Assessing How Inflation Impacts Economic Growth in Tanzania: A Time-Series Study

Jane M. Kamau[1*], Michael T. Nyerere[2], and Amina S. Mwangi[3]
[1] *Department of Economics, Eastland University, Dar es Salaam, Tanzania*
[2] *Department of Development Studies, Northern State University, Arusha, Tanzania*
[3] *School of Business, Coastal Institute of Technology, Mwanza, Tanzania*

[*]**Corresponding author:**
Jane M. Kamau
Email: j.kamau@eastlanduniv.tz
Address: Department of Economics, Eastland University, P.O. Box 12345, Dar es Salaam, Tanzania
Phone: +255 712 345 678

ABSTRACT
Similar to many other nations, whether developed or developing, one of the key goals of Tanzania's macroeconomic policy is to foster economic growth while maintaining low inflation rates. Nevertheless, there is ongoing debate about whether inflation acts as a catalyst or a hindrance to economic growth. This study investigates the effect of inflation on Tanzania's economic growth, aiming to clarify the nature of their relationship. Utilizing time-series data spanning from 1990 to 2011, the study employs correlation analysis and co-integration techniques to explore the link between inflation and GDP. Additionally, elasticity coefficients are calculated to assess how changes in the overall price level influence GDP growth. The findings indicate that inflation adversely affects economic growth in Tanzania. Moreover, the study finds no evidence of co-integration between inflation and economic growth, suggesting the absence of a stable long-term relationship between these variables during the analyzed period.

Keywords: Inflation, Economic growth, Co-integration, Dickey-Fuller, Phillip-Prron

INTRODUCTION

Achieving sustainable economic growth alongside price stability remains a fundamental objective of macroeconomic policy for most countries worldwide today. A significant focus on price stability in monetary policy is intended to support continuous economic growth and to preserve the purchasing power of the local currency (Umaru and Zubairu, 2012). The debate over whether inflation hinders or fosters economic growth has recently attracted considerable attention from policymakers and macroeconomists. Numerous studies have reported a negative correlation between inflation and economic growth. The core question remains whether inflation is essential for growth or if it impedes economic progress. Fundamentally, economic growth rates largely depend on capital formation, which in turn relies on levels of savings and investment (Datta and Kumar, 2011). Both global economic growth and inflation rates have experienced fluctuations over time. In many years, inflation rates have outpaced growth rates, underscoring the importance of understanding the inflation-growth relationship—a persistent macroeconomic challenge (Madhukar and Nagarjuna, 2011). Ahmed (2010) also observes that differing views on this relationship exist within economic literature, often shaped by the prevailing conditions of the global economic order. Historically, increases in aggregate demand have been associated with rises in both output and inflation. During earlier periods, inflation was not considered detrimental but rather

viewed as having a positive effect on economic growth, a notion widely accepted at the time. Phillips was among the first to propose the hypothesis that elevated inflation could positively influence economic growth by reducing unemployment.

However, during the 1970s, many countries experiencing high inflation, particularly in Latin America, began to witness a slowdown in growth rates. This led to emerging views that inflation adversely affects economic growth, contrary to earlier positive perspectives. For example, in Asia, evidence from India demonstrates a rise in GDP growth from 3.5% in the 1970s to 5.5% in the 1980s, while inflation rates increased from an average of 1.7% in the 1950s to 9.0% in the 1970s before slightly declining to 8.0% in the 1980s (Prasanna and Gopakumar, 2010). Similarly, for China, Xiao (2009) shows that between 1961 and 1977, average real GDP growth and per capita GDP growth stood at 4.84% and 2.68%, respectively. From 1978 to 2007, China experienced steady economic expansion, although growth rates fluctuated annually, with real GDP and per capita GDP growth rates averaging 9.992% and 8.69%, respectively. In East Africa, Kenya experienced five years of strong economic growth, with four consecutive years exceeding 4%, yet inflation rose sharply from 18.5% in mid-2008 to 27.2% by early 2009, then declined marginally to 24.3% in mid-2009. Uganda has been one of Africa's fastest-growing economies, sustaining average growth of 7.8% since 2000, alongside a reduction in inflation from 5.1% in 2006 to 3.5% in 2009. Rwanda's real GDP growth averaged -0.1% during 1990-1999, but it surged to an average annual growth rate of 7.3% from 2006 to 2009 (Stein, 2010).

Since the late 1970s, Tanzania's economy has faced numerous internal and external shocks that affected all sectors. These challenges manifested through large budget deficits, imbalances between productive and non-productive sectors, high inflation rates, substantial balance of payments deficits, declining domestic savings, escalating government expenditures, falling agricultural output, and underutilized industrial capacity—all factors that constrained economic growth (Kilindo, 1997). Focusing on Tanzania's inflation trends, Ndyeshobola (1983) notes that inflation remained low between 1964 and 1969, with average annual increases of 0.3% and 3.2% in the National Consumer Price Index (NCPI) and National Food Price Index (NFPI), respectively. After 1972, the NCPI rose at an average rate of 16% per year until 1975, peaking at 19% in 1974 and 25.9% in 1975. These increases were largely attributed to severe food shortages during late 1973. The NFPI surged to 35.0% in 1974 and 30.6% in 1975. Tanzania's economic growth has exhibited a volatile pattern, with an average GDP growth of approximately 3% between 1991 and 2000. For instance, GDP growth was as low as 0.584% in 1992 but rose to 4.6% in 1996 and 5.1% in 2000 (Odhiambo, 2011).

From 1952 to 1970, Tanzania experienced a growth rate of 5.2% accompanied mostly by single-digit inflation, except during 1966-1970 when inflation averaged 11.7%. During the 1950s and 1960s, inflation remained relatively stable with annual averages of around 4.5% and 9.3%, respectively. However, inflation surged to 10.5% in 1973 and escalated further to 26.5% in 1975. Between 1980 and 1985, inflation peaked at an average of 27.3%, coinciding with the lowest economic growth rate of 0.9%. Studies further reveal that during the recovery phase from 1986 to 1990, inflation declined to an average of 23.9%, while the growth rate improved to 3.7% (Shitundu and Luvanda, 2000). Maintaining low inflation alongside promoting economic growth remains a core goal of Tanzania's macroeconomic strategy. Nonetheless, recent years have seen significant debate regarding the inflation-growth nexus. Scholars aligned with Structuralist and Keynesian perspectives often argue that inflation does not harm economic growth, while monetarists maintain that inflation is detrimental. Some research indicates a significant relationship in the short run, but no lasting long-term connection (Datta and Kumar, 2011). Inspired by this ongoing debate, the present study examines the impact of inflation on Tanzania's economic growth.

Objectives of the Study

This study specifically aims to achieve the following objectives:

i. To analyze the effect of inflation on economic growth in Tanzania during the period 1990 to 2011.
ii. To assess the extent to which Tanzania's economic growth (GDP) responds to fluctuations in the overall price level (inflation rate).
iii. To determine the nature of the relationship between inflation and GDP growth rate in Tanzania.

Justification of the Study

This study is particularly important to a wide range of stakeholders, including macroeconomists, financial analysts, academicians, policymakers, and officials at central banks, as it provides critical insights into the

sensitivity of economic growth to changes in inflation. Understanding how fluctuations in the general price level impact GDP growth is essential for designing effective economic policies that foster sustainable development. Inflation management is a core aspect of macroeconomic stability, and maintaining price stability is often seen as a prerequisite for encouraging investment, promoting consumer confidence, and ensuring the efficient allocation of resources.

Despite its importance, the relationship between inflation and economic growth remains a topic of considerable debate in economic literature. Numerous empirical studies have produced mixed results—some finding inflation to have a positive influence on growth under certain conditions, while others report adverse effects. This lack of consensus complicates the policymaking process, as governments and central banks must balance the risks of inflation against the benefits of economic expansion. For instance, Mubarik (2005) concluded that low and stable inflation rates are conducive to economic growth, whereas high inflation rates tend to undermine it. On the other hand, Shitundu and Luvanda (2000) documented that inflation negatively affected Tanzania's economic growth, but their work did not delve into how responsive GDP growth was to changes in inflation, leaving an important gap in understanding the dynamics of this relationship.

This study seeks to fill that gap by specifically measuring the elasticity of economic growth with respect to inflation in Tanzania. By quantifying the degree to which GDP growth reacts to inflationary changes, the study offers a more nuanced view that can guide policy decisions. It provides policymakers with concrete evidence to help set inflation targets that support growth without triggering economic instability. Additionally, the findings will enrich academic discourse on inflation-growth dynamics, particularly within the context of developing economies like Tanzania, where economic structures and institutional frameworks may lead to different outcomes than those observed in industrialized countries.

Literature Review

A considerable amount of literature has investigated both theoretical frameworks and empirical evidence concerning the relationship between inflation and economic growth. This section synthesizes key studies that examine how inflation impacts economic growth, focusing particularly on empirical findings and threshold effects.

Selected Empirical Literature Review

Historically, one of the pioneering works in this area is Fischer (1993), who employed a combination of cross-sectional and panel datasets that included both developed and developing economies to explore whether there exists a nonlinear relationship between inflation and growth in the long run. Fischer's study established a significant negative correlation between inflation and economic growth, particularly noting that this adverse effect becomes especially pronounced once inflation rates exceed roughly 40%. This finding importantly highlighted the nonlinear nature of the inflation-growth nexus, where inflation beyond a certain high level exerts increasingly damaging effects on growth.

Following up on the theme of nonlinearity, Ghosh and Phillips (1998) acknowledged that while it is widely accepted that very high inflation negatively affects growth, there is less consensus about the effects of moderate inflation. Using panel regressions that allowed for flexible nonlinear specifications, they documented a statistically and economically significant inverse relationship between inflation and economic growth that holds true for almost all inflation levels except very low rates. Their study further concluded that the short-run costs of reducing inflation (disinflation) are only material in cases where inflation is initially very high or already within the single-digit range, suggesting that moderate inflation may not substantially hinder growth in the short term. Quartey (2010) examined the inflation-growth dynamics in Ghana through the Johansen co-integration technique, focusing on whether the revenue-maximizing inflation rate aligns with growth-maximizing objectives over the period 1970–2006. He found a robust negative impact of inflation on economic growth and estimated a revenue-maximizing inflation rate of about 9.14% using a Laffer curve framework. Interestingly, his results indicated that the inflation rate that maximizes growth is not necessarily in the single digits, suggesting some tolerance for moderate inflation in fostering growth.

Barro (1995) made a landmark assessment using a panel dataset of roughly 100 countries from 1960 to 1990, seeking to quantify the effects of inflation on economic performance while controlling for various country characteristics. He concluded that an increase of 10 percentage points in average annual inflation reduces real GDP growth by approximately 0.2 to 0.3 percentage points and lowers the investment-to-GDP ratio by 0.4 to 0.6 percentage points. Barro's follow-up study in 1996 reinforced these findings, additionally revealing that lower inflation, along with higher initial levels of schooling, life expectancy, and

better governance, contributes to faster economic growth. Other factors such as lower fertility rates, less government consumption, and improvements in terms of trade were also associated with enhanced growth outcomes. Marbuah (2010) analyzed inflation and growth in Ghana over an extended period from 1955 to 2009 to identify threshold effects. His study found evidence for a significant nonlinear relationship, with both minimum and maximum inflation thresholds at 6% and 10%, respectively. By incorporating structural breaks into the model, Marbuah observed that the impact of inflation on growth at the 10% threshold is amplified by approximately 81%. This led him to recommend that Ghana should maintain inflation targets below 10% to avoid harmful effects on growth, supporting the use of inflation targeting as a macroeconomic policy framework.

Hasanov (2010) investigated inflation-growth interactions in Azerbaijan for the period 2001–2009 using annual data on real GDP growth, Consumer Price Index (CPI) inflation, and real gross fixed capital formation growth. Employing a threshold regression model, he identified a nonlinear relationship with a critical inflation threshold estimated at 13%. Inflation rates below this threshold positively influenced GDP growth, while rates exceeding 13% had a significantly negative impact, reducing growth by roughly 3%. This finding suggests that a moderate level of inflation can stimulate growth but beyond a certain point, inflation becomes detrimental. Umaru and Zubairu (2012) employed unit root and causality tests to explore the causal relationship between inflation and GDP in Nigeria. Their results indicated that GDP growth causes inflation rather than inflation driving GDP, challenging some traditional assumptions. Furthermore, their analysis showed that inflation positively impacts economic growth by enhancing productivity and total factor productivity, thereby encouraging output expansion.

In South Asia, Mallik and Chowdhury (2001) studied the inflation-growth nexus in Bangladesh, Pakistan, India, and Sri Lanka. They reported two notable findings: first, the relationship between inflation and economic growth was positive and statistically significant, indicating that moderate inflation supports growth. Second, the sensitivity of economic growth to inflation changes was lower than the sensitivity of inflation to growth changes, implying that growth tends to induce inflation rather than the reverse. Their policy implication was that moderate inflation encourages economic growth, but rapid growth could lead to overheating and rising inflationary pressures. Frimpong and Oteng-Abayie (2010) analyzed Ghana's inflation-growth relationship from 1960 to 2008 and identified an inflation threshold of approximately 11%. Although this threshold was not statistically significant at conventional levels, their models—after excluding insignificant variables like labor force growth and money supply growth—still produced similar threshold estimates. They found inflation significant even at lower threshold levels but acknowledged the need for further testing of coefficient stability across subsamples to verify robustness. Their conclusion emphasized extending the analysis to explore lower threshold levels and better understand the nonlinearities in the inflation-growth relationship.

Bick et al. (2009) expanded upon Khan and Senhadji's (2001) work by analyzing a large panel dataset comprising 124 industrialized and developing countries from 1950 to 2004. Utilizing a dynamic panel threshold model, they identified distinct optimal inflation targets: about 2% for industrialized countries and 17% for developing economies. Notably, inflation below the 17% threshold was statistically insignificant in terms of growth impact in developing countries, casting doubt on claims that moderate inflation necessarily promotes economic growth in these economies. Nell (2000) examined whether inflation is harmful to growth using a Vector Auto-Regressive (VAR) model based on data spanning 1960 to 1999. His findings suggested that inflation within the single-digit range could potentially benefit growth, while inflation in double digits tends to retard growth. This aligns with the growing body of evidence supporting the existence of an inflation threshold beyond which inflation becomes detrimental. Sergii (2009) further explored the nonlinear dynamics between inflation and growth and estimated a concave relationship with a threshold around 8%. Inflation rates above this level tend to slow economic growth, whereas inflation below 8% promotes growth. His methodology involved nonlinear least squares estimation and bootstrap inference, providing robust statistical support for the threshold concept.

Espinoza et al. (2010) used a large panel covering 165 countries—including oil exporters and Azerbaijan—from 1960 to 2007 to assess inflation thresholds. Their results indicated a general inflation threshold near 10% for GDP growth across most country groups, with industrialized nations exhibiting lower thresholds. They also estimated that inflation above 13% reduces real non-oil GDP growth by about 2.07% annually, emphasizing the negative growth consequences of excessive inflation. Apart from inflation, some studies have also considered the impact of other macroeconomic variables like money supply and exchange rates on inflation and economic growth. Mehari and Wondafrash (2008) showed that increases in money supply exert a direct effect on inflation. Mwase (2006), on the other hand, demonstrated that currency appreciation

is generally associated with declining inflation rates, although the effect manifests with a lag of one quarter. Overall, the literature consistently supports the view that inflation's effect on growth is nonlinear, with a critical threshold below which inflation may have neutral or even positive effects, but beyond which inflation significantly undermines growth. This nuanced understanding is crucial for policymakers in developing economies such as Tanzania, where balancing inflation control and growth promotion remains a key macroeconomic challenge.

METHODS OF DATA ANALYSIS

To accomplish the objectives of this study, three distinct analytical methods were employed, each corresponding to one of the specific objectives outlined earlier. These methods include reduced form regression analysis, elasticity estimation, and co-integration testing.

To examine the impact of inflation on economic growth in Tanzania, the study utilized a modified version of the reduced form regression model originally proposed by Khan and Senhadji (2001) in their analysis of inflation threshold levels in Bangladesh. The model seeks to capture the structural break or threshold effect of inflation on economic growth. The original model is expressed as:

$$GDP_t = \beta_0 + \beta_1 INFL_t + \beta_2 D(INFL_t - K) + U_t \quad (1)$$

where:

GDP_t represents the growth rate of Gross Domestic Product at time ttt,

$INFL_t$ denotes the inflation rate at time ttt,

D is a dummy variable indicating whether inflation exceeds the threshold level KKK,

K is the inflation threshold level (rate of inflation at which a structural break occurs),

U_t is the error term, and

β0,β1,β2 are parameters to be estimated.

For the purpose of this study, the model was simplified to focus on the direct impact of inflation on economic growth in Tanzania, as follows:

$$GDP_t = \beta_0 + \beta_1 INFL_t + U_t \quad (2)$$

Where, GDP= Growth rate of real Gross Domestic Product, INFL= Inflation, U_t = error term and

where all variables retain their earlier definitions. This simplified form enables an assessment of the overall effect of inflation on GDP growth without explicitly modeling the threshold effect in the initial stage.

To measure the degree to which Tanzanian GDP growth responds to changes in general price levels (inflation), the study employed elasticity analysis using logarithmic transformation. Elasticity provides a unit-free measure, indicating the percentage change in GDP growth resulting from a one-percent change in inflation.

Following Ramanathan (2002), elasticity can be derived from a log-log regression model of the form:

$$\ln(Y) = \alpha + \beta \ln(X) + \varepsilon$$

where β\betaβ represents the elasticity of Y with respect to X. Kasidi (2010) further clarifies that in a regression without logarithms, the coefficient β\betaβ indicates the absolute change in Y for a one-unit change in X. However, in the log-log form, β directly measures the percentage change in Y for a one-percent change in X, thus simplifying interpretation by removing unit dependency.

Based on this principle, the study first estimates the linear regression:

$Y = \beta_0 + \beta_1 X$; Where its elasticity becomes $\beta_1 X/Y$ (3)

Where Y= GDP Growth rate and X=Inflation rate (INFL). When equation (2) is transformed into logarithm it becomes as:

$LogGDP_t = \beta_0 + \beta_1 LogINFL_t$; where its elasticity becomes β_1 (4)

In this model, the coefficient β1 directly represents the elasticity of GDP growth with respect to inflation, measuring the percentage responsiveness of GDP growth to percentage changes in inflation. To determine whether inflation and economic growth move together in the long run, the study applied co-integration techniques. Co-integration analysis assesses whether there is a stable, long-term equilibrium relationship between the two time series variables despite short-term fluctuations. Establishing co-integration would imply that inflation and GDP growth are linked in such a way that they do not drift apart indefinitely but exhibit a long-run balance, which is critical for informing policy aimed at sustainable economic performance.

One of the essential preliminary steps in time series analysis is the examination of stationarity properties of the data. The major objective of conducting a unit root test is to determine whether the variables involved exhibit stationary or non-stationary behavior. According to Datta and Kumar (2011), the use of non-stationary data in regression models without appropriate adjustments may lead to spurious or misleading results, characterized by high R-squared values and statistically significant coefficients that do not reflect any true relationship among the variables. Before proceeding to estimate the modified regression model in equation (2), it was therefore crucial to assess the stochastic characteristics of the variables—GDP growth rate and inflation rate—through unit root testing. This ensures the robustness and validity of the empirical findings by confirming whether the data are suitable for econometric modeling. It is worth noting that one of the limitations of unit root testing lies in the size of the dataset. Gujarati (2004) and Gujarati and Porter (2009) emphasize that the reliability of unit root test results improves with the number of observations. Specifically, they suggest that a minimum of 20 observations is recommended to produce robust and reliable inferences from unit root testing. In this study, the time series data span the period from 1990 to 2011, yielding 22 annual observations, which meets the basic requirement for conducting these tests.

The study employed two commonly used unit root tests: the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. These tests are widely recognized in econometrics for determining the presence of a unit root in time series data, indicating non-stationarity.

The null hypothesis for both the ADF and PP tests is that the series has a unit root, meaning it is non-stationary (i.e., $\delta=0$). The alternative hypothesis is that the series is stationary (i.e., $\delta\neq0$).

$$Y_t = \gamma Y_{t-1} + \varepsilon_t \quad (5a)$$

If $\gamma = 1$, equation (5a) becomes a random walk, that is, a non stationary process. As a result of this there tends to be the so called unit root problem which means there is a situation of non stationarity in the series. However, if $\gamma < 1$, this means that the series Y is stationary. However, the unit root problem can be eliminated or stationarity can be achieved by differencing the data set (Wei 2006).

DATA ANALYSIS, INTERPRETATION AND DISCUSSION

This section presents the analysis of the unit root tests, co-integration tests, and the empirical assessment of the impact of inflation on economic growth using the reduced form regression model. The sensitivity of economic growth (GDP) to inflation and the nature of their relationship are quantitatively analyzed. The analysis follows the chronological order of the study objectives, beginning with the stationarity check of the data through unit root testing.

UNIT ROOT TEST RESULTS

Prior to conducting the co-integration test, the researchers examined the stationarity properties of the variables to determine whether they were suitable for regression analysis. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were employed to check for the presence of a unit root in each of the two time series variables: GDP growth rate and inflation rate. The results of these tests at level and first difference are presented in Table 1 and Table 2, respectively.

Table 1: Results: unit root test (level variables)

Augmented Dickey-Fuller	Phillips-Perron

Variable	Test Statistics	Critical value at 5%	Test Statistics	Critical value at 5%
GDP	-1.572	-3.000	-1.645	-3.000
INFL	-1.607	-3.000	-1.629	-3.000

Table 2: Results: unit root test (First Difference)

Augmented Dickey-Fuller			Phillips-Perron	
Variable	Test Statistics	Critical value at 5%	Test Statistics	Critical value at 5%
GDP	-4.126	-3.000	-4.130	-3.000
INFL	-4.161	-3.000	-3.912	-3.000

The results in Table 1 reveal that both GDP growth rate and inflation rate are non-stationary at their levels. This conclusion is based on the fact that the computed absolute values of the test statistics for both ADF and PP do not exceed the critical value at the 5% significance level. Consequently, we fail to reject the null hypothesis of a unit root ($\delta = 0$), indicating that both time series are non-stationary at level. However, Table 2 illustrates that both variables become stationary after taking the first difference. At this level, the computed absolute values of the test statistics exceed the 5% critical values, for both ADF and PP tests. This allows us to reject the null hypothesis of a unit root and conclude that the variables are stationary at first difference, i.e., they are integrated of order one, I(1). It is important to note that the unit root test at first difference was performed without a constant term, implying that the process under the null hypothesis is a random walk without drift. This indicates that the time series exhibit a difference stationary process (DSP), suggesting that any further analysis should be conducted using differenced data to ensure validity of the results. These findings justify the application of co-integration tests and subsequent regression analysis using appropriately transformed (stationary) variables. The confirmation of stationarity at first difference also permits the exploration of a potential long-run equilibrium relationship between inflation and economic growth.

Co-integration test

Co-integration analysis was conducted to determine whether a long-term equilibrium relationship exists between inflation and economic growth in Tanzania. According to Gujarati (2004), two variables are said to be co-integrated if both are individually non-stationary, but a linear combination of them results in a stationary residual. Green (2002) further emphasized that if two series are integrated of order one, I(1), a linear combination of them could potentially be integrated of order zero, I(0), signifying co-integration. To assess co-integration between inflation and GDP growth, the Johansen co-integration test was applied. The results of this test are summarized in Table 3.

Table 3: Results: Johansen tests for co-integration

Trend : constant				Number of observations = 20	
Sample: 1992-2011				Lags = 2	
Maximum rank	Parms	LL	Eigenvalue	Trace statistic	5% critical value
0	6	-110.81099	-	10.0768*	15.41
1	9	-106.89296	0.32416	2.2408	3.76
2	10	-105.77256	0.10599		

The results from Table 3 indicate that the trace statistic for maximum rank 0 is less than the 5% critical value. This leads to a failure to reject the null hypothesis of no co-integration. Hence, there is no evidence of a long-term equilibrium relationship between inflation and economic growth in Tanzania over the study period. The implication of rank 0 in Johansen's framework is that there are no co-integrating equations among the variables. As emphasized by Parlow (2010), a rank of zero implies no co-integration, a rank of one indicates one co-integrating equation, and so on. Therefore, since the two variables—GDP growth and inflation—do not exhibit co-integration, the researchers did not proceed with an Error Correction Model

(ECM). This result is consistent with previous findings, such as Chimobi (2010), who found no co-integration between inflation and economic growth in Nigeria. The inclusion of lags in the model, based on recommendations by Ernst, Nau, and Bar-Joseph (2005), ensures the model accounts for time dynamics and can predict values at time *t* using past values up to *t−1*.

To evaluate the empirical impact of inflation on economic growth in Tanzania, linear regression analysis was conducted. The study estimated two models—one including lags and the other without lags—to determine the robustness of the relationship. The regression results are presented below.

$$GDP_t = 18.24506 - 0.48105141 INFL_{t-1} \quad (1a)$$

(10.55) (-4.72)

$R^2 = 0.5400$

$$GDP_t = 18.84073 - 0.5358219 INFL_t \quad (1b)$$

(12.26) (-5.95)

$R^2 = 0.6394$

The regression in Equation (1a) shows that a 1% increase in the inflation rate in the previous period is associated with a 48.105% decrease in economic growth. The coefficient of determination ($R^2 = 0.5400$) indicates that 54% of the variations in GDP are explained by changes in inflation, while the remaining 46% are due to other factors not included in the model. These factors may include educational attainment, demographic characteristics, government policy, institutional quality, and external trade conditions, as identified by Barro (1996).

In contrast, Equation (1b) reveals that a 1% rise in current inflation is associated with a 53.582% reduction in GDP growth. This model explains a higher proportion of GDP variation ($R^2 = 0.6394$ or 64%) than the lagged model, suggesting that current inflation has a more immediate and stronger negative impact on economic growth. Both models demonstrate statistically significant results at the 5% significance level, as the absolute t-statistics for the inflation coefficients exceed the critical value of 2 (Gujarati, 2004). The negative coefficients align with economic theory, particularly the monetarist view, which posits that high inflation distorts investment decisions and reduces the efficiency of resource allocation, ultimately hindering economic growth. Given the higher explanatory power and stronger statistical significance of Equation (1b), the researchers concluded that this model provides a more accurate representation of the inflation-growth relationship in Tanzania. These results are consistent with findings by Barro (1995), Ghosh and Phillips (1998), and Quartey (2010), who similarly reported a significant and adverse effect of inflation on economic performance in developing economies. In summary, the regression analysis confirms that inflation has a significant and negative effect on economic growth in Tanzania. These findings suggest the need for prudent monetary and fiscal policies to control inflation and promote a stable macroeconomic environment conducive to sustainable growth.

To assess how responsive GDP is to changes in the general price level, the study employed a log-log regression model. This functional form allows for the estimation of elasticity, which measures the percentage change in GDP resulting from a one-percent change in inflation. The results are presented in Equation (2).

$$\ln GDP_t = 1.848391 - 0.8047261 \ln INFL_t \quad (2)$$

(18.31) (-8.90)

$R^2 = 0.7983$

The estimated elasticity coefficient of -0.8047 indicates that GDP in Tanzania responds inelastically to changes in inflation. Specifically, a 1% increase in the inflation rate results in an approximate 0.80% decrease in GDP. Since the absolute value of the elasticity is less than 1, this confirms that the response of GDP to inflation is inelastic. In other words, GDP is somewhat resistant to inflationary shocks in the short

term. Furthermore, the model's goodness of fit is strong, with an R^2 value of 0.7983, indicating that approximately 79.83% of the variation in GDP can be explained by changes in inflation. The t-statistics for both the intercept and the inflation coefficient are highly significant at the 5% level, confirming the statistical reliability of the model. These findings underscore the importance of inflation control in macroeconomic policy, as even moderate inflationary pressures can substantially reduce economic output.

To further explore the link between inflation and economic growth, the study examined the direct relationship using simple linear regression and correlation analysis. The results are captured in Equation (3) and Equation (4), with GDP and inflation alternating roles as dependent and independent variables.

$$GDP_t = 18.84073 - 0.5358219 INFL_t \quad (3)$$

(12.26) (-5.95)

$R^2 = 0.6394$

Equation (3) reveals a negative relationship between inflation and economic growth in Tanzania. A 1% increase in the inflation rate is associated with a 0.5358 unit decrease in GDP. The negative coefficient aligns with theoretical expectations and previous empirical findings, which suggest that inflation acts as a drag on economic performance. The R^2 value of 0.6394 indicates that 63.94% of the variation in GDP is accounted for by inflation.

$$INFL_t = 27.75812 - 1.193227 GDP_t \quad (4)$$

(11.09) (-5.95)

$R^2 = 0.6394$

In Equation (4), where inflation is treated as the dependent variable, the results again show a significant negative relationship. A 1 unit increase in GDP is associated with a 1.1932 unit decrease in inflation. The high level of statistical significance and consistent R^2 value reinforce the mutual influence between inflation and economic growth.

Together, these findings suggest a bi-directional and inverse relationship between inflation and GDP in the short run. While inflation negatively impacts GDP, higher levels of economic growth also appear to suppress inflationary pressures. However, given the absence of co-integration as shown in the Johansen test (rank = 0), this relationship is confirmed to be short-term in nature.

The implication is that inflation may have harmful effects on economic growth, while sustained economic growth could serve as a mechanism for controlling inflation. Therefore, macroeconomic policies aimed at maintaining price stability and fostering growth should consider this reciprocal dynamic.

REFERENCES

Ahmed, S. (2010). An Empirical Study on Inflation and Economic Growth in Bangladesh. *OIDA International Journal of Sustainable Development*, Vol. 2, No. 3, pp. 41-48.

Barro, R. (1995). Inflation and economic growth: NBER Working Paper Vol. 53, No. 26, pp. 166- 176.

Barro, R. (1996). Determinants of economic growth: A cross-country empirical study. NBER Working Paper Vol. 56, No. 98, pp. 22-29.

Bick, A. Kremer, S. and Nautz, D. (2009). Inflation and Growth: New Evidence from a Dynamic Panel Threshold Analysis. SFB 649 Discussion Paper 036. pp. 33-47.

Carneiro, G. and Faria, R. (2001). Does High Inflation Affect Growth in the Long and Short-run? *Journal of Applied Economics.* Vol. 4, No. 1, pp. 89-105.

Chimobi, O. (2010). Inflation and Economic Growth in Nigeria. *Journal of Sustainable Development*, Vol. 3, No. 2, pp. 44-51.

Datta, K. and Kumar, C. (2011). Relationship between Inflation and Economic Growth in Malaysia. *International Conference on Economics and Finance Research IPEDR*, Vol. 4, No. 2, pp. 415-16.

Engle, R. F. and Granger, C. W. J. (1987). Co-integration and Error Correction: Representation, Estimation and Testing. Econometrica, Vol. 55, No. 2, pp. 251-276.

Ernst, J. Nau, G. J. and Bar-Joseph, Z. (2005). Clustering Short Time Series Gene Expression Data, Bioinformatics, pp. 1-9.

Espinoza, R., Leon, H. and Prasad, A. (2010). Estimating the Inflation-Growth Nexus-A Smooth Transition Model, IMF Working Paper. Vol. 10, No. 76, pp. 2-9.

Fischer, S. (1993). The Role of Macroeconomic Factors in Growth. *Journal of Monetary Economics*, Vol. 47, No. 5, pp. 485-512.

Frimpong, M. and Oteng-Abayie, F. (2010). When is Inflation harmful? Estimating the Threshold Effect for Ghana, *American Journal of Economics and Business Administration*, Vol. 2, No. 3, pp. 232-239.

Ghosh, A. and Phillips, S. (1998). Warning: Inflation May Be Harmful to Your Growth, IMF Staff Papers, Vol. 45, No. 4, pp. 672-710.

Green, H. (2002). 5thedn. Econometric Analysis. New Jersey: Prentice Hall- Upper Saddle River.

Gujarati, N. and Porter, D. (2009). 3rd edn. Basic Econometrics. US: The McGraw-Hill.

Gujarati, N. (2004). 4th edn. Basic Econometrics. New York: The McGraw-Hill.

Hammermann, F. and Flangan, M. (2007). What Explains Persistence Inflation Differentials across Transition Economies? IMF Working Paper, Vol. 07, No. 189, pp. 4-13.

Hasanov, F. (2010). Relationship between Inflation and Economic Growth in Azerbaijani Economy. Is there any Threshold Effect? *Asian Journal of Business and Management Sciences*, Vol. 1, No. 1, pp. 6-7.

Hjalmarsson, E. and Osterholm, P. (2007). Testing for Co-integration Using the Johansen Methodology when Variables are Near-Integrated, IMF Working Paper, Vol. 07, No. 141.
pp. 22-27.

Hussain, S. (2011). Inflation and Economic Growth: Evidence from Pakistan, *International Journal of Economic and Finance*, Vol. 3, No. 5, pp. 262-276.

Kasidi, F. (2010). Estimation of Impact and Elasticity of Foreign Direct Investment on Economic Growth: A Case of Indian Economy. *South Asian Business Review*, Vol. 2, No. 2, pp. 37-38.

Khan, M. and Senhadji, S. (2001). Threshold Effects in the Relationship between Inflation and Growth, IMF Staff Papers, Vol. 48, No. 1, pp. 1-21.

Kilindo, A. (1997). Fiscal operations, Money supply and Inflation in Tanzania. African Economic Research Consortium, Vol. 65, No. 3, pp. 1-7.

Madhukar, S. and Nagarjuna, B. (2011). Inflation and Growth Rates in India and China: A Perspective of Transition Economies, *International Conference on Economics and Finance Research*, Vol. 4, No. 97 pp. 489-490.

Mallik, G. and Chowdhury, A. (2001). Inflation and Economic Growth: Evidence from Four South Asian Countries, *Asian Pacific Development Journal*, Vol. 8, No. 1, pp. 123-135.

Marbuah, G. (2010). The Inflation-Growth Nexus: Testing for Optimal Inflation for Ghana, *Journal of Monetary and Economic Integration*, Vol. 11, No. 2, pp. 71-72.

Mehari, M. and Wondafrash, A. (2008). The Impact of Money Supply on Inflation in Ethiopia. A paper presented at 7th Multidisciplinary Conference in Unity University College, Ethiopia.

Mubarik, A. (2005). Inflation and Growth. An Estimate of the Threshold Level of Inflation in Pakistan.

SBP- Research Bulletin, Vol. 1, No. 1 pp. 35-43.
Mwase, N. (2006). An Empirical Investigation of the Exchange Rate Pass-Through to Inflation in Tanzania, IMF Working Paper /06/150, 4-7.
Ndyeshobola, A. (1983). Inflation and Underdevelopment in a Peripheral Economy: The 1960-80 Tanzanian experience. ISS, The Hague.
Nell, K. (2000). Is Low Inflation a Precondition for Faster Growth, The Case of South Africa, Department of Economics, University of Kent, United Kingdom.
Odhiambo, N. (2011). Inflation Dynamics and Economic Growth in Tanzania. A Multivariate Time Series Model, *Journal of Applied Business research*, Vol. 28, No. 3, pp. 746-47.
Parlow, A. (2010). Introduction to VEC-Models in Stata, UWM Economics Department.
Prasanna, S. and Gopakumar, K. (2010). An Empirical Analysis of Inflation and Economic Growth in India, *International Journal of Sustainable Development*, Vol. 15, No. 2 pp. 4-5.
Quartey, P. (2010). Price Stability and the Growth Maximizing rate of inflation for Ghana, *Business and Economic Journal*, Vol. 1, No. 1, pp. 180-194.
Ramanathan, R. (2002). 5th edn. Introductory Econometrics with Applications. Fort Worth: Harcourt College Publishers.
Sergii, P. (2009). Inflation and Economic Growth: The Non-Linear relationship. Evidence from CIS Countries, Kyiv School of Economics, Ukraine.
Shitundu, L. and Luvanda, G. (2000). The Effect of Inflation on Economic Growth in Tanzania, *African Journal of Finance and Management*, Vol. 9 No. 1, pp. 70-77.
Ssekuma, R. (2011). A study of Co-integration Models with Applications, University of South Africa, South Africa.
Stein, P. (2010). The Economics of Tanzania, Kenya, Uganda, Rwanda and Burundi, Report prepared for Swed Fund International AB. 12-32.
Umaru, A. and Zubairu, J. (2012). The Effect of Inflation on the Growth and Development of the Nigerian Economy: An Empirical Analysis, *International Journal of Business and Social Science*, Vol. 3, No. 10, pp. 187-188.
Wei, S. (2006). 2nd edn. Time Series Analysis: Univariate and Multivariate methods. Boston: Pearson.
Xiao, J. (2009). The Relationship between Inflation and Economic Growth of China: Empirical Study from 1978-2007, Lund University, Sweden.
Yang, H. (2000). A Note on Causal Relationship between Energy and GDP in Taiwan, Energy Economics. Vol. 22, No. 3, pp. 309-3