Vol. 15, Issue 1, 2025, pp. 96 – 105
Research Article

www.refaad.com

Global Journal of Economics and Business (GJEB)
المجلة العالمية للاقتصاد والأعمال
Journal Homepage: https://www.refaad.com/Journal/Index/2
E-ISSN 2519-9293 | P-ISSN 2519-9285

Inflation and Economic Growth in the Sudan: An Empirical Analysis

التضخم والنمو الاقتصادي في السودان: تحليل تجريبي

Mohieldin Ali Elhassan[1*], Gamaleldeen Osman Talha[2]
[1] Department of Economics, College of Business and Economics, Qassim University, Saudi Arabia
[2] Department of Business Administration, College of Business and Economics, Qassim University, Saudi Arabia
[*] Corresponding Author: Mohieldin Elhassan (mo.elhassan@qu.edu.sa)

Received استلام البحث	Revised مراجعة البحث	Accepted قبول البحث
2024/9/27	2024/10/26	2024/11/21

DOI: https://doi.org/10.31559/GJEB2025.15.1.7

Abstract:

Objectives: The study's objective is to investigate the relationship between inflation and economic growth in Sudan from 1982 to 2020.

Methods: To achieve this objective, the study co-integration analysis within an auto-regressive distributed lag (ARDL) methodology. The bound test revealed that the model's variables are co-integrated in the long term, with the significance of the error correction term further confirming this long-term relationship, while the ERC should focus on short-term dynamics.

Results: The results indicate that the growth rate of real GDP per capita is positively and significantly co-integrated with the growth rate of capital per capita, whereas it is negatively and significantly co-integrated with the inflation rate.

Conclusions: The study recommends that policymakers consider this inverse relationship when formulating economic policies.

Keywords: *ARDL; co-integration; economic growth; Inflation.*

الملخص:

الأهداف: تهدف الدراسة إلى معرفة العلاقة بين التضخم والنمو الاقتصادي في السودان من عام 1982 إلى عام 2020.

المنهجية: تم إجراء تحليل التكامل المشترك باستخدام منهجية الانحدار الذاتي للفجوات الزمنية الموزعة (ARDL). كشف اختبار الحدود أن متغيرات النموذج تتكامل بشكل مشترك على المدى الطويل. كما أكدت معنوية معامل تصحيح الخطأ ذي الصلة على وجود علاقة طويلة الأجل.

النتائج: تشير النتائج إلى أن معدل نمو نصيب الفرد من الناتج المحلي الإجمالي الحقيقي يتكامل بشكل إيجابي وهام مع معدل نمو نصيب الفرد من رأس المال، في حين أنه يتكامل سلبًا وبشكل ملحوظ مع معدل التضخم.

الخلاصة: توصي الدراسة صناع السياسات بضرورة الاهتمام بهذه العلاقة العكسية عند صياغة السياسات الاقتصادية.

الكلمات المفتاحية: *التكامل المشترك؛ النمو الاقتصادي؛ التضخم.*

Citation

Elhassan, M. A., & Talha, G. O. (2025). Inflation and Economic Growth in the Sudan: An Empirical Analysis. *Global Journal of Economics and Business*, 15(1), 96-105. https://doi.org/10.31559/GJEB2025.15.1.7

1 Introduction

A number of empirical studies in developed and developing economies have identified the nexus between inflation and economic growth. Economists use the term "economic growth" to refer to either an increase or a decrease in the yearly rate of change of real GDP or real GDP per capita. In contrast, inflation is defined as a persistent rise in the general price level.

There is no universal agreement on the nature of the relationship between inflation and economic growth. Some economists believe that inflation is favorable to economic growth and that there is a positive association between inflation and economic growth. Islam et al. (2021) investigate: "The impacts of carbon emissions, rainfall, temperature, inflation, population, and unemployment on Saudi economic growth from 1990 to 2019. The Auto-regressive Distributed Lag (ARDL) technique for co-integration has been used to analyze the variables' long-run relationships. The empirical findings show that there is a positive association between inflation and economic growth". In a similar manner, Dinh (2020) examines: "The impact of inflation on economic growth in both the short and long terms in Vietnam. The study employed the vector auto-regressive co-integration model and covering the years 1996–2018. According to the study's findings, economic growth and inflation are positively correlated". In addition, Behera and Mishra (2016) examine: "The inflation-growth nexus in the BRICS (Brazil, Russia, India, China, and South Africa) countries. The study made use of time series data from 1980 to 2012. Only China and South Africa, according to the study's empirical findings, exhibit a long-term positive correlation between inflation and economic growth. The VAR study was unable to find any consistent short-term relationship between inflation and economic development for the BRICS countries over the next ten years". In a similar manner, Mallik and Chowdhury (2001) study: "The relationship between economic growth and inflation in four South Asian economies. The study employed the yearly data supplied by the IMF and used the co-integration model. For the selected economies, the empirical results reveal a long-run positive relationship between inflation and economic growth". In addition, Datta and Mukhopadhyay (2011) explore: "The relationship between inflation and economic growth in Malaysia using data from 1971 to 2007. According to the study, inflation has a short-term negative relationship with economic growth but a long-term positive relationship with economic growth".

Stagflation is a phrase used in economic literature. It is a condition in which prices are rising while output is decreasing or remaining stable. As a result, the positive nexus is not the sole situation in practice. Some economists have found a negative association between inflation and economic growth. Atigala et al. (2022) investigate: "The effect of inflation on economic growth in Sri Lanka from Q1 2000 to Q4 2021. Using the Auto Regressive Distributed Lag model as the estimation approach, the study findings show a negative relationship between inflation and economic growth in the short run." In similar manner Mandeya and Ho (2021) explore: "The influence of inflation and inflation uncertainty on economic growth in South Africa from 1961Q1 to 2019Q4. Using auto-regressive distributed lag estimation techniques, the study discovered that inflation has a negative impact on economic growth in South Africa in both the short and long run, whereas inflation uncertainty is a short-run phenomenon that has an impact on economic growth only in the short run". Moreover, Azam and Khan (2020) employ: "Different techniques to investigate the relationship between inflation and economic growth for 27 countries from 1975 to 2018. The outcome demonstrates a significant inverse relationship between inflation and growth above the inflation threshold". In Brazil, Baltar (2015) examines: "The relationship between inflation and economic growth following trade and financial liberalization. The study employs a model for the relationship between inflation and economic growth under the cost-based price method. According to the estimated model, economic growth and inflation have an inverse relationship". Similarly, Bittencourt (2012) studies: "The impacts of inflation on economic growth in four Latin American countries, analyzing data from 1970 to 2007. According to the findings of the study, there is a negative association between inflation and economic growth". Furthermore, Adaramola and Dada (2020) investigate: "The impact of inflation on Nigerian growth. The study used ARDL on the specified variables from 1980 to 2018. According to the study, inflation has a significant negative influence on economic growth".

1.1 Problem Statement

When it comes to the relationship between the inflation rate and the economic growth rate, the professional literature is revived, it noticed that in the previous economic theories came to the conclusions that there is no relationship between these variables. But today the opinion has changed and nowadays there is a consensus that economic growth and inflation variables are associated. Consequently, in periods with higher inflation rate

and when inflation rate passes double-digits like in the Sudan (From 1991 to 1995, inflation reached triple digits and averaged 106.0 percent) this will hurt the economic growth trend.
This analysis focuses on the nexus between inflation and Sudan's economic growth. As a result, this study will show an answer to the following question:

- Does Sudan's inflation affect its economic growth? What kind of relationship, if any, exists between the two?

1.2 Objectives of the Study

Literature experiences in Sudan lack of research that tackles the relationship between inflation and economic growth. This study seeks to fill this research gap with the goal of analyzing the relationship between inflation and economic growth in Sudan. The study's particular objectives are as follows:

- Construct and estimate a model of Sudan's economic growth.
- Analyze the various policy alternatives.

1.3 Hypotheses of the Study

In line with the objective of the study, two study hypotheses will be tested:

- The growth rate of capital per capita and real GDP per capita have a positive functional relationship.
- The inflation rate and growth rate of real GDP per capita have a negative functional relationship.

The plan for the study is as follows: Section 2 presents the theoretical basis for growth modelling and inflation. Selected macroeconomic variables in the Sudan are summarized in Section 3. The model specification and methodology are discussed in Section 4. The empirical results are discussed in Section 5. While Section 6 shows the conclusions. Lastly Section 7 puts the recommendations.

2 Literature Review

Economists have been studying about inflation and its impact on economic growth starting from the appearance of classical economic theory to modern economic theories. This section is about the view of growth theories (i.e. classical, Keynesian, monetarist, neo classical and endogenous) on the relationship between inflation and economic growth.

Classical economists ranging from Adam Smith to F. Marshall assigned higher rates of economic growth primarily to capital accumulation. The relationship between inflation and production is not explicitly mentioned in classical models. "However, the relationship between the two variables is implied to be negative, as seen by a decrease in company profit levels due to rising worker expenses" (Gokal and Harfi, 2004). In The Keynesian theory uses aggregate demand and supply curves to describe how inflation and growth are related to one another. "According to this theory, the short-term slope of the aggregate supply curve is upward, which means that changes in the demand side of the economy impact both the level of output and the overall price level" (Dornbusch et al., 1996). According to Dornbusch et al. (1996), "The dynamic adjustment of the short-run aggregate demand and aggregate supply curves provides an adjustment path that shows a primary positive association between inflation and growth, but turns negative in the latter half of the adjustment path". Furthermore, Blanchard and Kiyotaki (1987) say that: "Inflation and economic growth are positively associated because companies agree to provide at agreed prices. The monetarist explanation of inflation and its relationship to output has is directly drawn from the quantity theory of money, which ties a unique price level to a particular stock of money. According to monetarists, "a quick growth in money supply can lead to an increase in income, which leads to an increase in production and employment rather than an increase in prices" (Friedman, 1968). The endogenous growth model concludes that the rate of economic growth is influenced by the capital investment return, and since inflation lowers the actual rate of return since it functions as a tax, it suggests that inflation slows capital formation and, as a result, slows growth." (Fama and Schwert, 1977; Boyd et al., 1996). The neoclassical growth models are mostly based on the Solow (1956) and Swan (1956) models. The Solow growth model posits a production function with capital and labor inputs, with inputs subject to declining returns and the production function characterized by constant-returns-to-scale. Economic growth is consistent with labor-augmentation technological progress, which operates as if it increases the number of workers available. In the long run, output per capita and labor productivity grow exogenously given the rate of technological progress, implying that technological progress is fully exogenous. Labor-augmented technological progress happens when machines are redesigned to generate the same output with a smaller labor force or when the labor force is more efficient, requiring fewer employees to manage a particular machine.

Mundell uses neoclassical growth theory to explain the effect of inflation on economic growth. As Mundell (1963) says, " If predicted prices rise, the nominal rate of interest rises by less than the rate of inflation, providing impetus for an investment boom and an acceleration".

In addition, Tobin (1965) creates a model based on neoclassical growth theory. According to the model, such a policy raises both the predicted and actual rate of inflation. The anticipated return on money decreases because the relationship between the inflation rate and the real rate of return on money is inverse. If the rate of return on money declines, it signals that individuals will abandon money in favor of capital assets (i.e., rebalance their wealth portfolios). According to Tobin's model, higher inflation rates enhance output permanently. The process of swapping private capital for money in reaction to expected inflation is referred to as the Tobin effect.

3 An Overview of Selected Macroeconomic Variables in Sudan

3.1 Economic Growth

For the Sudan economy, the beginning of the 1980s reveals a general downward trend. This is reflected in a -3.1 percent of GDP growth in the period 1982-1985. Many factors have been blamed for this steady deterioration of the economy. The internal causes include unstable economic policies, ill-conceived plans, poor maintenance of capital stock, inadequate and inconsistent implementation of economic policies, and declining national saving. In addition, numerous political, social, and natural problems accentuated the economic situation. In addition, the war in the South of Sudan has continued to drain resources and halt development efforts. " Among the external factors are the deterioration in the terms of trade, the high protectionist barriers erected by the industrial countries, the sharp increase in prices of capital goods and other imports, and the sluggish demand for primary products by industrial countries because of the recession these countries faced in the 1980s" (Bior, 2000). However, as shown in table 1, real growth averaged 4.5 percent from 1986 to 1990, indicating signs of recovery.

The beginning of the 1990s marked a major structural and macroeconomic policy transition in the economy. Sudan has adopted economic policy packages toward economic liberalization and resource mobilization. From 1991 to 1995, real GDP growth averaged 5.1 percent. The government also committed to the 1992 liberalization package. "The policy position, which coincided with a significant inflow of foreign direct investment associated with commercial oil exploitation, led to the creation of a macroeconomic climate" (U. N. D. P, 2006). The economy responded positively to these liberalization reforms and most economic indicators showed significant improvement, e.g., growth in GDP increased to 7.7 percent during the period 1996-2000.

During the 2001–2010 period, the performance of Sudan’s macroeconomics improved significantly; real growth averaged 6.1 percent; and economic stability has boosted external confidence, enhancing relations and economic cooperation with regional and international financial institutions. These improvements are due to economic reforms, investment in oil and oil-related sectors, and favorable weather conditions that led to improvement in the agriculture sector.

The period 2011-2020 has seen a regression in Sudan’s economic transformation. South Sudan's split from Sudan in 2011 has caused a big economic problem that has caused both internal and external imbalances. Between 2011 and 2015, real GDP growth averaged 4.4%, but between 2016 and 2020, it dropped to 1.8%. This decline may be due to political transformations in 2018 and 2019.

3.2 Gross Capital Formation

Table 4.1 depicts Sudan's gross fixed capital formation during the period 1982–2020. It shows that between 1982 and 1985, gross capital formation accounted for 14.2 percent of GDP, 10.2 percent of GDP between 1986 and 1990, 18.2 percent of GDP between 1991 and 1995, and 14.2 percent of GDP between 1996 and 2000. After the year 2000, the percentage of gross investment grew dramatically, from around 34.5 percent of GDP in 2001-2005 to 38.6 percent of GDP in 2006-2010. This outstanding growth in gross capital creation as a percentage of GDP is attributed to political and macroeconomic stability; increased petroleum output; high petroleum prices; and substantial inflows of foreign direct investment. However, the percentage of gross capital formation to GDP fell from 28.6 percent in 2011 to 2015 to 17.3 percent from 2016 to 2020, demonstrating the economic and political impact of separation.

Table 1: Selected macroeconomic indicators for Sudan from 1982 to 2020.

Item	1982-85	1986-90	1991-95	1996-00	2001-05	2006-10	2011-15	2016-20
Real GDP growth	-3.1	4.5	5.1	7.7	6.8	5.4	4.4	1.8
Gross capital formation to GDP	14.2	10.2	18.2	14.2	34.5	38.6	28.6	17.3
CPI Inflation	36.5	48.5	106.0	43.6	8.6	9.9	28.6	65.5

Source: the author's construction based on the data obtained from the Central Bureau of Statistics, Sudan.

3.3 Inflation

The Sudanese economy has been suffering from accelerating inflation rates since the 1980s and mid-1990s. During the years 1982-1985 and 1986-1990, inflation rates rose to 36.5 percent and 48.5 percent, respectively. "Inflation was the result of weak economic policies, including considerable monetary and fiscal expansion" (Abdulrahman, 2010). From 1991 to 1995, inflation reached triple digits and averaged 106.0 percent, owing to a major fiscal expansion to support domestic borrowing, which resulted in significant increases in the money supply. This situation started to improve quickly, and inflation dropped to 46.6 percent in 1997 before coming down to 16.1 percent in 1999. Between 1996 and 2000, the overall average was 43.6 percent. This decrease in inflation is the result of stabilization policy and money supply control during this time period. Figure 1 shows inflation in Sudan from 1982 to 2020.

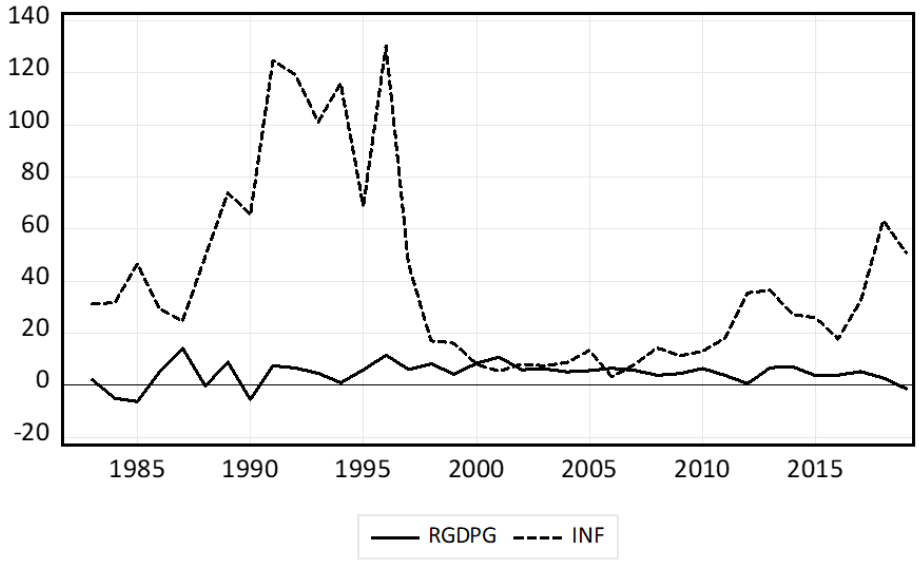

Figure 1: Depicts the rates of inflation and economic growth, 1983-2020.
Source: the author's construction based on the data obtained from the Central Bureau of Statistics, Sudan.

Sudan's inflation during the period 2001-2005 has generally remained in the single digits (8.6 percent on average) except for 2005, which was 13.4 percent. However, due to a rise in world food prices in 2007-2008, it averaged 9.9 percent from 2006 to 2010.

General inflation has been on the rise since 2011 and reached 18.1 percent, then 35.5 percent by the end of 2012 and 36.5 percent by the end of 2013. "Although overall inflation fell from its peak of 36.5 percent in 2013 to 27.2 percent at the end of 2014, this decline has been reversed after the cessation of gasoline subsidies in September 2013" (U. N. D. P, 2013). General inflation reached 28.6 percent between 2011 and 2015, rising to 65.5 percent between 2016 and 2020.

4 Research Methodology

The following model was developed to explore the relationship between inflation and economic growth. The model was based, on the Cobb-Douglas fuction. The Cobb-Douglas production function provides the basis for the model's formulation, which begins with a simplified version of the production function defined by constant returns with all factors variable. Despite criticisms, the Cobb-Douglas function has had a long and successful life and is still a popular production function. The parameters estimated from this function have provided results that seem to be meaningful from the point of view of economic theory. In most of the cases, the function

fitted has been of the unrestricted type, in the sense that the parameters could take any value whatsoever, positive or negative, high or low.

$$Y = e^{(\beta_1)t}\, K^{\beta_2} L^{(1-\beta_2)} \tag{1}$$

$$Y \text{ is the real gross domestic product } (GDP).$$

$$L \text{ is the total population.}$$

$$K \text{ is the capital stock.}$$

Where $e^{(\beta_1)t}$ represents the shift factor corresponding to technological progress β_1. Changes in techniques are supposed to take place at a constant rate β_1. The constant $\beta_2$represents the elasticity of the real gross domestic product (GDP) with respect to an increase in the capital. As is well known, it also corresponds to the share of the capital in the real GDP, where $(1 - \beta_2)$ is the relative share of the population.
Dividing real GDP by the total population, we have the following production function:

$$y = e^{(\beta_1)t} k^{\beta_2} \tag{2}$$

$$y \text{ represents the real GDP per capita.}$$

$$k \text{ represents the capital per capita.}$$

After the equation (2) is differentiated with respect to time and divided by real GDP per capita, this expression is reduced to

$$\frac{y^{\bullet}}{y} = \beta_1 + \beta_2 \frac{k^{\bullet}}{k} \tag{3}$$

$$\frac{y^{\bullet}}{y} \text{ represents the growth rate of real GDP per capita.}$$

$$\frac{k^{\bullet}}{k} \text{ represents the growth rate of capital per capita.}$$

For the purpose of the study, the inflation rate was added to the model as an independent variable. The final version of the model is:

$$\frac{y^{\bullet}}{y} = \beta_1 + \beta_2 \frac{k^{\bullet}}{k} + \beta_3 \frac{p^{\bullet}}{p} + u \tag{4}$$

$$\frac{p^{\bullet}}{p} \text{ is the inflation rate.}$$

$$u \text{ represents the random error term.}$$

The expected sign of the coefficient $\beta_2$is positive, whereas the expected sign of the coefficient $\beta_3$is negative.

4.1 Unit Root Tests

The Augmented Dickey-Fuller test (ADF) was performed in this study to determine whether or not the variables were stationary (see Dickey & Fuller, 1979). To test the null hypothesis of non-stationarity against a stationary alternative, the ADF method applies the regression Akaike Info Criterion (AIC). The limiting distribution of the regression AIC is independent of nuisance parameters by permitting the lag order to rise exponentially at a rate less than $T^{\frac{1}{3}}$ with the T number of observations (Said and Dickey 1984). As a result, the testing method applies the maximum lag structure of 3.

4.2 Testing for Co-Integration Using the ARDL Approach

The Auto-regressive Distributed Lag (ARDL) technique for co-integration analysis proposed by Pesaran (2001) was used in this study. To start with, the ARDL is a more statistically significant approach for determining cointegration relationships in small samples, while the Johansen co-integration techniques still require large data samples for the purposes of validity. A further advantage of the ARDL is that while other cointegration techniques require all of the regress to be integrated of the same order, the ARDL can be applied whether the regressors are I (1) and/or I (0), i.e. Whether the results are all unit root or all stationary or, indeed, even if mixed results are obtained. However, it cannot be employed when certain variables in order I (2) or higher are integrated. It is necessary to run unit root tests on all regressors. The three stages of the ARDL approach to co-integration analysis are as follows. In the first stage, an F-test was used to establish the possibility of any long-run relationship between the variables of interest (bound test for co-integration). The second stage in the ARDL

technique to co-integration analysis is to establish the lag length for the ARDL model. The lag length to be included in the model was calculated using Akaike's Information Criteria (AIC) up to three lags. The third stage in the ARDL technique to co-integration analysis is to estimate the model's long-run and short-run coefficients. The econometric program E-Views 12 will be used for computation.

5 Results and Discussion

The augmented Dickey-Fuller unit root test was performed to assess the stationary properties. Tables (2) and (3) show the ADF-test results for all variables in the behavioral equation (4). The first column contains a list of all variables that have been examined. The second column indicates whether the estimated equation for testing purposes includes a constant and a trend, a constant alone, or neither a constant nor a trend. The fourth column contains the ADF t-statistic, which is denoted as τ_τ for both a constant and a trend, τ_μ for only a constant, and τ for neither a constant nor a trend. The last column contains the F-test ϕ_1 (ϕ_2), which is used to determine if the constant and trend (constant) are significant under the null hypothesis of no unit root.

Table 2: Augmented Dickey-Fuller test results at level.

Series	Model	Lags	$\tau_\tau, \tau_\mu, \tau$	ϕ_1,ϕ_2
$\frac{y^\bullet}{y}$	Intercept and trend	0	-6.229956**	19.40836***
	Intercept	0	-6.207556**	38.53376***
	None	0	-6.295725***	
$\frac{k^\bullet}{k}$	Intercept and trend	0	-7.118893**	25.58901***
	Intercept	0	-6.865345**	47.13297***
	None	0	-6.659151***	
$\frac{p^\bullet}{p}$	Intercept and trend	3	-1.233498	1.885461
	Intercept	3	-1.662676	2.402181
	None	1	0.013446	

Source: author's estimation using the econometric software E-Views 12.
Note: The length of the lags was chosen using the Akaike Information Criterion (AIC).
*** (**) [*] indicate significant at the 1 (5) [10] % level.
▪When the constant and the trend are taken into account, the McKinnon critical values at a 1 (5) [10] % significance level are -4.262735 (-3.552973) [-3.209642], -3.646342 (-2.954021) [-2.615817] when only a constant is included, and -2.636901 (-1.951332) [-1.610747] when neither is included.
▪The Dickey-Fuller critical values at a 1 (5) [10] % significance level are 8.21 (5.68) [4.67] when the constant and the trend are taken into account, and 7.88 (5.18) [4.12] when only a constant is included.

Table 3: Augmented Dickey-Fuller test results, the first difference.

Series	Model	Lags	$\tau_\tau, \tau_\mu, \tau$	ϕ_1,ϕ_2
$\frac{p^\bullet}{p}$	Intercept and trend	0	-6.865198**	24.11230***
	Intercept	0	-6.850388***	46.92781***
	None	0	-6.874492***	

Source: author's estimation using the econometric software E-Views 12.
Note: The length of the lags was chosen using the Akaike Information Criterion (AIC).
*** (**) [*] indicate significant at the 1 (5) [10] % level.
▪When the constant and the trend are taken into account, the McKinnon critical values at a 1 (5) [10] % significance level are -4.262735 (-3.552973) [-3.209642], -3.646342 (-2.954021) [-2.615817] when only a constant is included, and -2.636901 (-1.951332) [-1.610747] when neither is included.
▪The Dickey-Fuller critical values at a 1 (5) [10] % significance level are 8.21 (5.68) [4.67] when the constant and the trend are taken into account, and 7.88 (5.18) [4.12] when only a constant is included.

With the exception of the inflation rate, which is integrated of order one, I (1), it is evident from the results from tables (2) and (3) that the variables were stationary since they are integrated of order zero, I (0).

5.1 Estimation Results

In the first stage, the bound test technique for the growth rate of the real GDP per capita equation reveals that there is a long-term relationship between the variables. The estimated F-statistics value is 8.45 greater than the

critical value for the upper bound at one percent significance level, indicating that the null hypothesis of no co-integration relationship is excluded, confirming the presence of a long-run relationship between the variables in the model. ARDL (1, 0, 2) was chosen using Akaike's Information Criteria.

5.1.1 Long-run Estimates

The long-run estimation result of the model is given in the equation (5). The growth rate of real GDP per capita is positively and significantly co-integrated with the growth rate of capital per capita, whereas it is negatively and significantly co-integrated with the inflation rate.

$$\frac{y^{\bullet}}{y} = \underset{(1.50)}{6.04} + \underset{(2.11)}{0.14}\,\frac{k^{\bullet}}{k} - \underset{(-2.24)}{0.17}\,\frac{p^{\bullet}}{p} \qquad (5)$$

$$(The\ figures\ in\ brackets\ are\ t-statistics.)$$

Visual inspection of the plot of the equation (5) in the Figure 2 below indicates stationarity.

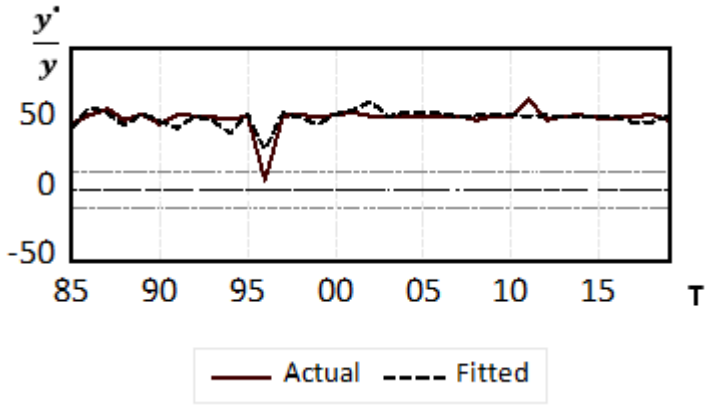

Figure 2: The Co-Integration Equation for the Growth Rate
Source: author's construction based on the results of estimating the equation (5) using E-Views 12.

5.1.2 Short-run Estimates

The estimation result of the short-run error correction model shows that the coefficients of all variables have the sign that confirms the economic growth theory along with their statistical significance.

$$\Delta\left(\frac{y^{\bullet}}{y}\right)_t = \underset{(-1.62)}{-0.13}\Delta\left(\frac{p^{\bullet}}{p}\right)_t + \underset{(2.64)}{0.25}\Delta\left(\frac{p^{\bullet}}{p}\right)_{t-1} - \underset{(-6.10)}{0.93}ECM_{t-1} \qquad (6)$$

$$(The\ figures\ in\ brackets\ are\ t-statistics.)$$

The error-correction term (ECM_{t-1}), which is correctly signed and significant at one percent, serves as evidence that a long-term relationship exists.

6 Conclusions

Investigating the relationship between inflation and economic growth in the Sudan is the purpose of this study. The ARDL technique was used to determine both the long run and the short run in order to fulfill the objective. The ARDL results reveal that co-integration exists between the variables, indicating a long-term relationship. Similarly, empirical findings revealed a negative relationship between inflation and economic growth in Sudan over the studied period. Furthermore, the empirical results reveal that the error correction term has a negative coefficient and is significant, indicating that the dynamic adjustment towards the long-run equilibrium path is stationary. This finding is consistent with other findings in the literature including Atigala et al. (2022) Mandeya, Ho (2021), Azam and Khan (2020) and Bittencourt (2012). Also, the study concluded that the growth rate of real GDP per capita is positively and significantly co-integrated with the growth rate of capital per capita.

6.1 Recommendations

The results of the study support the idea that when making macroeconomic policy, policymakers should take into account this negative relationship. Hence, to achieve economic growth in Sudan, the study recommends targeting inflation as the best monetary policy measure to enhance economic growth through money supply management. On the fiscal policy side, there is a need to increase government spending in the field of infrastructure development to increase production. The government should design policies to increase capital

stock in order to promote economic growth. These, in the long term, will enhance the level of economic growth in the Sudan.

References:

Abdulrahman, A. (2010). The Role of Monetary Policy on Economic Activity in Sudan: An empirical investigation, 1990-2004. *Journal of Human Science,* 44.

Adaramola A., & Dada O. (2020). Impact of inflation on economic growth: evidence from Nigeria. *Investment Management and Financial Innovations,* 17(2). [CrossRef]

Atigala, P., Maduwanthi, T., Gunathilake, V., Sathsarani, S., & Jayathilaka R. (2022). Driving the pulse of the economy or the dilution effect: Inflation impacting economic growth. *PLOS ONE,* 17(8). [CrossRef]

Azam, M., & Khan, S. (2020). Threshold effects in the relationship between inflation and economic growth: Further empirical evidence from the developed and developing world. *International Journal of Finance & Economics*. [CrossRef]

Baltar, C. (2014). Inflation and economic growth in an open developing country: the case of Brazil. *Cambridge Journal of Economics,* 1-18. [CrossRef]

Behera, J., & Mishra, A. (2016). Inflation and Economic Growth Nexus in Brics: Evidence from ARDL Bound Testing Approach. *Asian Journal of Economic Modelling,* 4(1), 1-17. [CrossRef]

Bior, I. (2000). *Some Reflections on Economic Liberalization in the Sudan*. Economy Research Group, University of Bremen, Germany.

Bittencourt, M. (2012). Inflation and Economic Growth in Latin Americca: Some Panel Time-series Evidence. *Economic Modelling,* 29, 333-340. [CrossRef]

Blanchard, O., & Kiyotaki, N. (1987). Monopolistic Competition and the Effects of Aggregate Demand. *The American Economic Review,* 77(4), 647-666.

Boyd, J.H., Levine, R.E. & Smith, B.D. (1996). *Inflation and financial market performance*. Working Paper, 9617.

Datta, K., & Mukhopadhyay, C. (2011). *Relationship between Inflation and Economic Growth in Malaysia- An Econometric Review*. International Conference on Economics and Finance Research, 4.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American statistical association,* 74(366), 427-431. [CrossRef]

Dinh, D. V. (2020). Impulse Response of Inflation to Economic Growth Dynamics: VAR Model Analysis. *Journal of Asian Finance, Economics and Business,* 7(9), 219-228. [CrossRef]

Dornbusch, R., Fischer S., & Kearney, C. (1996). *Macroeconomics*. The Mc-Graw-Hill Companies, Inc., Sydney.

Fama, E. & Schwert, G. (1977). Asset returns and inflation. *Journal of Financial Economics,* 5, 115–146.

Friedman, M. (1968). The Role of Monetary Policy. *The American Economic Review,* 58(1), 1-17.

Gokal, V., & Hanif, S. (2004). *Relationship between inflation and economic growth.* Economics Department, Reserve Bank of Fiji.

Islam, M. M., Alharthi, M., & Murad, M. W. (2021). The effects of carbon emissions, rainfall, temperature, inflation, population, and unemployment on economic growth in Saudi Arabia: An ARDL investigation. *PLOS ONE,* 16(4). [CrossRef]

Lucas, R. E. (1988). On The Mechanics of Economic Development. *Journal of Monetary Economics,* 22, 3-42.

Mallik Gand and Chowdhury A. (2001). Inflation and Economic Growth: Evidence from Four South Asian Countries. *Asia-Pacific Development Journal,* 8(1).

Mandeya, S. M. T., & Ho, S. Y. (2021). Inflation, inflation uncertainty and the economic growth nexus: An impact study of South Africa. *MethodsX,* 8 (101501). [CrossRef]

Mundell, R. (1963). Inflation and Real Interest. *The Journal of Political Economy,* 71(3), 280-283.

Pesaran, M., Shin, Y., & Smith, R. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics,* 16, 289-326. [CrossRef]

Romer, P. M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy,* 94(5), 1002-1037. [CrossRef]

Romer, P. M. (1994). The Origins of Endogenous Growth. *Journal of Economic Perspectives*, 8(1), 3-22. [CrossRef]

Said, S. E., and Dickey, D. A. (1984). Testing for Unit Roots in Autoregressive-moving Average Models of Unknown Order. *Biometrika*, 71(3), 599-607. [CrossRef]

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics*, 70(1), 65-94.

Swan, T. (1956). Economic Growth and Capital Accumulation. *Economic Record*, 32. [CrossRef]

Tobin, J. (1965). Money and Economic Growth. *Econometrica*, 33(4), 671-684.

UNDP. (2006). *Macroeconomic Policies for Poverty Reduction: The Case of Sudan*. United Nations Development Programme in Sudan, Khartoum, Sudan.

UNDP. (2013). *Update on Macroeconomic Developments in Sudan*. United Nations Development Programme in Sudan, Khartoum, Sudan.