISSN 2672 – 5142; e-ISSN 2734 – 3324

Original Research

IMPACT OF FOREIGN DIRECT INVESTMENT ON RWANDAN ECONOMIC GROWTH FROM THE PERIOD.

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ABSTRACT

This study is intended to assess the impact of Foreign Direct Investment on Rwandan economic growth, such determinants are gross domestic saving, population, and gross domestic product and to confirm if it has an impact on Rwandan economic growth. To achieve this study a multivariate time series analysis was used to analyze the impact of Foreign Direct Investment on economic growth.

In this study, diagnostic tests and the results confirmed (proved) that the model was good and the results from the tests suggest that the variables were not seriously affected by heteroskedasticity and serial correlation problems. The results showed a long-run relationship of variables based on the results from the unit root test of residuals of variables. The results also showed that the coefficient of ECM (-1) is positive and statistically significant, leading the model to be co-integrated between their variables and errors were corrected in the long run and some of the variables were statistically significant which showed that there are short-run relationships between variables where an increase in foreign direct investment decreased economic growth holding other factors constant.

Key Words: FDI (Foreign Direct Investment), GDP (Gross Domestic Product), GDS (Gross Domestic Savings), GCF (Gross Capital Formation), and Population.

INTRODUCTION

In Rwanda, FDI is highly debated on how it affects Rwanda's economic growth, as researchers such as (Adams S. , 2009) show that there is a positive relationship between FDI and economic growth of the economy. Rwanda's vision to build a knowledge-based economy and become a middle-income country led by the private sector by 2020, was necessitated by her realization of the importance of foreign direct investment which has aided her growth strategically. This is

evident from the significantly increased inflows recorded from 2008 when the Rwandan government adopted a new industrial policy (Shepherd, B., & Twum, A., 2018).

This study aims to show and analyze the relationship between Foreign Direct Investment (FDI) and the economic growth of Rwanda in the period 1970 to 2019. FDI plays a key role in developing countries, especially Rwanda. One reason is that FDI helps in the transfer of know-how of advanced technologies and increases the level of employment in host countries; they are a source of government revenue through taxation.

Most economists believe that FDI, through new technologies and high-standard management, creates pressure on domestic firms while making markets competitive. Moreover, FDI brings significant and positive externalities to developing economies, such as labor management, and training opportunities, thereby raising the standard of the production function. Through technology transfer, it will strengthen the economies of developing countries to stand on their own two feet through technology spillovers. Foreign Direct Investment strengthens the economy by creating employment opportunities, transferring skills and technology, increasing productivity, and continuing long-term development in developing countries (Javaid, 2016).

It also serves as a major source of external capital inflows for host countries. It attracts transfers of innovative technologies promotes international trade and management skills and promotes economic development in host countries. Other researchers concluded that FDI can be of greater benefit to host countries (Laryea, S. A, Sumaila, U. R, 2001).

Here one can ask why FDI is important for the host country and why investors and other firms are willing to invest in other countries. FDI is important in underdeveloped countries because It creates new jobs and more opportunities as investors build new companies in foreign countries (underdeveloped countries). This can lead to an increase in income and more purchasing power to locals which in turn increase Economic growth. FDI is also important in the development of human capital resources and the skills gained by the workforce through training increase the overall education and human capital within the country. Investors and other firms are willing to invest in other countries because they reap the benefits of economic growth and development while promoting sustainability for all. These investments provide access to new markets, resources, technologies, and capabilities that drive economic growth, create jobs, and build their infrastructures. Another reason why foreign firms and investors invest in developing countries is that foreign firms and investors are interested in investing in other countries due to the availability of cheap raw materials and cheap labor costs to maximize their profit. Low transportation costs and low excise taxes on imports and exports also encourage investors to invest in developing countries. Several product competitors and market structures also attract FDI inflows (Aziz, O. G., & Mishra, A. V., 2016).

REVIEW OF LITERATURE

The impact of foreign direct investment on economic growth plays a crucial role in countries' development as discussed with different researchers. Below are the contributions of other researchers to the impact of Foreign Direct Investment on economic growth.

Foreign Direct Investment brings many benefits to host country economies (LE, Phuong Nam, 2021). FDI also fills technology gaps and provides more skilled labor as well as quality management (LE, Phuong Nam, 2021). FDI contributes to job creation, increases GDP, improves infrastructure, promotes competition, and increases the productivity of host countries (LE, Phuong Nam, 2021). Most findings confirmed that FDI helps the growth of developing countries' economies (Herzer, D., & Klasen, S., 2008). FDI helps increase capital, employment, and output; while brownfield contributes to the increase in productivity (Yahya, F., & Rafiq, M., 2020).

Foreign Direct Investment can hurt the host country due to capital flight, which is the outflow of domestic capital and hence leads to an adverse effect on the country's current account and foreign exchange account (QUAZI, Rahim, 2004). Foreign Direct Investment has decreased domestic investment (Pilbeam, K., & Oboleviciute, N. , 2012). Foreign Direct Investment (FDI) increases the host country's imports because FDI-financed companies mostly use high-tech capital machinery and some intermediate products unavailable in the host country (Brouthers, L. E., Werner, S., & Wilkinson, T. J., 1996).

Foreign Direct Investment has a positive effect on domestic investment in Asian countries (Jan Mišun, V. T, 2002); this evidence shows that foreign investment encourages domestic investment. Foreign Direct Investment and trade are regarded as substantial catalysts for economic growth and enhancement both in developing and developed countries (Temiz, D., & Gökmen, A., 2011). Foreign Direct Investment contributed to stimulating sustainable economic growth of each country, but economic growth plays an important role in attracting Foreign Direct Investment (Cung, N. H., 2019). Foreign Direct Investment would be helpful to economic development if the economic, political, and social conditions of the host country are complementary (Rahman, A., 2015).

METHODOLOGY

Research design

This study is based on ex post facto design and secondary data were used to check if independent variables have the effects on dependent variables (i.e. if independent variables and dependent variables are related). Here the collected data helps to show the relationship that exists between FDI and Gross Domestic Product, Gross Domestic Saving, Capital Formation, and Population.

The Study Population

The study is based on time series data for secondary data from 1970 to 2019 for the economic variables focused in the analysis. Data were collected from the National Bank of Rwanda, the

Ministry of Trade and Industry, and the National Institute of Statistics of Rwanda and World Development Indicators (WDI, 2019) by the World Bank (FDI variable).

Model specification

The purpose of this study is to assess the effect of FDI on the economic growth of Rwanda from 1970-2019 using the data from World Bank nationals' accounts and the National Bank of Rwanda. The study has examined time series data over forty-nine years. Multiple regression analyses were utilized to measure the relationship between the independent (FDI) and dependent variable (GDP growth). Based on the neoclassical growth model theories, we developed the model to examine the effect of FDI on the economic growth of Rwanda. The econometric model is derived from the neoclassical production function.

Thus, the model specification will have the following form:

Equation: $GDPt = \beta 0 + \beta 1FDI_t + \beta 2GDS_t + \beta 3POP_t + \beta 4GCF_t + E_t$ (1)

Where:

FDIt = Foreign Direct investment at time t

GDPt = Gross Domestic Product at time t

GDSt= Gross Domestic Savings at time t

POPt= Population at time t

GCFt= Gross Capital Formation at time t

Et= Error term

Methods of Data Analysis

I used a series of tests before actual estimation such as co-integration for long run relationship of variables and Error Correction Model for short run relationship of variables, normality testing of variables using the Jarque Bera test, serial correlation (autocorrelation) testing using Breusch-Godfrey Serial correlation LM test, heteroskedasticity using Breusch-Pagan-Godfrey test, tests for stability using cusum test and unit root/ nonstationarity has been conducted. After checking the stationarity of variables, I tested for, co-integration, Error Correction Model, normality, heteroskedasticity, autocorrelation, and stability test. The econometric package used for empirical analysis and estimation was eviews10.

Co-integration Test

The concept of co-integration was first introduced by Granger and elaborated further by Engle and Granger (Boswijk, P., & Franses, P. H, 1992)." Engle and Granger co-integration (long-run

relationship) test is required. The first step for the co-integration testing is to determine the degree of integration of the variables included in the model. If all the series are stationary, let's say at the first difference, they are I(1). Then we can move to the second step of checking the co-integration. This step involves applying a two-step residual test of Engle and Granger. In the first step, we apply the ordinary least square to the regression equation in which all variables are found to be integrated in the same order, for example, I(1). The second step involves testing whether the residual term from the co-integrating equation is stationary, that is ut~I(0). If it is found to be stationary, this leads to the conclusion that long-run co-integration holds between the series.

Error Correction Model

The theory of co-integration arises out of the need to integrate short-run dynamics with long-run equilibrium. In cases where the data exhibit the presence of unit roots, short-run dynamic properties of the model can only be captured in an error correction model when the existence of co-integration has been demonstrated.

If the time series are I(1), then one could run regression in their first differences. However, by taking the first differences, we lose the long-run relationship of the data we are analyzing. This implies that one needs to use variables in levels as well. Given that the series are found to be co-integrated, there must exist an associated Error Correction Mechanism (ECM), according to (Engle and Granger, 1987). An advantage of an Error Correction Model is that it incorporates variables both in their levels and first differences. By doing this, the Error Correction Model captures the short-run disequilibrium situations as well as the long-run equilibrium adjustments between variables.

RESULTS AND DISCUSSION

This section shows the results obtained from different tests using Evies 10 and provides a discussion of the findings.

Data Transformation

The data used for this study were subjected to logarithmic transformation for two main reasons:

The first advantage of using logarithmic transformation is that it allows the regression coefficients to be interpreted as elasticities (Asteriou & Hall, 2007) . second, many economic time series exhibit a strong trend (i.e., a consistent upward or downward movement in the values) and when this is caused by some underlying growth process, a plot of the series reveals an exponential curve. In such cases, the exponential /growth component dominates other features of the series (e.g., cyclical and irregular components of the series) and thus obscures the more interesting relationship between this variable and another growing variable. Therefore, taking the logarithm of such a series effectively linearizes the exponential trend.

UNIT ROOT TESTING (STATIONARITY TEST)

Tests of Stationarity of Series

In the first step, the augmented Dickey-fuller (Dickey and Fuller, 1981) is used for all variables to test their stationarity and the results of this test are represented below.

Augmented Dickey-Fuller test

The results indicate that the series is not stationary at the level when including trend and intercept and becomes stationary at the first difference. The table below shows the Summary and conclusion of the unit root test of variables.

Table 1: Results from stationarity test of variables at level and second difference

Variables	p-values at level	Conclusion	p-values at the first difference	conclusion
LOGFDI	0.1091	Non-stationary	0.0000	stationary
LOGGCF	0.2617	Non-stationary	0.0000	Stationary
LOGGDP	0.5047	Non-stationary	0.0000	Stationary
LOGGDS	0.119	Non-stationary	0.0000	Stationary
LOGPOPULATION	0.3313	Non-stationary	0.0200	stationary

Sources: Reviews 10 from data entered by the researcher

Based on the above table all variables show that all variables are not stationary at levels but are integrated at first difference.

Co-integration

Table 2: Augmented Dickey-Fuller Unit Root Test on Residuals (R)

Null Hypothesis: RESIDC has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.925613	0.0001
Test critical values:	1% level	-4.219126	
	5% level	**-3.533083**	
	10% level	-3.198312	

*MacKinnon (1996) one-sided p-values.

Source: Researcher's computation using eviews10, 2023

Based on the above results, any probability which is less than 5% leads me to reject the null hypothesis means that there is a co-integration between variables (i.e. long-run relationship between variables) because probabilities are less than 5%.

Since --5.925613<--3.533083, the hypothesis of the stationarity of the residuals is accepted. Then we conclude that the variables LOGFDI, LOGGDP, LOGGCF, LOGGDS and LOGPOPULATIN are cointegrated at a 5% level of significance.

The above results, it is seen that residuals are stationary at 5%, which concludes that there is a long-run relationship between variables.
Co-integration

Table 3: Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.717390	108.5732	69.81889	0.0000
At most 1 *	0.458066	51.70736	47.85613	0.0208
At most 2	0.352493	24.13989	29.79707	0.1946
At most 3	0.096650	4.581748	15.49471	0.8515
At most 4	0.000171	0.007707	3.841466	0.9296

Source: Researcher's computation using eviews10, 2023

Based on the above results, any probability which is less than 5% leads me to reject the null hypothesis that there is no co-integration and the above case shows that there is co-integration between variables (i.e. long-run relationship between variables) because some probabilities are less than 5%.

Table 4: results from the regression model

Dependent Variable: LOGGDP
Method: Least Squares
Date: 09/20/23 Time: 02:11
Sample: 1970 2019
Included observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGCF	0.679089	0.036713	18.49736	0.0000
LOGFDI	-0.033204	0.013797	-2.406568	0.0203
LOGGDS	-0.013281	0.013105	-1.013467	0.3163
LOGPOLPULATIO N	0.672197	0.105675	6.360963	0.0000
C	-1.588582	1.153879	-1.376733	0.1754

R-squared	0.995038	Mean dependent var	21.41428
Adjusted R-squared	0.994597	S.D. dependent var	1.023552
S.E. of regression	0.075237	Akaike info criterion	-2.241717
Sum squared resid	0.254725	Schwarz criterion	-2.050514
Log-likelihood	61.04291	Hannan-Quinn criter.	-2.168906
F-statistic	2255.988	Durbin-Watson stat	1.558661
Prob(F-statistic)	0.000000		

Source: Researcher's computation using eviews10, 2023

From the regression results, the R-squared (R^2) value of 0.99 indicates that 99 percent of the explanatory variables explain the changes in the dependent variable. This means that the independent variables (FDI, GDS, GFC, and POPULATION) explain 99% of changes in gross domestic product (GDP). This simply means that FDI, GDS, GFC, and POPULATION explain the behavior of gross domestic product at the 99% level.

An F-statistical probability [Prob(F-statistic)] of less than 0.05 means that all the coefficients of the variables in the regression result are statistically significant for GDP. Durbin-Watson (DW), as shown in the regression analysis, is 1.55 (almost 2), indicating that there is a probability of non-autocorrelation.

Error Correction Model

Table 5: results of the error correction model

Dependent Variable: DLOG(GDP)
Method: Least Squares
Date: 09/20/23 Time: 02:46

Sample (adjusted): 1971 2019
Included observations: 49 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.007922	0.012541	-0.631678	0.5309
DLOG(FDI)	-0.018292	0.011120	-1.645003	0.1073
DLOG(GCF)	0.571186	0.032891	17.36586	0.0000
DLOG(GDS)	-0.017628	0.011516	-1.530790	0.1331
DLOG(POPULATION)	1.247996	0.341313	3.656461	0.0007
ECT(-1)	-0.824269	0.131507	-6.267888	0.0000

R-squared	0.911336	Mean dependent var	0.078603
Adjusted R-squared	0.901027	S.D. dependent var	0.202065
S.E. of regression	0.063570	Akaike info criterion	-2.559077
Sum squared resid	0.173768	Schwarz criterion	-2.327425
Log-likelihood	68.69738	Hannan-Quinn criter.	-2.471188
F-statistic	88.39578	Durbin-Watson stat	1.915855
Prob(F-statistic)	0.000000		

Source: Researcher's computation using eviews10, 2023

The main result of interest is the coefficient of the error correction variable [ECM (-1)]. The coefficient of ECT is 0.824269 which shows the speed of adjustment towards equilibrium and is significant with the appropriate (negative) sign. It shows that 82 percent equilibrium in inflows of GDP in the previous year is corrected in the current year. This significance and negative sign indicates the existence of a long-run equilibrium relationship between GDP and the factors that affect it (Adebiyi, 2001).

Based on the results shown above, the co-integration represents the long-run function as it is shown below:

LOGGDP=**-1.58-0.033204LOGFDI-0.013281LOGGDS+0.679089LOGGCF+0.672197POPULATION**

This coefficient implies that a 1 percent increase in FDI led to a 0.33% decrease in GDP in the Rwandan economy over the period 1970-2019. This implies a time when our country was going through political instability before and after the genocide, even though currently the Rwandan economy is experiencing sustained economic growth.

The regression results also show that gross domestic savings had a negative significant effect on GDP in the analyzed period (1970-2019). This is consistent with the a priori expectation that gross domestic saving hurts GDP, as expressed by the LOGGDS coefficient (--0.013281). This

coefficient means that a 1 percent increase in gross domestic savings led to a 0.1% decrease in GDP in the Rwandan economy over the period 1970-2019.

The regression results also show that the GCF has a positive effect on GDP, as expressed by the LOGGCF coefficient (0.679089). This coefficient implies that a 1 percent increase in GCF led to a 6.7% increase in GDP in the Rwandan economy over the period 1970-2019.

Finally, the regression results also show that Population has a positive effect on GDP, which is captured by the coefficient of LOG Population (0.672197). This coefficient implies that a one-person increase in Population in Rwanda led to a 6.7% increase in GDP in the Rwandan economy over the period 1970-2019.

Short-run Effects

The results of the ECM regression equation are as follows:

$$DLOG(GDP)=0.771250-0.032797DLOG(FDI_T)+0.000856DLOG(GDS_T)+ 0.642556DLOG(GCF_T)+ 0.717779DLOG(POPULATION_T)+E_{T-1}$$

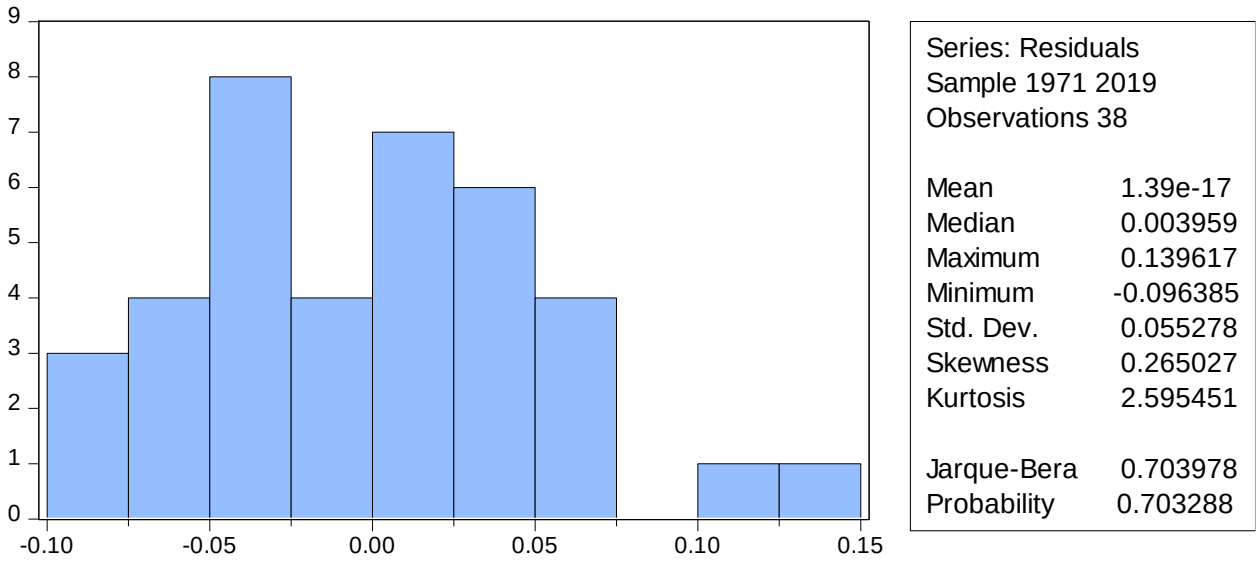
As can be seen, the FDI and GCF variables are statistically significant, implying that there are short-run effects of the gross domestic product variables in the Rwandan economy, as their probability is less than 0.05, except for gross domestic savings and population. The short-run coefficients of gross domestic savings and population are not statistically significant, which means that there are no short-run effects of GDP in the Rwandan economy. Interestingly, the coefficient of the error correction variable (et-1) is significant with the appropriate (positive) sign.

It shows that 77 percent of the GDP balance in the previous year is corrected in the current year. It shows the importance of all variables, especially GDS, FDI, and GCF in explaining GDP in the Rwandan economy.

NORMALITY TEST

This test is used to check if the error term follows normal distributions. The normality test that the researcher has adopted is the Jarque Bera (JB) statistics, which follows the Chi-Square distribution.

Figure 1: Normality test



Source: Researcher's computation using eviews10, 2023

For the probability of Jacque-Bera 70% which is greater than the 10% level of significance, we conclude by accepting H0 that residuals are normally distributed and this implies that the model is good.

Serial Correlation

This test is intended to show whether the model contains problems of autocorrelations of residuals. This implies that errors of a period affect the errors of the next period t+1 and it is done using the Breusch-Godfrey Serial Correlation LM Test.

Table 6: Serial correlation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.867461	Prob. F(2,30)	0.1720
Obs*R-squared	4.207126	Prob. Chi-Square(2)	0.1220

Source: Researcher's computation using eviews10, 2023

According to the above results for probability chi-square, 12.2% which is greater than 5% leads us to accept the null hypothesis that there is no serial correlation of errors.

Heteroscedasticity Test

Table 7: Heteroscedasticity test.

Heteroskedasticity Test: Breusch-Pagan-Godfrey

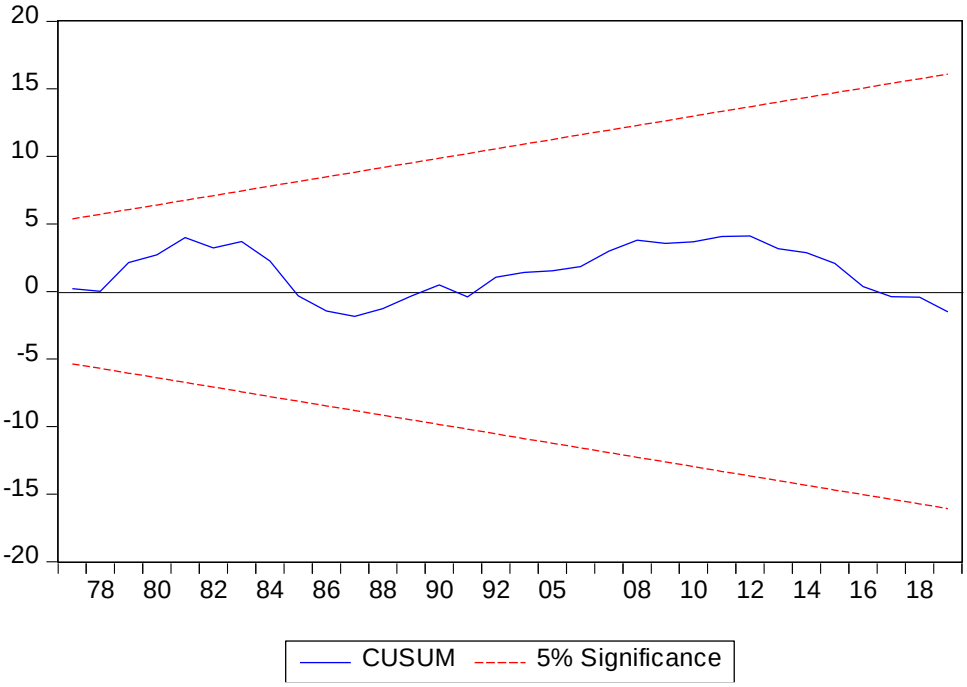
F-statistic	0.357705	Prob. F(5,32)	0.8734
Obs*R-squared	2.011453	Prob. Chi-Square(5)	0.8476
Scaled explained SS	1.137879	Prob. Chi-Square(5)	0.9507

Source: Researcher's computation using eviews10, 2023

According to the above results, for probability chi-square (5) of obs*R-squared (0.8476) which is greater than 10% leads us to accept the null hypothesis that there is no heteroskedasticity. This means that the model is free from heteroskedasticity.

STABILITY TEST

Figure 2: Cusum test (Cusum test)



Source: Researcher's computation using eviews10, 2023

According to the above graph, it is seen that the parameters of the model are stable because the navigating blue line of the graph does not cross away the borders (the red lines), the straight line represents the critical bounds at 5% significant levels.

CONCLUSION

Based on the result from E-views10, leads us to conclude that there is a long-run relationship between economic growth and the four independent variables (foreign direct investment, gross domestic saving, population, and gross capital formation).
This analysis showed that the variables have a long-run relationship because the residuals of the variables were stationary at the level and a short-run relationship based on their probabilities where some were less than 10% such as 0.0000 for population and 0.0052 and various diagnostic tests such as is the test of normality, correlation series, heteroskedasticity and R-squared was 99% showed that the model was good and it means that the change in the economic growth of Rwanda is caused by foreign direct investment, gross domestic savings, population, and gross capital formation.

The results also showed that the R-squared is 99%, which means that the independent variables explain the dependent variable 99%, and the probability (F-statistic) is 0.0000, which is less than 5%, which means that the independent variables together explain the dependent variable ceteris paribus. If FDI increases by 1 percent, economic growth decreases by 0.033204 percent, other factors remaining constant. If gross domestic saving increases by 1 percent, economic growth decreases by 0.013281percent, other factors held constant, if population increases by 1 percent, economic growth increases by 0.672197percent, other factors held constant, and a 1 percent increase in creation of gross capital will increase economic growth by 0.679089percent economy other factors constant.

In this section of econometric analysis, we accepted and confirmed the alternative hypothesis that stated that foreign direct investment hurt the economic growth of Rwanda in the period of 1970-2019.

In a nutshell, foreign direct investment hurts the economy of Rwanda.

The Rwandan economy can be better by controlling profit repatriation by encouraging foreign investors to reinvest the profit earned in different economic activities in Rwanda instead of repatriating it in their home countries. We can also encourage them to employ Rwandan citizens instead of employing experts from their home countries which will reduce the capital repatriation to increase the economic growth of Rwanda.

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