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THE ASYMMETRIC EFFECTS OF FOREIGN DIRECT INVESTMENT INFLOW ON ECONOMIC GROWTH: FRESH EVIDENCE FROM SOMALIA

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ABSTRACT

Purposes: Although there has been some progress since the 2012 establishment of the Federal Government Somalia, Foreign direct investment is the one of critical engines in economic growth. The latest value of foreign direct investment for 2021 was 5.97% of GDP, comparison of previous years to 2020 was 6.74% of GDP in Somalia. This paper aims to investigate the asymmetric effects of foreign direct investment (FDI) inflow on economic growth in Somalia from 1977-2021. In addition to FDI, inflation, gross capital formation, and trade openness are used as control variables to examine their influence on economic growth.

Design/Methodology/approach: This research employs the nonlinear autoregressive distributed lag (NARDL) technique.

Finding: The findings reveal that a positive shock in FDI positively influences Somalia's economic growth, while a negative FDI has a negative impact. The Wald test establishes the asymmetric effect of FDI on economic growth in both the short and long run. Moreover, trade openness and inflation rate significantly reduce the pace of economic growth in both the long and short run. However, gross capital formation only boosts economic growth in the long run.

Research limitations/ implications: although Somali faced a lot of challenges including civil war, terrorists, macroeconomics instability, poor infrastructure, and corruptions are not considered owing to data availability. Policy implications: firstly, increase revenue through tax reforms and anti-corruption measures. Secondly, initiatives policies that help public finance investments and reduce trade barriers. Finally, maintain macroeconomic stability of inflation, and exchange rates, can help reduce the negative impact on economic growth improve the investment climate and Somalia's image abroad.

Keywords: economic growth, FDI, NARDL method, Somalia.

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OS EFEITOS ASSIMÉTRICOS DA ENTRADA DE INVESTIMENTO DIRETO ESTRANGEIRO NO CRESCIMENTO ECONÔMICO: NOVOS DADOS DA SOMÁLIA

RESUMO

Propósitos: Embora tenha havido alguns progressos desde o estabelecimento do Governo Federal da Somália em 2012, o investimento direto estrangeiro é um dos motores fundamentais do crescimento econômico. O valor mais recente do investimento direto estrangeiro para 2021 foi de 5,97 % do PIB, em comparação com os anos anteriores até 2020, correspondeu a 6,74 % do PIB na Somália. O presente documento visa investigar os efeitos assimétricos da entrada de investimento direto estrangeiro (IDE) no crescimento econômico da Somália de 1977 a 2021. Para além do IDE, a inflação, a formação bruta de capital e a abertura ao comércio são utilizadas como variáveis de controlo para examinar a sua influência no crescimento econômico.

Design/Metodologia/abordagem: Esta pesquisa emprega a técnica de retardo distribuído autorregressivo não linear (NARDL).

Constatação: As conclusões revelam que um choque positivo no IDE influencia positivamente o crescimento econômico da Somália, ao passo que um IDE negativo tem um impacto negativo. O teste Wald estabelece o efeito assimétrico do IDE no crescimento econômico, tanto a curto como a longo prazo. Além disso, a abertura do comércio e a taxa de inflação reduzem significativamente o ritmo do crescimento econômico, tanto a longo como a curto prazo. No entanto, a formação bruta de capital só impulsiona o crescimento econômico no longo prazo.

Limitações/implicações da pesquisa: embora a Somália tenha enfrentado muitos desafios, incluindo guerra civil, terroristas, instabilidade macroeconômica, infraestrutura deficiente e corrupção não são considerados devido à disponibilidade de dados. Implicações políticas: em primeiro lugar, aumentar as receitas através de reformas fiscais e medidas de luta contra a corrupção. Em segundo lugar, iniciativas políticas que ajudem os investimentos das finanças públicas e reduzam as barreiras comerciais. Por último, a manutenção da estabilidade macroeconômica da inflação e das taxas de câmbio pode ajudar a reduzir o impacto negativo no crescimento econômico, melhorar o clima de investimento e a imagem da Somália no exterior.

Palavras-chave: crescimento econômico, IED, método NARDL, Somália.

1 INTRODUCTION

Foreign direct investment (FDI) is one of the most critical factors influencing economic growth in developing countries such as India, where capital is scarce due to irregular distribution and insufficient domestic savings in both the public and private sectors. This investment is significant for any country's industrial growth and development **(Sarker & Khan, 2020; Usman et al., 2020a).**

The most significant advantage for developing countries is FDI's contribution to bringing and introducing new technology, skills, training, and other relevant and essential materials to their economy (**Hossain & Hossain, 2012**). Additionally, A crucial benefit for the host nation is the possibility of employment. When foreign businesses expand to

operate in their countries, they also bring management effectiveness and improved technological output. It allows developing countries to compete with foreign competitors and produce higher-quality future goods and services. Yet, the primary driver of FDI demand is the requirement for capital to finance investments in emerging nations. Thus, FDI could help them raise their standard of living and build their countries by creating more jobs and launching essential projects.

FDI from advanced countries technologically is being encouraged to accelerate the process of privatization, globalization, and industrialization; maintain and increase sustainable growth; and reduce unemployment (**Hussain & Haque, 2016**). Foreign direct investment (FDI) can also give foreign investors enormous benefits, the most significant of which are cost savings on transportation (for both inputs and finished goods), reduced labor costs, accessible infrastructure, and customs savings. Also, contributions to imported goods, a closed position to clients, the possibility for quick and effective delivery with data accessibility, preferences, and the potential for quick product adaption to market demands. Moreover, there are three categories of FDI: fund stocks, invested income, and intra-company credits (**UNCTAD Report, 2017).**

In Africa, FDI flows reached $83 billion – a record – from $39 billion in 2020, accounting for 5.2 percent of global FDI. Most recipients saw a moderate rise after the pandemic-induced fall in 2020. A single intra-firm financial transaction in South Africa in the second half of 2021 inflated the total. Excluding that, the increase was more in line with other developing regions, including South Africa, East Africa, and West Africa, which saw flows rise; flows in Central Africa remained flat, and North Africa declined. Moreover, FDI to East Africa grew by 35 percent to $8.2 billion. Flows to Ethiopia reached $4.3 billion due to a tripling of Chinese investment. FDI to the United Republic of Tanzania rose 35 percent to $922 million (**UNICAT report, 2022).**

However, the military government altered the country's structures and policies, leading to the nationalization and governance of major companies and industries. Private organizations still possess and operate facilities to produce goods and services (**Argiolas et al., 2009**). Investment plays a crucial role in every business ecosystem, particularly in a setting like the Somali region, where micro-sized businesses dominate and require investment to develop and achieve economies of scale. External governments, companies, and investors are increasingly looking at the potential in Somalia's private sector, seeking opportunities for investment and business expansion. The Somali diaspora is the most

committed and involved among these potential investors. The diaspora actively supports households, relatives, and many individuals in the Somali regions, serving as a lifeline. According to the World Bank, in 2014, the global diaspora sent $1.3 billion to Somalia, representing 24% of the country's GDP.

Additionally, diaspora capital significantly contributes to private sector investment through remittances, mainly used for monthly household expenditures and supporting family and friends. Diaspora members often provide capital for micro-startups as well. Many members of the diaspora are eager to return to their homeland, and a favorable business climate and stable economic outlook would provide the reassurance they need to decide to come back.

Despite facing numerous challenges, diaspora investments in the Somali economy persist. The safety, financial, and political complications in the Somali regions have severely impacted the effectiveness of governing associations. As a result, money transfer channels operate informally, raising concerns related to corruption, potential terrorist financing, and money laundering. The World Bank report (2015) emphasizes the necessity for transparent and reliable investment channels for the Somali diaspora and non-diaspora individuals and the international community. These channels would address these issues and facilitate the growth of companies needing capital.

Somalia's FDI has experienced a slight decline, with the study indicating a 7% decrease in investment inflow, from US$107 million in 2013 to US$106 million in recent years. By the end of 2014, FDI balances reached US$988 million, accounting for 0.1% of the total Arab investment during the same period (UN, 2014). According to the FDI Markets database, from January 2003 to May 2015, Somalia attracted 16 Arab and foreign investors who implemented 17 FDI projects, primarily in the telecommunication sector (65.2% of investments) and the warehouse sector (21%). These projects had an estimated total investment cost of nearly US$936 million and employed approximately 1,208 workers. The Bolor Group emerged as the leading company investing in Somalia, with a project valued at around US$197 million (**UNCTAD, 2014**). Over the past four decades, Somalia's FDI has fluctuated between US$43,390,000 in 1970 and US$339,000,000 in 2016. The most recent data on net foreign direct investment inflows (BOP, current US$) in Somalia indicate a value of US$339,000,000 (**IMF, 1988**). This research aims to examine the asymmetric effects of FDI on economic growth in Somalia.

2 LITERATURE REVIEW

2.1 THEORETICAL REVIEW

FDI incentivizes economic growth, and researchers across various countries have examined this relationship. Adam Smith's "The Wealth of Nations" (1776) supports this notion. The FDI-growth nexus is evident in neoclassical growth models, which posit that FDI can increase income levels but lacks long-term economic impact unless it contributes to technological advancement. The neoclassical growth model considers labor force expansion and technological advancement exogenous factors. Long-term growth depends on population and technical expansion, and FDI can enhance growth if it positively affects technology **(Solow, 1956).**

From a macroeconomic perspective, **Lipsey (2004)** defines FDI as a specific arrangement of capital flow between home nations and host countries, measured by the balance of payments statistics. These transfers result in capital accumulation stocks in the recipient countries, precisely the amount of investment by the home country in corporations controlled by home country owners or where home country owners possess individual voting rights. Additionally, **Lipsey (2004)** describes the variables of interest as the flow of financial capital, the value of the money stock accumulated by investment companies, and the revenue streams from investments. At the micro-level, several factors influence a host country's ability to attract FDI, including market size, economic growth rate, GDP, infrastructure, natural resources, and institutional characteristics such as political stability.

2.2 EMPIRICAL REVIEW

Recent studies have examined the effects of FDI on host countries' economies and firm competitiveness, with empirical results yielding diverse outcomes. Some researchers suggest that FDI can stimulate economic growth through positive spillover effects, including technological development, capital formation, increased international trade, and human capital development (such as improved labor skills and employment). However, other studies propose that FDI can have a negative impact on economic growth **(Cuadros, 2004).**

Asafo-Adjei et al. (2023) employed instrumental variable quantile regression (IVQR) and find a significant positive relationship between FDI inflows and economic growth. Their study provides new evidence of the asymmetric relationship between

foreign direct investment and economic growth. An additional survey **by An & Yeh (2021)** examines the effects of FDI on economic growth in emerging and developing Asian countries from 1996 to 2017, using the panel smooth transition regression (PSTR) model. They conclude that FDI has nonlinear effects on growth, contingent on the level of financial development. Researchers have found that a sufficiently developed financial system enhances the growth effects of FDI in emerging and developing Asia. However, in other cases, the impact of FDI on economic growth may be adverse or modest.

Adeniyi (2020) explored the impact of FDI and inflation on the economic growth of selected African countries between 1996 and 2018, using ordinary least squares (OLS) methods. The results indicate a strong and positive impact of FDI on economic growth in all five countries. At the same time, inflation has a negative but significant relationship with economic growth in four selected countries (except Egypt**). Gochero & Boopen (2020)** investigated the relationship between FDI in the mining sector and economic growth in Zimbabwe from 1988 to 2018, employing the autoregressive distributed lag (ARDL) approach. The research demonstrates that the mining sector's FDI significantly impacts the country's GDP in the long run.

In another study focusing on developing countries, **Chaudhury et al. (2020**) examined the impact of FDI on economic growth in South Asia using panel data from 1990 to 2014. The results reveal an overall positive and significant impact of FDI on economic growth, although FDI in the secondary sector has a significantly adverse effect on economic growth. Similarly, based on quarterly data, **Bilas (2020)** investigated the relationship between FDI and economic growth in Croatia from 2000 to 2019. The findings from three cointegration tests indicate no long-run equilibrium relationship between GDP growth rate and FDI, suggesting no Granger causality between these series. Furthermore, researchers have found that FDI does not statistically impact the GDP growth rate in Croatia.

In Bangladesh, **Bibhuti & Khan (2020)** examined the nexus between FDI inflows and economic growth from 1972 to 2017, utilizing the augmented autoregressive distributed lag (ARDL) bound testing approach and granger causality analysis. The results indicate a positive impact of FDI on economic growth, with unidirectional causality from GDP to FDI. **Muhammad & Khan (2019)** analyzed the relationship between FDI, energy consumption, capital formation, and economic growth in 34 Asian countries using various estimators such as a generalized method of moments (GMM),

ordinary least squares (OLS), fixed effect, and random effect. The findings demonstrate the importance of all selected variables in the economic growth of these countries.

Akadiri et al. (2020) investigate the causal relationship between FDI, trade openness, and economic growth in 25 African countries, employing panel bootstrapping cointegration techniques that account for cross-sectional dependence. The results indicate a long-run equilibrium nexus between the variables and bidirectional causality between FDI, trade openness, and economic growth. In the case of Cambodia, **Khun (2019**) studies the nexus between FDI and economic growth by utilizing time series data from 2006 to 2016. The correlation matrix and multiple regression analysis are employed, revealing a positive impact of FDI on economic growth.

In a separate study conducted in Cambodia between 1980 and 2014, **Sothan (2017)** assesses the linkage between FDI and economic growth. The results indicate a unidirectional relationship between FDI and economic growth in the long and short run. Additionally, a study on 13 MENA countries between 1990 and 2010 investigates the interrelationship among FDI, domestic capital, and economic growth. The empirical findings reveal a bidirectional causal relationship between FDI and economic growth, indicating that FDI can cause economic growth and vice versa. A newly developed bootstrap autoregressive distributed lag (ARDL) cointegration is employed in these MENA countries **(Asin, 201**7). In Nigeria**, Kur (2019)** examines the impact of inflation on the FDI-growth relationship from 1981-2017. The results reveal a positive long-run relationship between inflation, FDI, and economic growth. Besides, studies that used ordinary least square (OLS) approach are not able to provide the ways relationships. It just tells the one-way relationship between the variables. Many studies have utilized the ARDL and instrumental variable quantile regression (IVQR). Since there is lack of such studies in Somalia, this study utilized the normal econometric technique in the literature to explore the association among variables whether are strong or weak. The following chapter discusses the methodology.

3 METHODOLOGY AND DATA

3.1 EMPIRICAL MODEL

This research used an empirical model developed by **Amwaama (2018)**. The following Equation represents the practical model:

$$LGDPt = f\,(LFDIt\ ,INFLt\ ,LGCFt,\ TOt) \qquad (1)$$

Where,

GDPt, FDI_t, TO_t, GCF_t, and $INFL_t$, are GDP, Foreign direct investment, trade openness, Gross Capital formation, and percentage of inflation in the economy. Equation (1) is transformed into natural logarithms as follows:

$$LGDPt = a_1 + \beta_1\ LFDI_t + \beta 2\ TO_t + \beta 2\ LGCF_t + \beta 2\ INFL_t + \pi_t \qquad (2)$$

In this model, t represents the residuals, while the remaining variables are specified. Economic theory suggests that increased FDI inflow may lead to a higher GDP. Fiscal resources provided by FDI can contribute to long-term positive GDP growth. Therefore, researchers predict that FDI will improve GDP growth. Researchers expect a positive correlation between the proportion of trade openness in the economy and economic growth. Additionally, researchers expect a positive association between gross capital formation and economic growth, an essential factor. The study also anticipates that in the case of rising inflation (especially in a country like Somalia), there will be a decrease in GDP, indicating an inverse relationship between GDP and inflation.

3.2 DATA

This research utilizes time series data from 1971 to 2021 to investigate the asymmetric effects of foreign direct investment on economic growth in Somalia. The dependent variable is economic growth, measured as GDP at constant 2015 prices. The key independent variable is FDI inflow, measured in millions of dollars. Moreover, Control variables include trade openness, measured as a percentage, inflation measured by the consumer price index (CPI), and gross capital formation, measured at constant prices. Researchers use these control variables to address the issue of overfitting the model. Data sources for this study include the World Development Indicators from the World Bank and the Statistical, Economic, and Social Research and Training Centre for Islamic Countries (SESRIC).

Previous research has established trade openness as a significant factor influencing economic growth in recent studies **(Khan et al., 2021; Kumari et al., 2021; Raghutla, 2020; Sethi et al., 2019)**. Similarly, research has shown that inflation significantly impacts economic growth **(Guru & Yadav, 2018; Raghutla, 2020; Sethi**

et al., 2019; Sharma et al., 2018). Furthermore, numerous studies have indicated that gross capital formation is an important variable influencing economic growth including (**Muhammad Asghar Khan, 2022**). The researchers obtained the data for FDI inflows from the United Nations Conference on Trade and Development (UNCTAD) database. In contrast, data for economic growth, inflation rate, trade openness, and financial development was sourced from the World Bank.

3.3 ESTIMATION TECHNIQUES

This paper aims to investigate the potentially unequal relationship between FDI and GDP growth in Somalia. The study explores this relationship by applying the nonlinear autoregressive distributed lag model (NARDL).

NARDL Model: A nonlinear relationship between variables has emerged as a significant development in the current literature. Shin et al. (2014) introduced the concept of a nonlinear relationship in empirical research. They proposed a nonlinear equation incorporating positive and negative shocks in the explanatory variables, known as the nonlinear autoregressive distributed lag (NARDL) model. In this study, Equation (1) is transformed into a nonlinear form by separating FDI into increasing and decreasing values to examine the asymmetric effects of FDI on economic growth. The NARDL model has been widely applied in recent literature (Bansal et al., 2021; Kumar et al., 2021). The equations representing the increasing and decreasing values are as follows:

$$FDI_t^{+} = \sum_{k=1}^{t} In\,FDI_k^{+} = \sum_{k=1}^{T} Max(\Delta\, InFDI_k, 0) \quad (3)$$

$$FDI_t^{-} = \sum_{k=1}^{t} In\,FDI_k^{-} = \sum_{k=1}^{T} Min(\Delta\, InFDI_k, 0) \quad (4)$$

In line with Shin et al. (2014), a nonlinear cointegration equation can be derived by incorporating positive and negative economic growth shocks into the linear autoregressive distributed lag (ARDL) cointegration equation, resulting in the NARDL model. The NARDL model is expressed as follows:

$$\Delta InGDP_t = \alpha + \sum_{k=1}^{n} \alpha_{1k}\Delta InGDP_{t-k} + \sum_{k=0}^{n} \alpha_{2k}\Delta InFDI^{+}_{t-k} + \sum_{k=0}^{n} \alpha_{3k}\Delta InFDI^{-}_{t-k} + \sum_{k=0}^{n} \alpha_{4k}\Delta InTO_{t-k} + \sum_{k=0}^{n} \alpha_{5k}\Delta InINF_{t-k} + \sum_{k=0}^{n} \alpha_{6k}\Delta InGCF_{t-k} + \boldsymbol{\theta}_1\, InGDP_{t-1} + \boldsymbol{\theta}_2\, InFDP^{+}_{t-1} + InFDP^{-}_{t-t} + \boldsymbol{\theta}_4 InTO_{t-1} + \boldsymbol{\theta}_5\, InINF_{t-1} + \boldsymbol{\theta}_6 InGCF_{t-1} + \varepsilon \quad (5)$$

Where,

n is the lag orders, and $\boldsymbol{\theta}_1$, $\boldsymbol{\theta}_2$, $\boldsymbol{\theta}_3$, $\boldsymbol{\theta}_4$, $\boldsymbol{\theta}_5$ and $\boldsymbol{\theta}_6$ are the long-run coefficients. The long-run positive and negative effects of FDI on economic growth are:

$\emptyset^{+}_1 = -\boldsymbol{\theta}_2/\boldsymbol{\theta}_1$ and $\emptyset^{-} = \boldsymbol{\theta}_3/\boldsymbol{\theta}_1$

The null hypothesis is that there is no asymmetric long-run effect of FDI's positive and negative effects on economic development is written as:

$\boldsymbol{\theta}_2/\boldsymbol{\theta}_1 = \emptyset^{-} = \boldsymbol{\theta}_3/\boldsymbol{\theta}_1$ against the alternative hypothesis $\boldsymbol{\theta}_2/\boldsymbol{\theta}_1 = \boldsymbol{\theta}_3/\boldsymbol{\theta}_1$ Similarly, the null hypothesis of no short-run asymmetric effect of FDI on economic growth can be specified as:

$\sum_{k=0}^{n} \alpha_{2k} = \sum_{k=0}^{n} \alpha_{3k}$ against the alternative hypothesis $\sum_{k=0}^{n} \alpha_{2k} \neq \sum_{k=0}^{n} \alpha_{3k}$.

The error correction term (ECT) can be specified in the following equation:

$$InGDP_t = \alpha_1 + \alpha_2 InFDI^{+}_t + \alpha_3 InFDI^{-}_t + \alpha_3 InTO_t + \alpha_4 InINF_t + \alpha_5 InGCF_t + \mu_t$$

Where,

γ shows the ECT.

4 RESULTS AND INTERPRETATION

4.1 DESCRIPTIVE STATISTICS

The following descriptive analysis provides the minimum, maximum, and mean values. The mean value represents the highest average, and the standard deviation indicates the variability. For the dependent variable, Table 1 presents the descriptive results of LGDP, showing an average of 21.60155 units, a standard deviation of 0.351243, and a maximum value of 22.75535 units. Regarding the independent variables, including LFDI, INFL, LGCF, and TO, the average LFDI is 15.01346 units, with a standard deviation of 2.868513 and a maximum value of 19.94674 units. The average INFL is 7.979400 units, with a standard deviation of 8.307532 and a maximum value of 42.000000 units. The average LGCF is 19.47062 units, with a standard deviation of 0.428687 and a maximum value of 20.84138 units. The average of trade openness is 53.80156, with a standard deviation of 39.45528 and a maximum value of 121.6700.

The next step of this study involves conducting a unit root test using the Augmented Dickey-Fuller (ADF) to determine the presence of nonlinearity.

Table 1: Descriptive Statistics

	LGDP	LFDI	INFLA	LGCF	TO
Mean	21.6015	15.01346	7.979400	19.47062	53.80156
Median	21.5439	14.60397	5.300000	19.34825	39.49000
Maximum	22.755 5	19.94674	42.00000	20.84138	121.6700
Minimum	21.23609	9.210340	0.620000	19.08406	5.630000
Std. Dev.	0.351243	2.868513	8.307532	0.428687	39.45528
Skewness	2.152024	0.060668	2.733035	2.142816	0.152682
Kurtosis	7.148717	2.167849	10.35189	6.780380	1.352014
Jarque-Bera	67.00627	1.325997	157.3653	61.23358	5.267070
Probability	0.000000	0.515304	0.000000	0.000000	0.071824
Sum	972.0697	675.6057	359.0730	876.1780	2421.070
Sum Sq. Dev.	5.428367	362.0483	3036.664	8.085994	68495.65
Observations	45	45	45	45	45

Source: computed by the authors (2023)

4.2 UNIT ROOT TESTS

The results from the ADF test indicate that all variables are not stationary at level, but the stories in LGDP, LFDI, INFLA, LGCF, and TO are nonstationary. It means we do not integrate the LGDP and all other independent variables of order zero. The ADF unit root test results confirm that all variables are nonstationary in levels, meaning they have a unit root. Since nonlinearity is present, the results of the ADF test prove that all variables are integrated of order one (1). The next step is to figure out the ARDL cointegration between the factors that are not linear.

Table 2 Unit root tests by ADF

Variables	Level		First difference	
	Intercept	Trend & intercept	Intercept	Trend & intercept
LGDP	0.728841	-0.072142	5.987300**	-6.254189**
LFDI	-1.817906	-2.429010	-6.309709**	-6.287739**
INFL	-2.234662	-2.296503	-5.967153**	-5.893892**
LGCF	0.061271	-0.462265	-6.721760**	-7.055339**
TO	-0.922312	-1.299161	-5.301089**	-5.635186**

Note: probability for all dimensions is zero.
Source: computed by the authors (2023).

4.3 THE SPEARMAN PAIRWISE CORRELATIONS

This research additionally calculated the Spearman pairwise correlations to build on the first findings. Table 3 displays the results and includes the coefficients and p-values for each pairwise variable. A value of 0.61 shows a positive pairwise association between

GDP growth and foreign direct investment inflow percentage. Inflation and GDP growth have a positive correlation, as indicated by its value of 0.0077. While gross capital formation, trade openness, and GDP growth are positively associated, their values are 0.88 and 0.27, respectively.

Table 3. Pair's Correlation Matrix

Correlation (Probability)	LGDP	LFDI	INFLA	LGCF	TO
LGDP	1.000	0.616867	0.007720	0.886209	0.275468
LFDI	0.616867	1.000000	0.135255	0.490750	0.465637
INFLA	0.007720	0.135255	1.000000	-0.287786	-0.391770
LGCF	0.886209	0.490750	-0.287786	1.000000	0.400278
TO	0.275468	0.465637	-0.391770	0.400278	1.000000

Source: computed by the authors (2023)

4.4 NONLINEARITY TEST

Examining the nonlinearity among the variables is crucial, as this research aims to establish the asymmetric link between foreign direct investment inflow and GDP growth in Somalia. The study employed the widely recognized BDS test to assess the nonlinearity. The findings in Table 4 indicate that the variables exhibit a non-normal distribution, suggesting the presence of nonlinearity. As shown in Table 4, the study rejected the null hypothesis of linearity in favor of nonlinearity.

Table 4: BDS Test for Nonlinearity

BDS test for nonlinearity		
Variable	**Dimension**	**BDS statistics**
LGDP	2	0.120698
	3	0.175366
	4	0.180063
	5	0.145098
	6	0.171077
LFDI	2	0.082890
	3	0.085317
	4	0.062721
	5	0.046756
	6	0.022018
INFL	2	0.133297
	3	0.217851
	4	0.271207
	5	0.298376
	6	0.302081
LGCF	3	0.098172
	4	0.133566
	5	0.115920
	6	0.054335
	3	0.150238

TO	4	0.235314
	5	0.289183
	6	0.320559

Source: computed by the authors (2023)
Note: Probability for all dimensions is zero

4.5 NARDL BOUNDS COINTEGRATION TESTS

The NARDL cointegration test is utilized in this study to analyze an unconstrained model. It applies the F-test to test the joint hypothesis that the lagged long-run parameters all equal zero. The results are presented in Table 5 below. The results provide statistical evidence supporting the long-term cointegration of the variables. The findings indicate that the calculated F-statistics of 8.197940 exceeds the critical value 3.0 at the 1% significance level. This implies that GDP and Somalia's FDI inflow have a long-term relationship.

Table 5: NARDL bounds cointegration results.

Critical value (%)	**Lower bound I (0)**	**Upper bound I(1)**
1	2.08	3.0
5	2.39	3.38
10	3.06	4.15
NARDL F-statistics	**Wald F-stat**	**8.197940*** **

Notes: *** 10% significance level, **5% significance level, *1% significance level. Null hypothesis: no asymmetric cointegration. Alternative hypothesis: asymmetric cointegration.
Source: prepared by the authors (2023).

4.6 NARDL LONG-RUN PARAMETER ESTIMATION

The rejection rule is to reject the null hypothesis if the F-statistics exceed the upper limit. As there is evidence of nonlinear cointegration, the long-run parameters of the NARDL regression are presented. The findings are shown in Table 6. The nonlinear ARDL specification with lags 2, 0, 4, 0 is chosen based on empirical research. It reveals that while the positive consequences of decomposed foreign direct investment (LFDI NEG) are small, the negative ones (LFDI POS) are even smaller. The expected long-run parameters for positive and negative FDI shocks are 0.045920 and -0.018422, respectively. Therefore, the findings suggest that GDP growth is more sensitive to negative than positive shocks. The results indicate that a 1% increase in FDI leads to a 0.045% increase in GDP growth, and this coefficient is statistically significant.

Additionally, an increase in FDI is associated with a 0.027% boost in GDP growth. The findings also reveal that inflation has a negative and small impact on GDP growth. According to the results, a 1% rise in inflation would result in a 0.0059% decline in GDP

growth. Furthermore, the findings demonstrate that gross capital formation positively and substantially impacts economic growth. Based on the results, a 1% increase in gross capital formation would lead to a 0.55% boost in GDP growth, and trade openness is negatively correlated with GDP and is statistically significant. The calculated model's modified R-squared value is satisfactory. After estimating the NARDL long-run parameters, a short-run model is estimated, and diagnostic tests are conducted to assess the model's robustness. The short-term results are presented in Table 6.

Table 6 NARDL long-run parameter estimation

Exogenous variables	**Parameters**	**p-values**
LFDI_POS	0.045920	0.0038***
LFDI_NEG	0.027311	0.1844
INFLA	-0.005919	0.00367***
LGCF	0.556068	0.000***
TO	-0.002127	0.0481***
R-squared	0.968600	
Adjusted-R-squared.	0.957458	
Selected model:	ARDL (2, 0, 4, 0)	

Notes: *** 10% significance level, **5% significance level, *1% significance level. Dependent variable: D(GDP).
Source: computed by the authors (2023).

4.7 NARDL SHORT-RUN ESTIMATION AND DIAGNOSIS

The short-run and residual diagnostic findings are shown in Table 7. The Ect (-1) term, often the error correction term, controls how quickly an equilibrium is reached. Table 6 demonstrates that the mistake corrects the term's coefficient is statistically significant and negative. Given that it is more than 1, there has been an excessive adjustment to equilibrium. Additionally, Table 7 shows that the findings met diagnostic statistics. The diagnosis test results show no serial correlation, heteroskedasticity, and normality.

Table 7 NARDL short-run estimation and diagnosis

Exogenous variables	**Parameters**	**p-values**
C	27.2413279711	0.0379***
@TREND	0.214065	0. 0.0769***
Δ (LFDI_POS)	0.148424	0.0296***
Δ (LFDI_POS(-1)	-0.124181	0.0563***
Δ (LFDI_POS(-2)	0.073206	0.0818***
Δ (INFLA)	-0.040154	0.1528
Δ (INFLA(-1)	0.050902	0.1175
Δ (LGCF)	0.184750	0.2760
Δ (LGCF(-1)	0.082040	0.6778
Δ (TO)	0.001243	0.3680
Δ (TO(-1)	-0.005192	0.5999

Ect (-1)	-1.33	0.000***
R-squared	0.995115	
Adjusted R-squared	0.972785	
Heteroskedasticity Test: Breusch-Pagan-Godfrey		2.259195 (0.1323)
Jarque-Bera test		0.910396(0.634322)
Breusch-Godfrey Serial Correlation LM Test		1.292075 (0.4338)

Notes: *** 10% significance level, **5% significance level, *1% significance level.
Source: computed by the authors (2023)

4.8 LONG RUN AND SHORT RUN ASYMMETRIC TEST

The study investigated further whether the coefficients in the long run and short run are symmetrical or asymmetrical. The results of an asymmetrical test are presented in Table 8. It is evident from Table 8 that decomposed positive and negative effects of foreign direct investments inflow on GDP growth are significant at 5%. This implies that the study rejects the null hypothesis of no asymmetry means that can accept alternative hypothesis which have asymmetric relationship between foreign direct investment inflow and economic growth in Somalia. This suggests that there is inequality and that the coefficients are different.

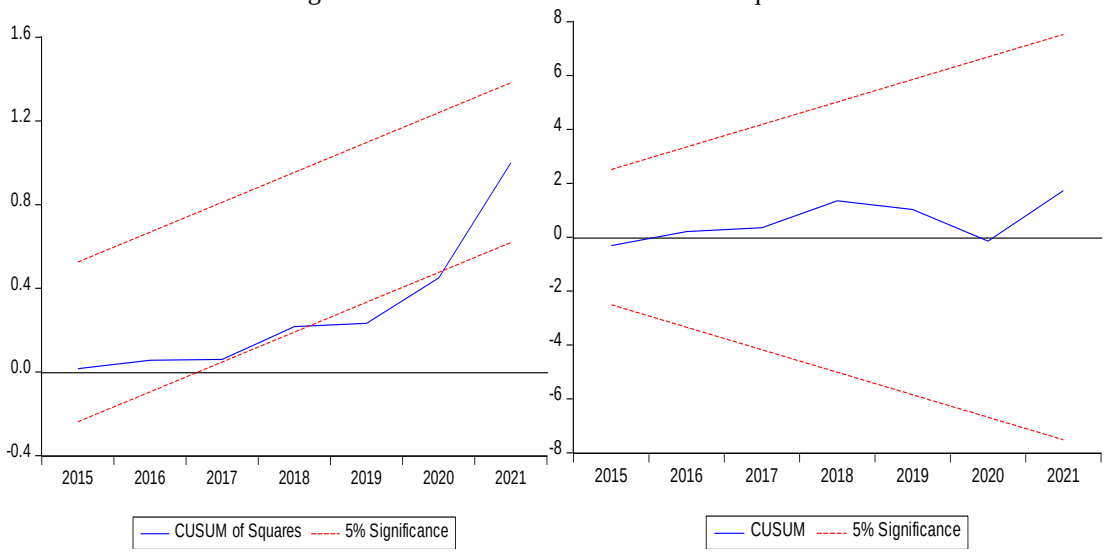
Table 8 Long run and short run asymmetric test

Dependant variable	**F-statistics**	**P-value**	**Presence of asymmetric**
Long run asymmetric of LGDP	4.149234	0.0186	Yes
Short run asymmetric of LGDP	5.13454	0.0226	Yes

Source: computed by the authors (2023)

The results of an asymmetrical test are presented in Table 8. It is evident from Table 8 that decomposed positive and negative effects of foreign direct investment inflow on GDP growth are significant at 5%. This implies that the study rejects the null hypothesis of no asymmetry. This suggests that there is inequality and that the coefficients are not the same. The research further evaluated the estimated model's stability. The findings of Figure 2 reveal that the model is stable according to both the CUSUM and the CUSUM of squares.

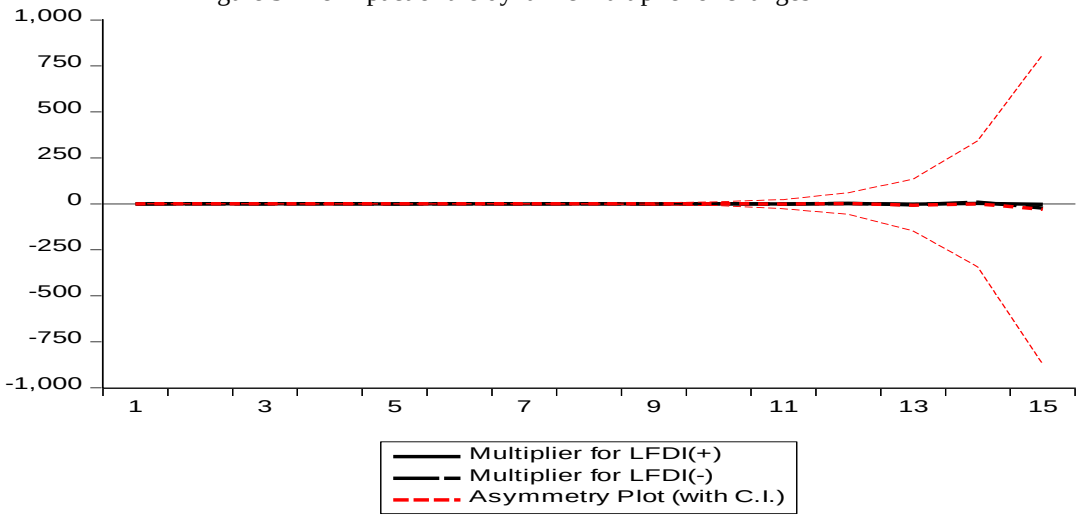
Figure 2 the CUSUM and the CUSUM of squares.



Source: computed by the authors (2023)

Additionally, the impact of the dynamic multiplier of changes in FDI, both positive and negative, is illustrated in Figure 3 below. The solid black line represents the asymmetric adjustment of GDP growth to a positive FDI inflow shock over a given time horizon, capturing positive developments. On the other hand, the dotted black line captures the asymmetries in how GDP growth responds to a negative shock from foreign direct investment inflow during a specific period. The red dotted line distinguishes between positive and negative shocks. Figure 3 shows positive shocks are more volatile in the short term than negative ones. However, these shocks are transitory and gradually stabilize over the long run. Notably, a decrease in foreign direct investment inflow appears to have a more prolonged impact on GDP growth than a decline in inflation.

Figure 3 The impact of the dynamic multiplier of changes in FDI



Source: computed by the authors (2023)

5 CONCLUSION AND RECOMMENDATIONS

The Federal Government of Somalia and the Federal Member States (FMS) have a positive attitude towards foreign direct investment (FDI). However, insecurity and uncertainty driven by terrorist groups, lack of transparency, failure to fully constitute governing bodies per the 2012 provisional constitution, and widespread corruption in government sectors present considerable barriers to FDI. In September 2020, Somalia's investment promotion authority, Som-invest, released a five-year National Investment Promotion Strategy, which purposes to improve the investment climate and Somalia's image abroad. Nevertheless, this article examined the asymmetric impact of FDI inflow on Somalia's economic growth from period 1977 to 2021. The unit root tests using augmented Dickey-Fuller indicated that all variables were nonstationary at the level but stationary at first differences, suggesting that all variables were second-order integrated I(1).

The NARDL model was employed to estimate the long-run and short-run asymmetric impacts of FDI on economic growth. The Wald tests revealed that FDI inflow had an asymmetrical effect on the economy's growth. The findings demonstrated that an increase in FDI positively affected Somalia's GDP growth, while a decrease in FDI inflows had a detrimental influence on economic growth. The inflation rate was found to slow the pace of economic growth in the long run, and trade openness negatively affected economic growth. On the other hand, gross capital formation boosted economic growth in Somalia in both the short and long run.

Furthermore, the short-run results showed that the positive shock of FDI significantly enhanced real GDP growth. The findings suggested that FDI can impact economic growth from both the supply and demand sides, with the demand side being more beneficial and suitable in the context of Somalia's economic growth. These empirical findings indicated the presence of a nonlinear cointegration relationship in the model. The error correction term (ECT) results showed that equilibrium would be reached from the short to the long run at a convergence speed of 1.33% per year.

These findings hold significance and are also applicable in the case of Somalia, both in terms of short-run and long-run equilibrium. Limitations of the research, although Somali faced a lot of challenges including civil war, pirates, terrorists, macroeconomics instability, lack of human capital, poor infrastructure, and corruptions are not considered owing to data availability. In the context of economic reform, the researchers recommend

that the Somali government considers more realistic and practical economic measures. This may include reducing barriers that hinder the establishment of necessary connections for local enterprises and facilitating domestic firms' access to technology. Such measures would contribute to fostering economic growth in Somalia. Policy recommendations firstly. prioritize public investments: Investment in infrastructure, education, health, and other areas that enhance productivity and economic growth should be prioritized over consumption spending. Secondly, increase revenue: Governments can increase revenue through tax reforms, anti-corruption measures, and other initiatives to help finance public investments and reduce trade barriers. thirdly, maintain macroeconomic stability: Stable inflation, and exchange rates, can help reduce the negative impact on economic growth. finally improve the investment climate and Somalia’s image abroad.

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