



Relationship between Kenya's economic growth and inflation

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Abstract

This study estimates the threshold level of inflation for Kenya using 49 years of annual time series data for the period 1971 to 2019. First, the estimated threshold level of inflation was obtained using the threshold regression method and, second, by use of an augmented regression model with inflation at structural breaks. Lastly, an econometric analysis of the restricted parametric model was used to verify the validity of each of the estimated threshold levels of inflation obtained from the two techniques. The threshold regression method estimated a statistically significant threshold inflation rate of 5.83%. An augmented regression model with inflation at structural breaks predicted a statistically insignificant threshold inflation rate of 5.7%. The restricted parametric model established a statistically significant positive effect and negative effect for the threshold inflation of 5.8% and 5.7%, respectively. At threshold inflation of 5.8% and 5.7%, a unit increase in inflation improved GDP growth by 2.89% and decreased GDP growth by 3.29%, respectively. Therefore, the estimated threshold inflation of 5.8% obtained by the threshold regression method gives a better prediction than the estimated threshold inflation of 5.7%. The study recommends that the central bank of Kenya pursues inflation below 5.83% to boost economic growth.

Keywords Inflation · Threshold inflation rate · Economic growth

Introduction

It is not a question of whether high inflation affects economic growth or not but to what extent. Firstly, the empirical evidence on the relationship between inflation and economic growth is diverse. For instance, Taderera et al. (2021) obtained a positive relationship, Saungweme and Odhiambo (2021) obtained a negative relationship, Cameron et al. (1996) established a neutral relationship and Vinayagathan

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(2013) established only neutral relationship for inflation below the threshold level. In addition, Mamo (2012) obtained an unclear relationship between inflation and economic growth, and Nyenyia et al. (2017) obtained a weak negative relationship of -0.0067 .

For the Kenyan case, Saungweme and Odhiambo (2021), established a negative effect of inflation on Kenya's economic growth in the long run and proposed strong monetary and fiscal policy to lessen the negative effects of inflation that impedes economic growth. The research further recommended the pursuit of the inflation target to guide the central bank in achieving and maintaining low and stable levels of inflation as a prerequisite condition to support economic growth.

Secondly, inflation targeting remains a primary focus for most economies, Adler et al. (2020). Maintaining inflation at low levels provides the necessary condition that supports an increase in aggregate supply, expansion of productivity, and better living standards for the majority of the population, Amanja and Morrissey (2013). It is, therefore, the mandate of the central bank to keep inflation levels low and stable in the medium term to create favorable conditions for economic growth. A high inflation rate is unfavorable to growth for it discourages investments in the economy and distorts returns on investment, Gokal and Hanif (2004). In addition, a high rate of inflation distorts financial market operations, weakens local currencies against foreign currencies, and changes government attention from productive economic activities to inflation mitigation (Chiu and Meh 2007).

Therefore, the transition of Kenya's monetary policy from backward-looking to forward-looking inflation targeting has made it possible to initiate this goal, Nyamongo et al. (2021). This study seeks to estimate the threshold level of inflation for Kenya firstly, using the threshold analysis method and secondly, using an augmented regression method with inflation at structural breaks. The two techniques were used to allow for consistency checks on threshold estimates obtained. The use of two estimation techniques widens the chance of obtaining a plausible threshold estimate for inflation. A restricted parametric model was used to verify the validity of the estimated threshold levels of inflation. Lastly, this research expands the literature of similar contexts and informs policy aimed at attaining sustainable economic growth (Fig. 1).

Kenya's rate of inflation averaged 11.95% in the last 49 years from the year 1971 to 2019. In addition, the average rate of growth in GDP during the same period averaged 4.79% with cycles of fluctuating rates of inflation and economic growth. Kenya recorded the highest growth rate in GDP of 22.1% and the lowest inflation rate of 3.7% in 1971.

From 1972 onwards Kenya's economic growth on average recorded fluctuating results. However, in 1992, rising inflation is followed by negative economic growth. This is attributed to the general election held in 1992. Further, inflation rose to a high of 45.98% in 1993. Inflation rates fell drastically from 1995 and rose again in 2003 to a high of 26.23% in 2008. The high inflation rates recorded in 2008 were due to the global financial crisis experienced during that period. However, inflation dropped in the year 2009 to a low of 3.9% in 2010 and then rose to 14% in 2011. From 2011 to 2019, inflation averaged 6.79% and the economy grew at an average rate of 5.48% in the 9 years.

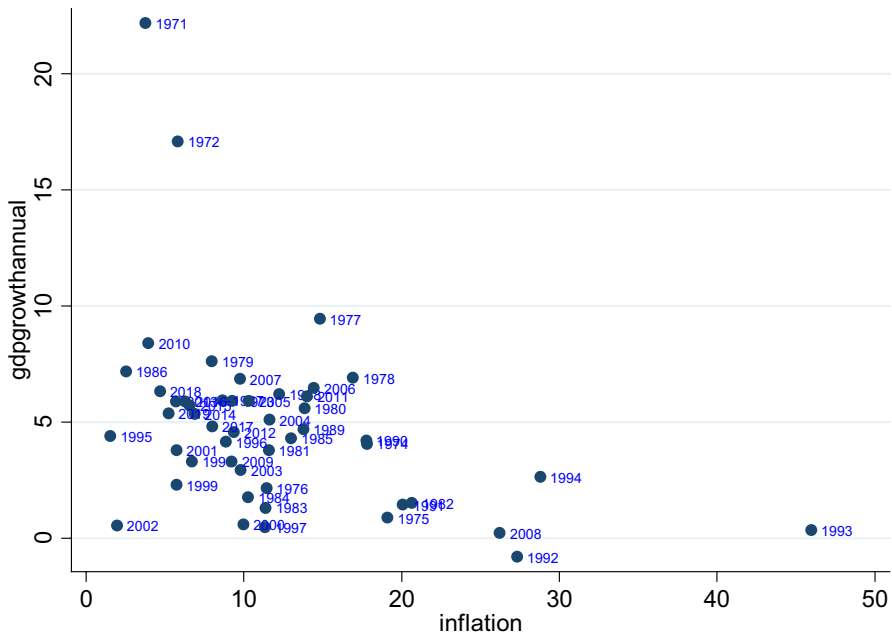


Fig. 1 Trends of inflation and GDP Growth in Kenya. Source: World Development Indicators Data (1970–2019)

During this period, Kenya applied a series of institutional reforms comprising financial, economic, and public sector reforms to correct disequilibrium in the balance of payment and to counter the rising inflation, Ngui et al. (2016). However, inflation rose to a high of 45.98%.

In this regard, the central bank of Kenya engaged monetary policy to lower and maintain inflation at 5% as a precondition to boost economic growth and development, Ndung'u, (2010). According to Kenya's Vision 2030, the pursuit of annual economic growth of 10% would improve the prosperity of Kenyans, Vision, K. 2030, Popular Version (2007). To achieve this economic growth, the central bank of Kenya set a target inflation rate of 5% to provide favorable conditions for investment in the economy, Central Bank of Kenya (2014).

Literature review

Many studies extensively explored the relationship between economic growth and inflation. Similarly, inflation targeting has attracted a large number of researchers across countries due to its significance in economic growth. In this case, inflation and economic growth are the central focus of policymakers due to their significance in the economy. Indeed, numerous research findings have uniquely established the existence of positive, Taderera et al. (2021), negative, Saungweme and Odhiambo (2021), and neutral, Cameron et al. (1996) relationship between

inflation and economic growth. However, central banks globally accord more importance to inflation targeting which forms the threshold level of inflation at which economic growth rises. Therefore, this section explores research findings from different related studies and applies them in building theoretical and empirical literature for this research.

The primary objective of monetary policy is price and financial stability. According to Furusawa (2021), a high rate of inflation distorts saving and investment decisions of the private sector and slows economic growth. For these reasons, countries have prioritized price stability and made low and stable inflation their primary monetary objective. Concerning this, central banks embrace forward-looking monetary policy frameworks to achieve macroeconomic stability and promote economic growth. This involves a combination of an explicit medium-term inflation target, market-based instruments, and a flexible exchange rate, Furusawa (2021).

In addition, Njoroge and Murinde (2021), emphasized the importance of the independence of central banks in the management of inflation. This was triggered by high inflation rates and floating currencies witnessed after the collapse of the Bretton Woods System. In this case, countries could no longer trust politicians with monetary discipline and instead bestowed the mandate to central banks to effectively manage inflation. The independence of the central bank from political influence increased the credibility of monetary policy, lowered and stabilized inflation, and reduced variations in output, de Haan and Berger (2003).

A high rate of inflation is detrimental to the economy in many ways. It impedes the efficiency of factors of production, falsifies the ability of a country to attract investment, and negatively affects the country's financial development, Hoomani et al. (2021). The interaction of a low and stable inflation rate and a developed financial system creates enabling conditions for economic growth. For Kenya to achieve real growth in output, appropriate economic policies that favor stable and sustainable low levels of inflation, capital accumulation, resource mobilization, reduced government spending, and a vibrant financial system should be encouraged, Chen et al. (2020).

A vibrant and regulated financial system attracts investment opportunities into a country, creates a favorable environment for production, and places anti-inflationary measures on alert. Hence, there is a need for a regulated and integrated financial market system to prevent negative inflationary effects caused by unregulated mobile money systems, Qiu (2022).

Both economic growth and inflation are affected by diverse factors. According to Coccia (2019) and Coccia (2018), a country's economic growth is influenced by socioeconomic and political factors, technology, preference, and institutional forces. Similarly, weak institutions may lead to excessive government spending and correspondingly may dampen anti-inflationary measures in the case where decisions of the central bank are constrained. In addition, the low competitiveness of local products may reduce demand for locally manufactured goods over foreign products. Consequently, increased preference for foreign products over locally made products may lead to unfavorable terms of trade. An increase in imports over exports exerts pressure on foreign currency reserves and this may lead to increased inflation in the case of a depressed economy.

Empirical evidence shows that economic growth is also influenced by the consequential effect of an unstable exchange rate on inflation and that countries should prioritize policies that support the appreciation of local currencies, Olamide et al. (2022). Further, Mushtaq et al. (2022) suggested that within the precincts of an inflation-targeting framework, the state bank of Pakistan (SBP) should consider pursuing exchange rate stability and price stability to overcome inflation. However, according to Civcir and Akçağlayan (2010) on inflation targeting and exchange rate, the pursuit of exchange rate intervention in the course of inflation targeting is not sustainable. Therefore, pursuing inflation targeting can promote a desirable inflation level and reduces inflation pass through on inflation.

Both inflation and inflation uncertainty are critical factors that affect economic growth. According to Mandeya and Ho (2021), inflation affects economic growth both in the short run and in the long run. Inflation uncertainty was found to harm the GDP growth of South Africa in the short run with no relevance in the long run. It is also interesting to note that inflation uncertainty lost its bearing when South Africa adopted inflation targeting. In the case of Ghana, inflation hurts GDP growth in the short run and the long run whereas the effect of inflation uncertainty on growth varied in the short run and showed a negative effect on growth in the long run, Iyke and Ho (2019). In the case of central and eastern European countries, inflation has a relatively smaller effect on output growth than inflation uncertainty. In addition, countries with smaller GDPs suffered more from inflation uncertainty than countries with bigger GDPs due to their relatively high vulnerability to external shocks, Živkov et al. (2020). The study further found that inflation uncertainty reduces economic growth particularly when output growth is low or negative.

More link between inflation, inflation uncertainty, and GDP growth shows that increased inflation uncertainty is linked to high levels of inflation and low GDP growth, Wilson (2006). Whereas high levels of inflation damage GDP growth, inflation uncertainty enhances growth in countries not exposed to inflation crises. Therefore, countries that are not exposed to inflation crises may gain from inflation uncertainty if they keep inflation levels low. A low level of inflation is desirable for both developing and developed countries.

A major challenge of inflation targeting occurs when the noninflationary rate of unemployment (NIRU) is breached. When unemployment is above NIRU any effort employed to bring unemployment down will worsen the inflation condition in the economy. According to Modigliani and Papademos (1975), as long as unemployment is above NIRU efforts to counter unemployment and inflation are expected to work. Similarly, Dinçer et al. (2019) reiterated that expansionary monetary policy is preferred when there is no inflation problem. When NIRU is breached, anti-inflationary measures aimed at raising economic growth are dampened.

The degree of public finance discipline and economic conditions also affects price stability. A high degree of financial discipline supports stable exchange rates and reduces overreliance on fiscal remedies over monetary goals, Tsatsaronis et al. (2022). It should be noted that import-reliant countries often suffer from exchange rate variability. In turn, unfavorable terms of trade caused by low production capacity and high import tax exert pressure on foreign currency reserves leading to exchange rate volatility and a rise in the consumer price index, Islam et al. (2022).

Based on empirical research, findings from some reviewed studies show that countries have different threshold inflation levels. This is attributed to the diversity of economic characteristics across countries. Using fixed effect and feasible generalized least squares on panel data obtained from 16 developing countries and 11 developed countries, Azam and Khan (2020) established that inflation impedes growth when inflation rises above 12.23% and 5.36% respectively. The study further suggested the need to strengthen capital formation and exports due to their significance in stimulating economic growth. Developing countries were found to exhibit high threshold levels of inflation compared to developed countries, Khan and Hanif (2020). This is attributed to the difference between the institutional quality of developing and developed economies. Developing economies were found to suffer from political instability, polarization, and inflation tax which stifles the value of the local currency. The above empirical findings agree with threshold inflation estimates of 19.1% and 4.5% for developing and developed countries respectively obtained from analysis of data from 138 countries, Ibarra and Trupkin (2016).

Using a dynamic panel threshold model on data obtained from 32 Asian countries estimated threshold inflation of 5.43% was obtained, Vinayagathan (2013). Inflation above this level was found to have a detrimental effect on economic growth while inflation below the threshold exhibited no effect on economic growth. Using the same model, Ndoricimpa (2017) obtained an average threshold inflation rate of 6.7% for 47 African countries. Threshold inflation analysis of low-income and middle-income African countries exhibited thresholds of 9% and 6.5% respectively. Further, using the dynamic panel threshold model, Kelikume (2018) analyzed threshold inflations of 12.5% and 9.4% for 21 resource-rich and 20 non-resource-rich African countries respectively.

Misiri and Fetai (2022), using 21 years of panel data obtained from Western Balkan countries of Europe obtained a threshold inflation rate of 3.9% above which inflation negatively affected economic growth. Adopting a sample-splitting approach on 51 years' time series data for Ghana, Prempeh et al. (2022) obtained threshold inflation of 17.45% above which inflation inhibits economic growth. Also, Alsaban and Alnuwaiser (2021) estimated threshold inflation of 3% for Saudi Arabia using 39 years' time series data on the dynamic threshold regression model. Lastly, Tarawalie and Kamara (2022), obtained threshold inflation of 10.3% for Sierra Leone using 41 years' time series data by employing the Ordinary Least Squares method. The theoretical and empirical evidence presented shows distinct estimates for threshold inflation rates of different countries and regions. The findings of the reviewed studies suggest that their no universal threshold levels of inflation applicable to all countries or regions. Thus, there is a need to establish threshold levels of inflation that suits individual countries' needs due to varying economic characteristics across nations. Therefore, this study expands the literature on inflation targeting and provides policy recommendations about inflation levels that promote economic growth (Table 1).

From the empirical evidence of target inflation rates in table one above, inflation levels beyond the threshold level are detrimental to economic growth. Therefore, the effective pursuit of a low inflation rate by the central bank provides the necessary condition for robust economic activities.

Table 1 Summary of empirical studies for threshold inflation

Study (author, year)	Country	Empirical method	Estimated threshold	Significance
Azam and Khan (2020)	16 developing and 11 developed economies	Feasible generalized least squares (FGLS)	12.23% & 5.36% respectively	Significant
DINH (2020)	Korea	Ordinary least squares	4.5%	Significant
Mushtaq et al. (2022)	Pakistan	Threshold regression	6.02%	Insignificant
Ding and Vitenu-Sackey (2021)	Ghana	Threshold regression	26.1%	Significant
Nkume (2014)	Malawi	Conditional least squares method	17%	Significant
Tien (2021)	Vietnam	Error correction model	6%	Significant
Runganga (2020)	Zimbabwe	Dynamic ordinary least squares	4%	Significant

Methodology and model

Two techniques were used to estimate the threshold rate of inflation. Firstly, we employed a threshold regression model developed by Khan and Senhadji (2001) and secondly, we used an augmented regression model with inflation at structural breaks. Lastly, a restricted parametric model was used to verify the validity of each of the estimated threshold levels of inflation obtained from the two techniques.

Threshold regression model

This research utilized the model used by Khan and Senhadji (2001) to estimate the threshold level of inflation for Kenya. The basic functional form of the model is given as:

$$GDPgrowth = \beta_0 + \beta_1\pi + \beta_2D(\pi - k) + \mu_t$$

where $GDPgrowth$ is GDP growth (annual %), π is inflation of consumer prices (annual %), k is the threshold level of inflation, D is a dummy variable representing the point of structural break of inflation while μ and t are error term and time respectively. The dummy variable D is assigned numeric 0 and 1 explained below.

$$D = \begin{cases} 1 & \text{if } \pi > k \\ 0 & \text{if } \pi \leq k \end{cases}$$

Coefficient β_1 measures the effect of inflation on GDP growth when inflation is low while $\beta_1 + \beta_2$ measures the effect of inflation on GDP growth for inflation levels above the threshold. The estimate of k that minimizes the Sum of Squared Residuals (SSR) was picked. The process of estimating threshold inflation involved the use of STATA 16 and Eviews version 9.

Augmented regression model with inflation at structural breaks

In addition to the threshold regression model, this study used an augmented regression model with inflation at structural breaks to obtain a second estimate of threshold inflation. The model was applied by Barro (1991), Levine and Renelt (1992), and Sala-i Martin (1997). The model was modified through the addition of control variables to aid the estimation of threshold inflation. The modified model is given as;

$$GDPgrowth_t = \beta_0 + \beta_1\pi_t + \beta_2D(\pi - k) + \beta_3logexports_t + \beta_4logimports_t \\ + \beta_5logpopulation_t + \beta_6logGCF_t + \beta_7publiddebt_t + \mu_t$$

where $GDPgrowth$ is GDP growth (annual %), π is inflation and k is threshold inflation. Control variables include *Publicdebt* (Public Debt % of GDP), imports,

exports, population, and gross capital formation in logarithm form. t and μ represent time and error terms respectively.

To endorse a plausible value of k obtained, this study examined the effect of estimates of threshold inflation generated by the threshold regression model and augmented regression model with inflation at structural breaks on GDP growth. This double-check ensures that only the optimal value of k is recommended.

Restricted parametric model

The study used a restricted parametric model to verify the validity of each of the estimated threshold levels of inflation obtained through the threshold regression method and augmented regression model with inflation at structural breaks respectively. The restricted parametric model used is given as;

$$GDPgrowth_t = \beta_0 + \beta_1\theta + \beta_2\logexports_t + \beta_3\logimports_t + \beta_4\logpopulation_t + \beta_5\logGCF_t + \beta_6publiddebt_t + \mu_t$$

where $GDPgrowth$ is GDP growth (annual %), t and μ represent time and error terms respectively and θ represents estimated threshold inflation rates obtained through threshold regression method and augmented regression model with inflation at structural breaks. The rest of the variables which include public debt and exports, imports, population, and gross capital formation in logarithm form are control variables.

Diagnostics test

The dickey-Fuller test was used to check for stationarity in the time series data. Non-stationary data reduces the predictive ability of estimates, Cheng et al. (2015). In regard to this, the study employed inbuilt-Stata command for robustness to solve the challenges of non-stationarity in time series data, Álvarez-Ayuso et al. (2018).

Data and summary statistics

This study used 49 years of annual time series data from the year 1971 to 2019 for GDP growth and inflation to estimate threshold inflation. The data were obtained from world development indicators (World Bank) and International Monetary Fund (IMF). During this period Kenya pursued major institutional reforms to correct the balance of payment and inflation Ngui et al. (2016). The choice of variables used concurs with the findings of Morar (2011) that control variables should have a significant effect on the dependent variable. Therefore, control variables for this study are exports, imports, population, gross capital formation, and public debt. In addition, GDP growth, unemployment, and public debt were analyzed to show respective trends at different levels of inflation. The data were analyzed using Stata 16 and Eviews version 9 (Table 2).

Table 2 Measures of variables

Variable	Measures	Source
GDP Growth	GDP Growth Annual %	World Development Indicators (World Bank)
Inflation	Inflation Consumer Prices Annual %	
Exports	Exports of goods and services	
Imports	Imports of goods and services	
Gross Capital Formation	Gross Capital Formation	
Population	Population, total	
Unemployment	Unemployment, % of the total labor force	
Public Debt	Public Debt, % of GDP	

Table 3 Descriptive statistics

Variable	Mean	Standard Deviation	Min.	Max.	Adj. $\chi^2(2)$	Prob > χ^2
GDP growth %	4.797	3.931	- 0.799	22.174	29.93	0.0000
Inflation %	11.820	8.012	1.554	45.979	24.92	0.0000
Log of exports	9.668	0.228	9.345	10.025	20.11	0.0000
Log of imports	9.701	0.348	9.194	10.281	12.85	0.0016
Log of gross capital formation	9.549	0.284	9.204	10.091	7.31	0.0259
Log of population	7.424	0.195	7.069	7.721	8.43	0.0148
Unemployment %	3.086	0.464	2.76	5.01	29.67	0.0000
Public debt %	44.540	16.540	13.077	82.085	1.11	0.5729

Table 4 GDP growth, public debt, and unemployment at different inflation bands

Inflation band	GDP growth (Mean)	Debt % of GDP (Mean)	Unemployment (Mean)
$0 \leq \text{INFL} < 5$	8.171	48.274	3.285
$5 \leq \text{INFL} < 10$	5.332	45.956	3.089
$10 \leq \text{INFL} < 20$	4.408	36.447	2.933
$20 \leq \text{INFL} < 30$	1.002	53.066	3.058
$\text{INFL} \geq 30$	0.352	82.085	3.104

Table 3 indicates that economic growth and inflation averaged 4.79% and 11.82%, respectively, from 1971 to 2019. Kenya recorded economic growth of - 0.799% in 1992 with inflation of 27.33%. Kenya held the first multiparty general election in 1992. In 1978 Kenya recorded the highest economic growth of 22.17% with an inflation of 3.78% in the same year.

From Table 4, an increase in inflation is followed by a diminishing GDP growth. Similarly, a gradual increase in public debt and inflation above 10% grow in tandem.

Table 5 Correlation between GDP growth, public debt, and unemployment

Variable	Inflation	GDP growth	Public debt	Unemployment
Inflation	1			
GDP growth	- 0.524	1		
Public debt	0.375	- 0.372	1	
Unemployment	- 0.091	0.056	0.3472	1

Table 6 Unit root test: GLS-Dickey Fuller

Variable	Stationary at order 0			Stationary at first difference		
	Statistic	Significance level (%)	<i>p</i> value	Statistic	Significance level (%)	<i>p</i> value
GDPgrowth	- 5.845	1	0.0000			
Inflation	- 3.975	1	0.0015			
logpopulation	- 20.615	1	0.0000			
logimports				- 6.661	1	0.0000
logexports				- 7.364	1	0.0000
logGCF				- 7.210	1	0.0000
Publicdebt				- 6.117	1	0.0000

The trend of inflation below 20% and unemployment moves in opposite direction. Therefore, inflation below 20% supports the inverse linear association between inflation and unemployment. Scrutiny indicates fairly stable unemployment across the inflation band. This phenomenon complements Hooper et al. (2020) evidence of the flattening of the Philips curve due to the unresponsiveness of unemployment to inflation based on United States labor market data.

The correlation analysis shows an inverse linear association between inflation and economic growth, inflation and unemployment, and public debt and economic growth. However, there is a positive linear association between public debt and inflation, public debt and unemployment, and economic growth and unemployment (Table 5).

Table 6, data for GDP growth, inflation, and logpopulation are stationary at order (0) while that of logImports, logExports, LogGCF, and publicdebt are stationary at first difference. All variables are statistically significant at a 1% level. Even though the data are stationary at different orders, the econometric methods used produced reliable estimates.

Results and discussion

An estimated threshold inflation rate of 5.83% was obtained by the threshold regression model. The estimate minimizes SSR. The estimated threshold inflation of 5.83% splits the sample into region 1 and region 2. Region 1 relates to the

Table 7 Threshold Regression Model Results

	GDPgrowth b/p
Threshold Inflation	5.831
Threshold order	1
GDPgrowth	
Inflation	− 0.141 (0.059)
Region1	
Constant	8.392*** (0.000)
Region2	
Constant	5.961*** (0.000)
SSR	581.25
AIC	127.71

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8 Augmented regression model with inflation at structural breaks results

Structural breaks (Inflation)	Correlation coefficient	Regression coefficient for inflation	$P > t $	Akaike info. criterion	SSR
INFL ≤ 6.0	0.1674	0.558	0.599	6.812	407.209
INFL ≤ 5.9	0.1674	0.558	0.599	6.812	407.209
INFL ≤ 5.8	− 0.0048	− 0.086	0.921	6.690	315.926
INFL $\leq 5.7^*$	0.4755	1.421	0.356	7.008	255.917
INFL ≤ 5.6	0.4755	1.421	0.527	7.008	255.917
INFL ≤ 5.5	0.4755	1.421	0.527	7.008	255.917

*Threshold level of inflation

This is the maximum level of inflation that supports positive growth of GDP. At this level the values of correlation coefficient and regression coefficient are both positive and highest in comparison with the coefficients of other structural break level of inflation. In addition, the p value of 0.356 at the threshold level of inflation is the lowest among the positive regression coefficients for inflation

sample in which inflation is less than or equal to the threshold level while region 2 relates to the sample in which inflation is above a threshold of 5.83%. The coefficients of the two regions are statistically significant with p -values less than 5% (Table 7).

Augmented Regression Model with Inflation at Structural Breaks estimated threshold inflation of 5.7%. At this threshold level of inflation, the correlation coefficient and regression coefficient are both positive and maximum. In addition, threshold inflation of 5.7% best fits the augmented regression model because the value of the Akaike Information Criterion (AIC) is the smallest among positive coefficients of correlation. SSR is also minimized. However, the coefficient is statistically insignificant (Table 8).

The restricted parametric model indicates that inflation below or equal to 5.8% is positive and statistically significant. At threshold inflation of 5.8%, a one percent increase in inflation raises GDP growth by 2.89%. A threshold inflation of 5.7% is statistically significant. However, the estimated coefficient is negative hence it is detrimental to GDP growth. Therefore, threshold inflation of 5.8% is more reliable because it is statistically significant and improves economic growth (Table 9).

Conclusion

Inflation targeting is embraced globally due to the substantial influence of inflation on economic growth. This study employed the threshold regression model and augmented regression model to estimate the threshold inflation for Kenya. A restricted parametric model was used to verify the validity of the threshold values obtained. Firstly, there is a negative relationship between inflation and economic growth in Kenya.

Secondly, the threshold regression model and augmented regression model with inflation at structural breaks predicted statistically significant threshold inflation rates of 5.8% and statistically insignificant threshold inflation of 5.7% respectively. The restricted parametric model found out that threshold inflation of 5.8% has a

Table 9 Restricted parametric model results

	5.8% threshold	5.7% threshold
	GDP growth annual	GDP growth annual
	b/p	b/p
Inflation ≤ k	2.888* (0.046)	- 3.297* (0.049)
Logexports	8.292 (0.440)	4.814 (0.620)
Logimports	1.523 (0.825)	4.610 (0.499)
Logpopulation	- 36.723* (0.026)	- 31.318* (0.034)
logGCF	13.707* (0.046)	9.643 (0.179)
publicdebt	0.038 (0.518)	0.016 (0.797)
Constant	49.395 (0.333)	56.107 (0.259)
R2	0.457	0.464
df_res	40	40
BIC	259.5	258.9
AIC	246.6	246.0

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

statistically significant positive effect on GDP growth while threshold inflation of 5.7% has a statistically significant negative effect on GDP growth.

With respect to threshold inflation of 5.8%, a unit increase in inflation raised GDP growth by 2.89%. Conversely, at a threshold inflation of 5.7%, a unit increase in inflation was found to reduce GDP growth by 3.29%. Therefore, the estimated threshold inflation of 5.8% obtained by the threshold regression method gives a better prediction than the threshold inflation of 5.7% obtained by the augmented regression model with inflation at structural breaks. This study recommends that the Central Bank of Kenya pursues inflation below 5.8% as a precondition to boost economic growth.

Theoretically, a major limitation of using inflation targeting to pursue economic growth arises when expansionary monetary policy aimed at checking on unemployment pushes inflation upwards especially when the noninflationary rate of unemployment (NIRU) is breached. Therefore, it would also be interesting to establish the limit at which expansionary monetary policy expected to reduce unemployment is detrimental to economic growth.

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Data availability The data used in the analysis will be made available on reasonable request.

Declarations

Conflict of interest I Kiptum George Kosgei declare that there is no conflict of interest concerning the study; RELATIONSHIP BETWEEN KENYA'S ECONOMIC GROWTH AND INFLATION. The study is a bona fide record of my original work, has not been presented anywhere for publication, and no organization, institution, or individual claims any part of this study. I declare that the study is well-referenced.

Ethical approval I declare that this study is ethically sound. The study relied on open-source secondary data obtained from World Bank (World development indicators) and International Monetary Fund (IMF).

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