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Determinants of Economic Growth in Somalia: ARDL Model

Abdisalan Aden Mohamed, Salad Shire Mohamud

Abstract
Using an autoregressive distributed lag model (ARDL) and error correction technique, this paper investigates the short- and long-run relationships between exports, imports, and FDI on economic growth in Somalia. Secondary data was collected from the SESRIC website. The study spans the years 1995 to 2020. The result of the study revealed short- and long-term relationships between the variables. While FDI and exports have a negative long-term relationship with economic growth, imports have a positive long-term relationship. It also shows that FDI has a negative, short-run insignificant relationship with economic growth, whereas imports and exports have a significant, short-run relationship. Diagnostic tests were applied, and the results demonstrate that the model's validity for Somalia's economic growth is characterized by normality, the absence of serial correlation, and heteroscedasticity.

Keywords: FDI, GDP, exports, imports, ARDL, ECM

1 Introduction

In recent years, both scholars in developed and developing nations have paid close attention to the crucial role that international trade policy plays in promoting economic growth. Since A. Smith's traditional economic theory, trade has come to be recognized as a major factor in the expansion of the global economy and as playing an even more critical role in emerging and developing economies (Bahramian & Saliminezhad, 2020). The factors that influence economic growth have received scholarly interest in recent decades, both theoretically and empirically. Nevertheless, there is a lack of agreement on the subject, which offers a pertinent foundation for ongoing research and growing scholarly attention (Oyebowale & Algarhi, 2020). Both the export and import sectors, according to economic theory, are capable of boosting national income (Awokuse, 2008).

In the case of Somalia, the country's current account balance of payments was unfavorable as a result of trade transaction deficits. Imports have a significant impact on the economy and remain so. A trade deficit of around 64% of Somalia's GDP has existed since 2013. Somalia's current account deficit increased by 22% this year, from US$486 million in 2018 to US$592 million this year. A total of US$662.2 million in exports and US$3,905 million in imports were made by the nation in 2019, leaving a US$3,243 million imbalance (49 percent of GDP). This is a result of local businesses being unable to satisfy regional customers' needs. Food products, such as sugar, pasta, wheat flour, rice, and khat, make up the majority of the consumer items that are imported from Somalia, with petroleum and manufactured goods coming in second and third(Central Bank of Somalia, 2019).

Despite substantial increase of the literature there is inconclusiveness between whether export causes economic growth or not. According to (Boame, 1998; El-Sakka & Al-Mutairi, 2000; Garcimartín et al., 2008) emphasized export led growth (ELG) hypothesis by finding causal relationship between export and economic growth while (Ahmad & Kwan, 1991; Jin & Yu, 1996) indicate no causal relation between export and economic growth.

Although numerous have investigated the determinants of economic growth, few among others include the study by (Thaddeus et al., 2021) analyzed specific macroeconomic factors and economic growth in Cameroon. (Hussein Ali Mohamud & Ali Dahir Abdi, 2022) investigated The Role of International Trade and Agricultural Production on Economic Growth in Somalia. However the determinants of economic growth in Somalia has received very little study attention, this one of the few studies that is conducted in Somalia. There is no

scientific research on the factors that influence Somalia's economic growth in this context, to the author's knowledge.
This study's goal is to identify the factors that influence Somalia's economic growth utilizing time series data from 1995 to 2020 and its country-level analysis. The objective of the research is to assess how foreign direct investment, imports and exports affect Somalia's economic growth.

2 Literature review

The export-led growth hypothesis (ELGH), which has been the subject of numerous empirical studies, has been examined in the context of both single countries and groups of countries. Contradictory findings resulting from differences in the study era, country, or groups of countries, however, keep this topic relevant and at the center of research.

(Odhiambo, 2022) examined if the export-led growth hypothesis was still true for sub-Saharan African nations from 1980 to 2017. To determine the relationship between export and economic growth in sub-Saharan African nations, a panel cointegration test and panel Granger-causality model were used. Although the study discovered a long-term link between exports and economic growth, neither low-income nor middle-income countries showed any evidence of export-led growth. Instead, in middle-income and low-income countries, the study discovered evidence of a bidirectional causality and a neutrality response. The study "Economic fluctuations and growth in sub-Saharan Africa: the impact of import instability" was conducted by (Fosu, 2001). Using the ordinary least squares method, he used data from the World Bank that spans the years 1968 through 1986 for 33 sub-Saharan African nations. According to the study, export instability (XI) is unrelated, import instability (MI) seems to be far more significant, and capital instability (KI) is still a valid explanation for the production function.

Using data from 21 African countries between 1986 and 2015, (Oyebowale & Algarhi, 2020) investigated the macroeconomic factors that influence economic growth in Africa. The study used a Dumitrescu-Hurlin Granger causality test on the panel data together with a pooled mean group estimator. They came to the conclusion that among the selected African countries, exports, government spending, and gross capital formation show substantial positive long-run associations with economic growth, whereas broad money is not statistically significant. Their findings also revealed a conflicted short-run relationship between macroeconomic factors and economic growth in these particular African nations. In terms of causality, it demonstrated a bidirectional relationship between gross capital formation and economic growth among the chosen African nations, although other macroeconomic variables did not demonstrate a relationship with economic growth. Their research made the case that effective macroeconomic measurements and policies are not being implemented well in Africa, and the findings support their claim.

(Muhammad Adnan Hye, 2012) examined the economic growth in China. The direction of the long-run and short-run causal relations were assessed using a modified Granger causality test, and the long-run relationship is determined using the autoregressive distributed lag (ARDL) approach. Annual time series data from 1978 to 2009 were used. The findings support the long-term bidirectional relationship between exports and imports, as well as between economic growth and exports. The authors drew the conclusion that the external deficit for China is manageable based on these data, which also supported the validity of the hypotheses of growth-led exports, growth-led growth, growth-led imports, and growth-led growth. Effects of export and technology on economic growth in a few selected emerging Asian economies were researched (Sultanuzzaman et al., 2019). The study used the Generalized Method of Moments (GMM) method using panel data covering the years 2000 to 2016. The findings showed that export and technology have a positive and significant impact on the economic growth of emerging Asian economies.

The relationship between export diversification, imports, capital, and economic growth in the United Arab Emirates from 1975 to 2017 was examined by (Shadab, 2021). She used the Toda-Yamamoto Causality Approach and the Vector Error Correction Model (VECM) to determine if the variables are related in the long- or short-term. The results of the VECM test demonstrated that export diversification, imports, and economic growth in the UAE have a substantial long-term link. In addition, the results of the Toda Yamamoto Granger Causality Test showed that imports are the primary factor behind the UAE's economic expansion, supporting the Import-Led Growth Hypothesis over the long term. The findings also supported the existence of a one-way causal relationship among export diversification and UAE economic growth. According to the results of

the VECM test, export diversification has a long-term, significant inverse association with economic growth, which suggests that lowering export concentration promotes economic growth in the UAE. Additionally, a strong and positive correlation between imports and economic expansion was discovered. The relationship between physical capital and economic growth was found to be unfavorable and inconsequential, highlighting the necessity for the UAE government to direct tax money toward worthwhile projects that may boost and stabilize economic growth.

(Próchniak, 2011) examined the factors influencing economic growth in ten Central and Eastern European (CEE) nations. Correlation and regression analysis were employed in this study, which covered the years 1993 through 2009. The findings suggested that investment rate (including FDI), human capital measured by the level of education of the labor force, financial sector development, good fiscal stance (low budget deficit and low public debt), economic structure (high share of services in GDP), low interest rates and low inflation, population structure (high share of working-age population), and information technology development are the most significant economic growth determinants in the CEE countries (economic freedom, progress in the market, and structural reforms).

3 Theoretical Framework and Methodology

This study is based on the Solow-Swan neoclassical growth model. The Model is an exogenous economic growth model that examines changes in an economy's output level over time as a result of variations in the rates of population growth, savings growth, and technological advancement.

Charles Cobb and Paul Douglas first put forth the idea that the amount of labor and physical capital invested determines the level of manufacturing output in 1928. The Cobb-Douglas production function depicts the connections between the amount of output produced and its inputs, particularly labor and physical capital. It serves as a tool for determining the effects of changes to a production activity's relevant efficiencies, yields, and inputs.

The Cobb-Douglas production function's fundamental shape is as follows:

$$\boldsymbol{Y(K,L) = A\,K^{\alpha}\,L^{\beta}} \ldots\ldots\ldots\ldots (1)$$

Where **Y** represents total output, **L** represents labor input, **K** represents capital input, and **A** represents technology. $\boldsymbol{\alpha}$ And $\boldsymbol{\beta}$ are the production elasticities of labour and capital respectively. Return to scale is measured by the sum of both coefficients $\boldsymbol{\beta}$ and $\boldsymbol{\alpha}$.

By including exports in the aggregate production function, early empirical formulations attempted to explain the relationship between exports and GDP growth (Awokuse, 2008; Balassa, 1978; Sheehey, 1992). We take logarithm and expand the growth equation by adding relevant variables such as imports and exports.

$$\boldsymbol{GDP = \beta_0 + \beta_1 Ln(\,Exports_t) + \beta_2\, Ln(Imports_t) + \beta_3 Ln(FDI_t)\ + \mu} \ldots\ldots\ldots\ldots (\mathbf{2})$$

GDP= gross domestic product, **X=** export, **M**= import, **FDI**= Foreign direct investment, **t**=time and **μ**= error terms, **β0**= is the constant where **β1**, **β2a**nd **β3** are parameters to be evaluated.

The primary goal of this study is to investigate the long-run and short-run effects using the ARDL model. As a result, Equation 2 was converted into ARDL long-run and short-run models. The long-run ARDL Mode was represented by Equation 3, while the short-run ARDL Model was represented by Equation 4. The equations were written as follows:

$$\boldsymbol{\Delta GDP = \beta_0 + \beta_1 lnGDP_{t-i} + \beta_2 ln\ exports_{t-i} + \beta_3 ln\ imports_{t-i} + \beta_4 ln\ FDI_{t-i} + \in_t} \ldots\ldots\ldots\ldots (\mathbf{3})$$

Equation (3) above, **β1** up to **β3** denotes the coefficient of the parameters while **∈** symbolizes error or white noise.

$$\Delta lnGDP = \beta_0 + \beta_1 \sum_{i=1}^{p} ln\, GDP_{t-i} + \beta_2 \sum_{j=1}^{q} ln\, exports_{t-i} + \beta_3 \sum_{k=1}^{q} ln\, imports_{t-i} + \beta_4 \sum_{l=1}^{q} ln\, FDI_{t-i} + \gamma ECT_{t-1} \quad \ldots\ldots\ldots\ldots (4)$$

In equation 4 above, **β1** up to **β3** stands for coefficients while **γ** represents the coefficient of error correction term.

Annual time series from 1990 to 2020 are used in the study. The information was obtained from the SESRIC website. The dependent variable of the study is economic growth (GDP), while the independent variables are export, import, and foreign direct investment (FDI).

4 Results

This section gives the results of the empirical analysis. It contains more subsections: descriptive statistics, unit root test, ARDL bound test and Error Correction Model (ECM)

4.1Descriptive statistics

Table 4.1 presents a summary of descriptive statistic for the variables considered for analysis namely exports, imports, FDI and economic growth. It described the distribution of each variable with respect to mean, standard deviation, minimum and maximum values for the 26 observations. Gross domestic product is measured in billions dollars while the remaining variables are measured in millions dollars.

Table 4. 1 Descriptive statistics

	LGDP	LIMPORTS	LEXPORTS	LFDI
Mean	0.493754	3.314145	1.616458	4.514975
Median	0.491965	3.313158	1.615935	4.847493
Maximum	0.955511	3.779661	2.077289	5.855072
Minimum	0.088743	2.908239	1.20174	2.197225
Std. Dev.	0.25204	0.251197	0.242235	1.014162
Jarque-Bera	0.968621	0.97873	0.881677	2.376122
Probability	0.616122	0.613016	0.643497	0.304812
Observations	26	26	26	26

From Table 4.1, all variables are measured in millions us dollar except GDP measured in billion us dollar and transformed into log form. LGDP averaged 0.493754 percent whereas that of FDI averaged 4.514975 percent. Imports averaged 3.314145 percent and exports averaged 1.616458 percent. Foreign direct investment has the highest standard deviation, its clear indication that FDI is highly volatile. The standard deviation of exports, imports, capital and GDP are all low and hence they are less volatile. According to the Jarque-Bera test, all the variables are normally distributed having probability value greater than 5% significance level. FDI has the highest maximum value of 5.85 percent while GDP has the lowest minimum values 0.08 percent.

4.2 Unit root test

To test the stationarity of the relevant variables and determine their order of integration, Augmented Dickey-Fuller (ADF) was used, and the results are reported in Table4.2. The number of lags was determined based on Ng and Perron (1995), with a maximum lag of 2 set based on the rule of thumb suggested by Schwert (1989). The test was performed on all the variables in their natural logarithm (ln) form to account for the possible presence of heteroskedasticity. The rejection criteria are that we reject the null hypothesis if the test statistic value is greater than their respective critical values of 0.05 level of significance and if the p-value is less than 0.05.

Table 4. 2 Unit root test

Variables	Stationary order	ADF Test Statistic	Critical Values			P-Value
			1%	**5%**	**10%**	
LEXPORTS	I(0)	-3.89	-3.75	-2.99	-2.63	0.072
LIMPORTS	I(0)	-3.72	-3.73	-2.99	-2.63	0.0103
LGDP	I(0)	-3.73	-3.73	-2.99	-2.63	0.0101
LFDI	I(1)	-4.04	-3.78	-3.01	-2.64	0.0057

Results in Table 4.2 provide a summary of the augmented Dickey-Fuller test; it shows that all variables are stationary except FDI. Using nonstationary variables would produce false (spurious) results from which it would be pointless to draw further conclusions. However, stationarity is achieved through the first difference. The results indicate that FDI was unit root, hence it was converted to first difference before model developments were undertaken.

4.3 Cointegration test

After establishing that all the variables are integrated of mixed order and determined the optimal lag length, it is appropriate to test for cointegration to discover if the relevant variables have a long-run relationship. Autoregressive distributed lag ARDL bound test was employed to determine the long run relationship between the variables. We reject the null hypothesis of no level relationship if F-Bound test is greater upper bound I (1), and accept if it's less than lower bound I (0).

Table 4. 3 F-Bound Test

Test Statistic	Value	K
F-statistic	6.700283	3
Critical Value Bounds		
Significance	I(0) Bound	I(1) Bound
10%	2.37	3.2
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

As we mentioned before, the bound test is used to determine whether there is a long-term relationship or not. There are two scenarios that we described earlier. In the first case, if the F-statistics value is lower than I (0), we don't reject the null hypothesis, and there is no long-rum relationship. In the second case, if the F-statistics value is greater than I (1), the null hypothesis is rejected, and we can say that there is a long-term relationship. According to table 4.3 above, we are in the second case, as the value of the F-statistic is greater than the upper bound, which indicates that there is a long-run relationship at all levels of significance of 1%, 5%, and 10%.

4.4 Long run and short run coefficients

The dependent variable and independent variables are shown to have a long run and short run relationship in Table 4.4 below. Utilizing the ARDL and ECM, the long-run and short run coefficients are estimated. The Akaike Information Criterion is used to determine the ideal lag order for the model and to estimate the ARDL model with a maximum lag duration of 2. Automatic selection was used in this.

Table 4. 4 Long run and short run coefficients

Variable	**Long run Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LIMPORTS	1.173830	0.034950	33.58589	0.0000
LEXPORTS	-0.194115	0.034935	-5.556467	0.0001
LFDI	-0.005946	0.001168	-5.089676	0.0003
C	-3.056193	0.063226	-48.33762	0.0000
Variable	**Short run Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LGDP(-1))	0.497768	0.156895	3.172615	0.0080
D(LIMPORTS)	1.159152	0.024499	47.31507	0.0000
D(LIMPORTS(-1))	-0.593278	0.193763	-3.061875	0.0099
D(LEXPORTS)	-0.166747	0.025455	-6.550690	0.0000
D(LEXPORTS(-1))	0.116532	0.047613	2.447459	0.0307
D(LFDI)	-0.000446	0.001784	-0.250078	0.8068
D(LFDI(-1))	0.006490	0.002242	2.894695	0.0135
CointEq(-1)*	-1.688876	0.252695	-6.683454	0.0000
R-squared	0.99			
Durbin-Watson stat	1.91			

The table 4.4 above summarizes the long-run and short run coefficients of the variables. Imports and economic growth have a positive long-run relationship. FDI and exports have a negative and significant long-run relationship with economic growth. One percent Increases in FDI and exports decreases GDP by 0.59% and 19.4%, respectively, while a 1 percent increase in imports increases GDP by 117.3%.

The Error Correction Model (ECM) shows how much of the disequilibrium is being corrected, that is, the extent to which any disequilibrium in the previous period is being adjusted in current point. A positive coefficient indicates a divergence, while a negative coefficient indicates convergence.

In the short-run model, the error correction term has a coefficient of -1.68, indicating that instead of directly convergent to the equilibrium path, the error correction process fluctuates around the long-run value in a dampening manner. Once this process is complete, however, convergence on the equilibrium path is rapid. The magnitude of the coefficient implies that approximately 168.8% of the disequilibrium caused by the previous year's shocks converges back to the current year's long-run equilibrium.. The value of Durbin-Watson (1.72), which falls between the range 1.7 and 2.3 and that the value of DW is greater than R 2 (99%), means that the model is adequate and not spurious. The coefficient of R-square is 0.99, meaning that between 1995 and 2020, the variables controlled in the model described around 99% of the variance in economic growth, while other variables not included in the model, represented by the error term, explained the remaining 1%.

4.5 Diagnostic test

To guarantee the model's consistency and soundness, stability and residual diagnostic tests have been used. Additionally, various analytical methods were used to find auto-correlation and heteroscedasticity. Using the Ramsey RESET test, it was possible to determine whether the model was stable. Residual diagnostic tests and stability diagnostic tests were examined and summarized in tables 4.6 and figure 1 and 2 respectively. We reject the null hypothesis of ARCH heteroskedasticity, serial correlation and normality if p-value is less than 5% significance level.

Table 4. 5 Diagnostic test

Test	Null hypothesis (H0)	p-value	Decision
Normality	Residuals are normally distributed	0.675469	Failed to reject the hypothesis

Serial correlation	No serial correlation	0.8203	Failed to reject the hypothesis
Heteroskedasticity	Homoscedasticity	0.7471	Failed to reject the hypothesis

4.6 Stability test

Model stability is essential for economic inference and prediction. This is thought to be a sufficient criterion, thus the study utilized stability tests utilizing the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares (CUSUMS Q) tests for estimated parameters. Figures 1 and 2 provide the graphical representation of these tests.

In figures 1 and 2, respectively, the short-run equilibrium and the CUSUM and CUSUMSQ test results are shown. Since both the CUSUM and CUSUM square lines are inside the 5 percent critical bound, the results suggest that the model is stable. This shows that the error correction model's coefficients are stable.

Figure 1 CUSUM Test

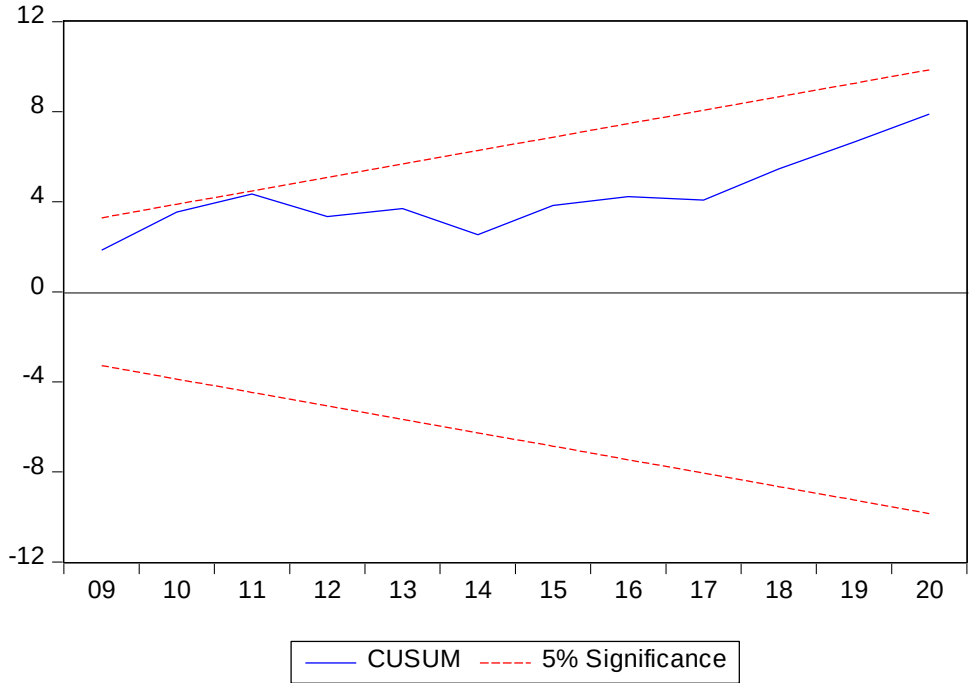
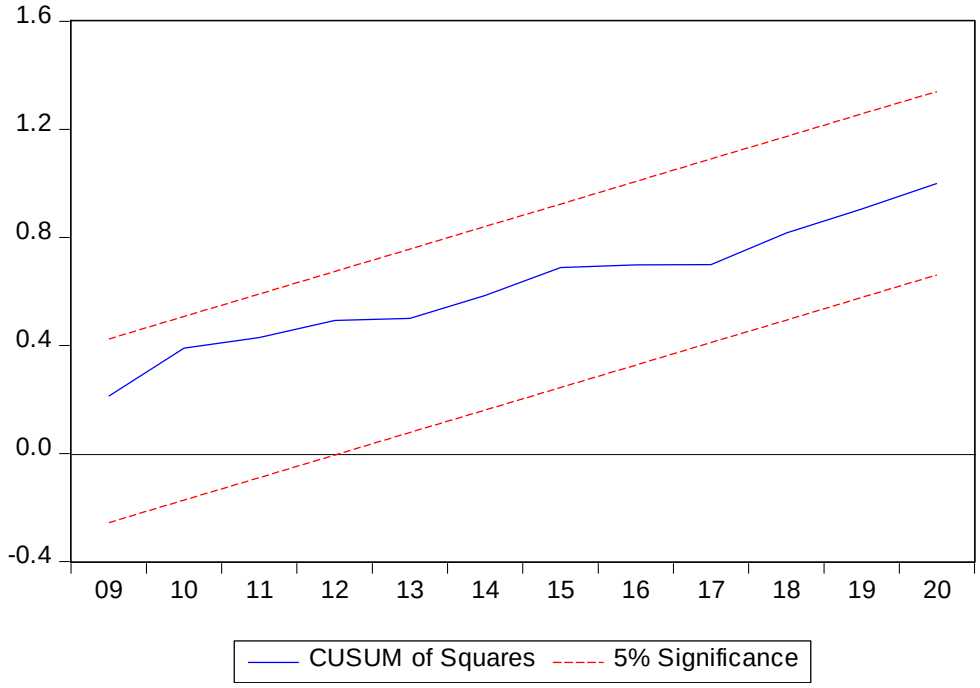


Figure 2 CUSUM squared test



5 Conclusion and recommendations

Factors influencing Somalia's economic growth were examined in this article. The SESRIC website was used to gather data, with a focus on the years 1995 through 2020. GDP was the dependent variable, while the explanatory factors in this study were FDI, exports and imports.

The study used a variety of tests. The Augmented Dickey-Fuller (ADF) test was used to assess stationarity. The co-integrating test was determined using the autoregressive distributed lag model (ARDL). Short-run relationships were discovered using the error correction model ECM model, whereas long-run relationships were discovered using the long-run form and bound test. The consistency and soundness of the model have been ensured by diagnostic and stability test. In contrast to the FDI, which becomes stationary at the first difference, the study found that all other variables are stationary at level.

The study's findings demonstrate that there is a long-term association at all levels of significance. While FDI and exports have a negative long-term relationship with economic growth, imports have a positive long-term relationship. Diagnostic tests were applied, and the results demonstrate that the model's validity for Somalia's economic growth is characterized by normality, the absence of serial correlation, and heteroscedasticity. This article contributes to the literature by investigating the contribution of FDI, exports, and imports to economic growth in Somalia using a neoclassical growth modeling framework and the autoregressive distributed lags (ARDL) method.

The study recommendation is as follows:

1. The study discovered that FDI has a negative significance long-run relationship with GDP. While it has a negative insignificance relationship with GDP in the short run. According to the study, the government should monitor foreign direct investments in Somalia and how they are managed in order to find effective and long-term solutions to the country's economic problems.
2. Import openness is essential for economic growth because it enhances exports by providing intermediate production inputs required in the export sector. Imports of foreign technology and knowledge from developed countries could benefit poor countries with limited technological endowments, such as Somalia.

3. A negative and insignificant short run relationship between FDI and economic growth was discovered, indicating the need for the Somalia government to implement policies that could help increase economic growth.
4. Exports have a positive impact on economic growth in the short run, so the government has to improve the country's exports, which then leads to increased economic growth.
5. The government has to work out the rules and regulations of the country to determine the determinants of economic growth, but without peace and rule, the country can't reach economic growth.

Abbreviations

ECM= error correction model

ARDL= autoregressive distributed lags

FDI= foreign direct investments

ELG= export led growth

ILG= import led growth

Generalized Method of Moments = (GMM

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