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FINANCE & ACCOUNTING

INFLATION TARGETING AND ITS EFFECT ON FOOD PRICE VOLATILITY IN KENYA

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ABSTRACT

Purpose of Study: The study investigates the effectiveness of inflation targeting in stabilizing food prices by examining its impact on food price volatility and the broader economic factors influencing this instability, including global commodity prices, exchange rate fluctuations, climate variability, and regional conflicts. Inflation targeting, introduced by the Central Bank of Kenya in 2011, aims to control inflation and stabilize prices.

Problem Statement: Despite achieving its overall inflation objectives, Kenya continues to face volatile food prices, posing significant socioeconomic challenges, especially for low-income households that are heavily burdened by high food costs.

Methodology: The study aopted non-experimental research design with secondary quarterly time series data from 2011 to 2022 sourced from the Central Bank of Kenya, Kenya National Bureau of Statistics, and the Food and Agriculture Organization, this research analyzes factors including the Consumer Price Index, exchange rates, and food prices using a Vector Error Correction Model (VECM).

Result: The findings indicate that, while inflation targeting has succeeded in controlling overall inflation, it has struggled to reduce food price volatility. This suggests the need for more comprehensive policies that go beyond traditional monetary strategies to stabilize food prices effectively.

Conclusion: The results highlight the necessity for a multifaceted approach involving monetary, fiscal, and trade policies to manage food price dynamics, improve food security, support farmers' incomes, and enhance overall economic stability in Kenya.

Keywords: *Inflation targeting; Food price volatility; Monetary policy; Economic stability; Food security*

INTRODUCTION

Inflation targeting, as a monetary policy, involves setting a central bank and publicizing a numerical goal for future inflation to maintain price stability, which is deemed a fundamental long-term objective (Bernanke et al., 1997). In doing so, it aims to influence consumer expectations and behaviors, potentially lowering food prices. In practice, central banks may adjust their money supply or alter interest rates to steer the economy towards this target (Krušković, 2022). Such monetary actions can encourage consumer spending and investment in agriculture, leading to increased food production and lower prices (Braun and Tadesse, 2012).

This policy is applied using a two-tiered approach: central banks establish inflation goals and the government aligns its fiscal and monetary policies accordingly. The overarching purpose is to ensure sustained, low, and predictable inflation, contributing to economic stability and growth (Meerza, 2020). Inflation targeting has become a pivotal strategy in managing food costs internationally, particularly during periods of significant price spikes, such as those in 2007-08 and 2011, when food prices tripled from the early 2000 levels (Braun and Tadesse, 2012). The consequential global food price trends are depicted in Figure 1, highlighting the escalating concern for economic policy and food security.

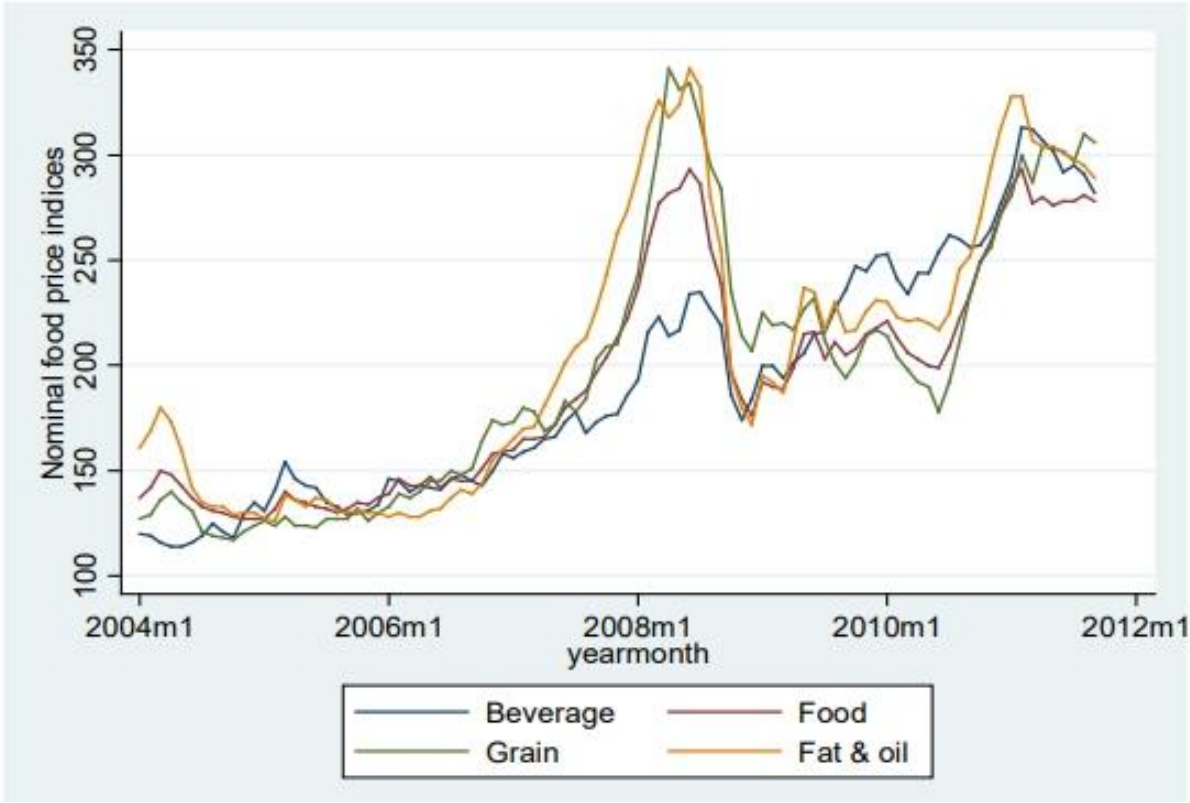

Figure 1: Increasing food prices from 2004 to 2011

Source: Braun and Tadesse (2012)

Countries have adopted inflation targeting to stabilize prices, with several nations such as Canada, Switzerland, the UK, Sweden, Norway, and South Korea utilizing this framework to enhance economic stability (Meerza, 2020). Interestingly, it has been found that in some developing countries, where inflation targeting was implemented, it did not significantly outperform other inflation control methods (Surya, 2016). In African nations such as Ghana, Kenya, Uganda, and South Africa, the adoption of inflation targeting has varied effectiveness, with Kenya and Ghana experiencing higher volatility, likely due to frequent supply shocks (Nabbosa, 2017).

In Kenya, a lower-middle-income country reliant on agriculture, inflation targeting was adopted to tackle high and volatile food prices that disproportionately affect the poor (World Bank, 2023). However, the country has faced continuous economic challenges such as high public debt and frequent supply shocks that exacerbate food price instability. Despite achieving general inflation targets, the Central Bank of Kenya (CBK) has found it difficult to control food price inflation due to factors beyond monetary policy, including global commodity prices and climatic changes (Durevall and Sjö, 2012; KNBS, 2022). The CBK has made progress in transitioning to an inflation targeting regime, moving from a focus on monetary aggregates to a framework that adjusts the Central Bank Rate (CBR) to influence a broader economic climate (MPC, 2021).

Kenya, a developing nation with a significant agricultural sector, contributes roughly 34% to the GDP and employs over 40% of its workforce in this sector, with tea, coffee, and horticultural products being major exports (World Bank, 2023). Although GDP growth was over 5% annually from to 2014-2019, it faced a downturn due to the COVID-19 pandemic. Economic vulnerabilities persist, including high public debt and sensitivity to climate variability, thus impacting agriculture. Inflation has been challenging to manage despite the Central Bank of Kenya's (CBK) monetary policy efforts (World Bank, 2023).

Economic growth has shown volatility but an overall uptrend since the 1970s. The 1970s saw an average growth of 6.5%, with swings between 1.7% and 8.2%, while the 1990s experienced a slowdown with an average growth of only 2.4 %. The 2000s saw a rebound, with the rates peaking at 8.4% in 2010, supported by reforms. The trend was disrupted by the 2007-08 violence and the 2009 drought, but remained resilient (World Bank, 2022; KNBS, 2022).

The CBK, critical in setting monetary policy through the Central Bank Rate (CBR), balances fostering economic development with price stability (Were et al., 2014). Interest rate adjustments are a primary tool in this endeavor, but managing the interplay between growth and inflation is complex. A notable surge in inflation occurred in the 1980s, peaking at 54.5% in 1984; however, recent decades have seen a more controlled inflation environment (KNBS, 2022).

Since 2013, Kenya has transitioned towards an inflation-targeting framework to stabilize prices, but challenges with food price volatility remain because of various external and internal factors (Durevall and Sjö, 2012; Ndirangu and Ngugi, 2015). This study assesses the effectiveness of inflation-targeting food price stability in Kenya, aiming to offer comprehensive policy recommendations beyond just monetary adjustments to achieve a stable food pricing environment. It proposes a holistic approach that extends beyond monetary measures, incorporating strategies to fortify agricultural resilience, develop strategic reserves, and bolster regional trade. Figure 2 shows inflation rates for Kenya from January 2022 to August 2023.

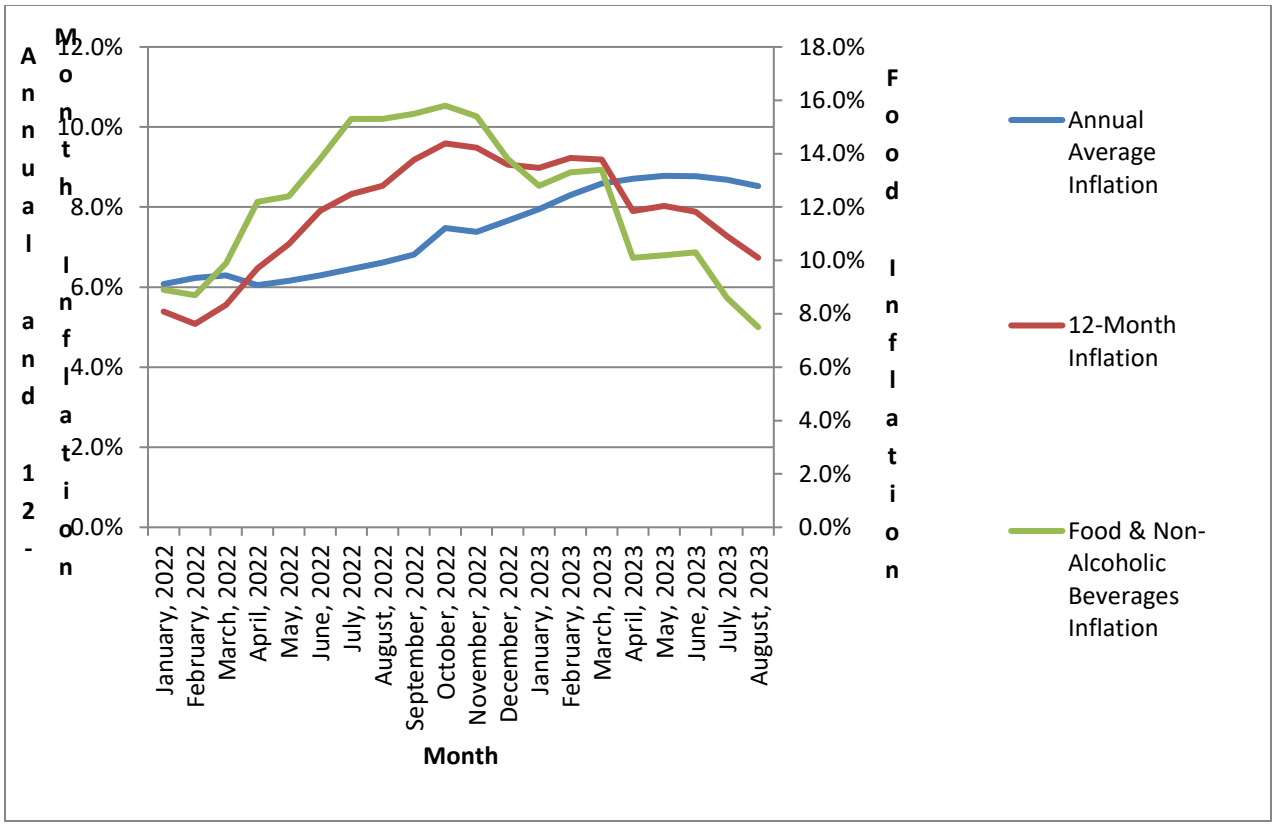

Figure 2: Inflation rates for Kenya from January 2022 to August 2023 (%)

Source: CBK, 2023

Figure 2 captures Kenya's inflation trends from January 2022 to August 2023. Initially, the Annual Average Inflation rate was 6.08% in January 2022, escalating to a peak of 8.78% in May 2023, before slightly declining to 8.52% in August 2023. This pattern indicates a steady increase in general prices throughout the period. The 12-Month Inflation, representing the CPI's year-over-year change, rose from 5.39% in January 2022 to 9.23% in February 2023 and then decreased to 6.73% by August 2023, suggesting a deceleration of price hikes as the year progressed. Notably, food inflation, which directly impacts living costs, soared from 8.9% in January 2022 to 15.8% in October 2022, later settling at 7.5% by August 2023. These fluctuations may reflect supply challenges and varying demand, which seemed to ease by mid-2023. Figure 3 shows inflation rate trends in Kenya.

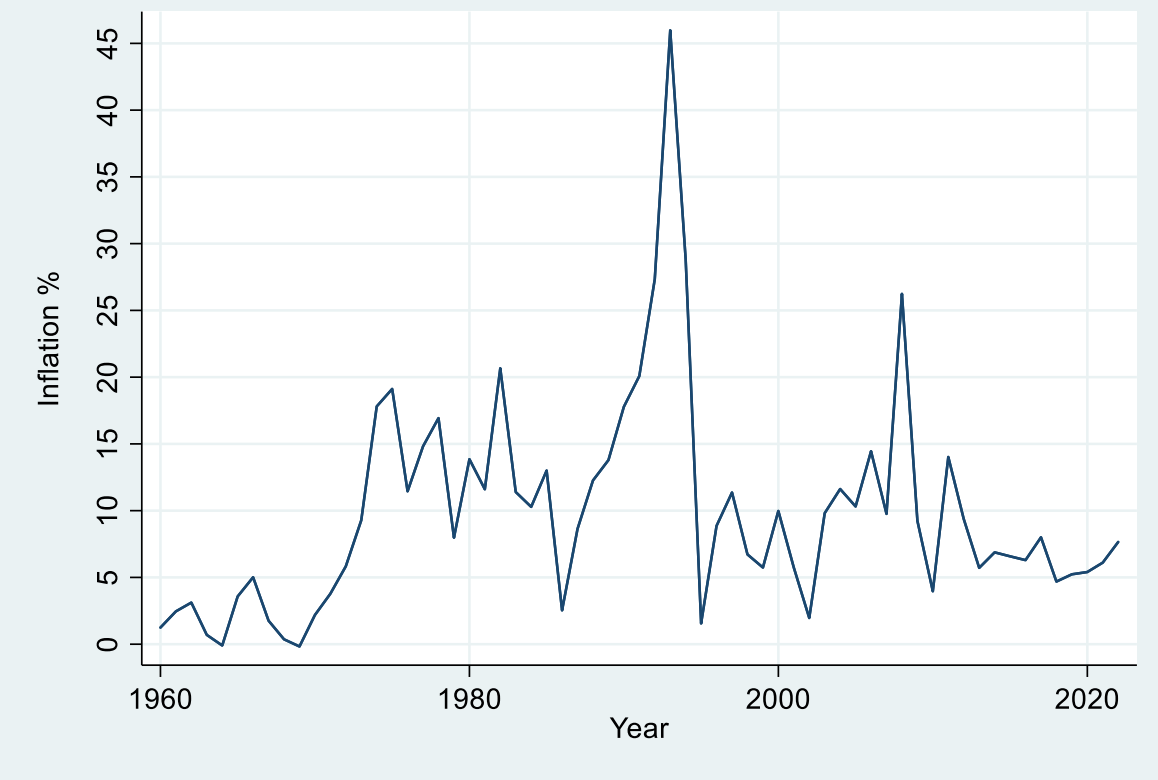

Figure 3: Inflation Rate Trends in Kenya

Source: CBK (2021)

The inflation history depicted in Figure 3 shows significant past volatility, with a notable peak of 54.52% in March 1984 and substantial reductions in recent years due to improved economic policies. Kenya's shift towards a modernized inflation-targeting approach aims to mitigate such extremes and sustain economic stability.

The Central Bank of Kenya (CBK) adopted inflation targeting in 2011 to stabilize prices and control inflation. The CBK adopted an explicit inflation target range of 2.5% above or below 5%, moving away from backward-looking monetary aggregate targets (CBK, 2017). Despite these efforts, Kenya faces persistent challenges with high and volatile food prices, significantly impacting low-income households who spend a substantial portion of their income on food (KNBS, 2022; KIPPRA, 2020). While the CBK has met its overall inflation targets, it struggles to manage food price shocks due to global commodity price fluctuations, exchange rate changes, climatic conditions, and regional conflicts (Durevall and Sjö, 2012; KIPPRA, 2020).

PROBLEM STATEMENT

This persistent volatility undermines Kenyans' macroeconomic stability and well-being, exposing the limitations of inflation targeting in a context reliant on food imports and rain-fed agriculture. The current research largely overlooks the relationship between inflation targeting and food price stability. This study aims to fill this gap by assessing how inflation targeting influences food price volatility in Kenya by offering policy recommendations for achieving food price stability. These include enhancing food security and farmer incomes through investments in climate-resilient

agriculture, strategic food reserves, border monitoring, and regional trade, suggesting a multifaceted approach beyond mere monetary policy.

This study aims to assess inflation targeting and its influence on food price volatility in Kenya, with the following specific objectives:

i. Analyzing the impact of food prices on overall inflation in Kenya.
ii. Examining the influence of international food prices on domestic food prices in Kenya.
iii. Assessing the effectiveness of inflation-targeting food inflation in Kenya.

LITERATURE REVIEW

This section reviews the theoretical and empirical perspectives on inflation targeting within Kenya, exploring how this monetary policy framework, aimed at maintaining price stability, is integral to the Central Bank of Kenya's goals. Achieving a balance between controlling inflation and fostering sustainable growth is crucial to address economic growth and stability. The theoretical review emphasizes the critical role of central banks in managing expectations and stabilizing inflation through various economic theories and policies. The Rational Expectations Theory introduced by Robert Lucas in 1970 outlines how individuals' expectations, when aligned with a credible central bank's actions, simplify their efforts to maintain stable inflation rates. The Time-Inconsistency Theory, developed by Kydland and Prescott (1977), explains the importance of maintaining consistent inflation targets to prevent policymakers from deviating from prior commitments, thus enhancing trust and credibility.

The Taylor Rule, formulated by John Taylor in 1993, is a practical guideline for central banks to adjust their interest rates in response to changes in inflation and economic output, highlighting its significance in stabilizing prices and managing food price volatility in developing economies. The New Keynesian Phillips Curve, advanced by Galí and Gertler in 1990, integrates the role of future inflation expectations, arguing that effective communication of inflation targets by central banks can stabilize current inflation and align public behavior with monetary policy goals. This comprehensive approach underlines the interconnectedness of these theories in forming a robust framework for monetary policy aimed at achieving economic stability.

The empirical literature review extensively explores the dynamics of inflation, food price volatility, and the role of monetary policies, with a particular focus on Kenya. Central banks are tasked with the challenge of balancing price stability with economic growth, yet the direct effects of inflation-targeting food price volatility remain insufficiently explored. Key studies, such as Wanjuki and Muriithi (2022), have evaluated the effectiveness of Seasonal Autoregressive Integrated Moving Average (SARIMA) models in forecasting food and beverage prices, highlighting their importance for monetary policy and price stability. They noted a decline in model accuracy over longer forecast periods, potentially affecting policy decisions. Similarly, Oduor et al. (2021) addressed the economic repercussions of inflation in Kenya's manufacturing sector, identifying how increased production costs can deter foreign investment and influence food prices. Lidiema (2020) explored the impact of trade openness and oil prices on food inflation, suggesting strategies to stabilize food prices and lessen dependency on rain-fed agriculture. Okwori and Abu (2017) and Berg et al. (2005) further analyze the constraints of monetary policy in effectively managing inflation, particularly in response to external shocks and a large informal sector. Overall, while individual studies touch on various components influencing inflation, a comprehensive analysis that directly links inflation targeting to food price dynamics in Kenya is required to provide clearer insights.

METHODOLOGY

Theoretical Framework: The GARCH Model

The Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model is a popular econometric tool to study and estimate time-varying volatility in financial and economic time series data. Volatility, in this context, refers to the dispersion or variability of returns or prices.

The GARCH (p, q) model specification is given by:

$y_t = y'_t\theta + \varepsilon_t$ ……(1)

This is a basic equation linking the outcome (y_t) to a function of its past values with a random shock or error term (ε_t).

$H_t = \alpha_0 + \alpha_{1\varepsilon 2t-1} + \ldots\ldots + \alpha_p\, \varepsilon_{2t-p} + \phi_1 H_{t-1} + \ldots\ldots + \phi_q H_{t-q}$ ……(2)

Where;

ε_t is the error term,

H_t represents the conditional variance of the error term, which varies over time.

Equation (2) models how current volatility is influenced by past squared shocks (ε_{2t-p}) and past volatilities.

The conditional mean of the series is frequently determined by the AR process. Higher order lag terms up to (p, q) are present in GARCH (p, q) models (Engel, 2001). The GARCH (1, 1) process model, developed by Engel (1982) and Bollerslev (1986), is the most widely used volatility measure model. This is a special case of the GARCH model where only one lag of the error term and the conditional variance are considered. The GARCH (1, 1) model can be stated as:

$$y_t = \alpha_{0,} + \alpha_{1,t} y_{t-1} + \varepsilon_t \quad (3)$$

$$\varepsilon_t = H^{1/2}_t\, u_t \quad (4)$$

$$H_t = \alpha_0 + \alpha_1 \varepsilon^2_{t-1} + \beta_1 H_{t-1} \quad (5)$$

Equation (3) represents a time series process, where the outcome at time (t) depends on its own past value, a constant term, and a random shock.

In Equation (4), (ε_t) is decomposed into the standard deviation of the volatility ($H^{1/2}$) and a purely random shock (u_t) with mean zero and standard deviation of one.

In Equation (5), the conditional variance (H_t) is influenced by the past squared error term and its own past value.

Equations (3), (4) and (5) are used to estimate conditional variance measures of volatility of the consumer price inflation. The GARCH model is able to provide a dynamic representation of volatility. The GARCH model captures how present volatility is influenced by past shocks and past volatilities in a series.

Empirical model Specification

Food inflation is affected by multiple factors (Andrle *et al*., 2015): Global food prices; Exchange rates; Domestic demand and supply factors; and Monetary policy (which encompasses inflation targeting). Given these factors, and following Andrle *et al*., (2015) the following models for food inflation will be used:

Food Price Index Relation

$$\pi_t^f = \omega\pi_t^f + (1-\omega)\pi_t^{nf} \quad \text{.....(6)}$$

Where;

π_t^f is the food inflation

π_t^{nf} is the non-food inflation

ω is the weight of food in the consumer basket

The weight ω is a representation of the importance or contribution of food prices to the overall consumer basket. The weight can range from 0 to 1.

3.2.2 Deviation of Domestic and International Food Prices

$$dev_t = P_t^f - (P_t^{*f} + S_t) \quad \text{.....(7)}$$

where:

dev_t is deviation of domestic and international food prices

P_t^f is the domestic price of food

P_t^{*f} is the international price of food

S_t is the nominal exchange rate

Equation (3.7) captures the difference between the domestic food price and what the international food price would translate to in the domestic market, given the exchange rate.

Phillips Curve for Food Prices (Relating food inflation to output gap and deviation from target inflation)

$$\pi_t^f = \beta_1\pi_t^{*f} + \beta_2 dev_t + \beta_3 y_{gapt} + \beta_4(\pi_{target} - \pi_t^f) + \varepsilon_t \quad \text{..... (8)}$$

where:

π_t^{*f} is the international food inflation

y_{gapt} represents the output gap

π_{target} is the central bank's inflation target

ε_t is the error term

The term $\beta_4(\pi_{target} - \pi_t^f)$ represents the effect of inflation targeting on food inflation. If food inflation deviates from the target, this term captures the effect of the central bank's efforts to bring it back to the target.

Equation (8) is a representation of the Phillips Curve specifically tailored for food prices. It will be used to evaluate the impact of inflation targeting on food inflation.

Data Type and Source

This study used a quantitative method to analyze quarterly time-series data from 2011 to 2022. It examines a range of economic indicators such as the Consumer Price Index (CPI), food prices, production figures, and exchange rates. The data sourced from the Central Bank of Kenya (CBK), Kenya National Bureau of Statistics (KNBS), and Food and Agriculture Organization (FAO) are crucial for assessing the dynamics of inflation and food price volatility in Kenya. This comprehensive dataset also helps evaluate the effectiveness of the CBK's inflation-targeting policies during this period.

EMPIRICAL RESULTS AND DISCUSSION

Descriptive Statistics

Table 1 presents descriptive statistics of study variables.

Table 1: Descriptive Statistics of Study Variables

Variables	Observations	Mean	Standard Deviation	Min	Max
Food Inflation	154	9.082	4.3265	-1.15	21.52
Non-food Inflation	154	73.557	13.838	46.07	101.07
Food and Non-alcoholic beverage weight	154	0.36	0	0.36	0.36
Domestic Food Price Index	154	96.025	30.288	48.1	155.6
International food price Index	154	111.86	17.515	84.9	159.7
Exchange Rate	154	101.46	13.865	81.03	149.4
Interest Rates	154	14.649	2.504	11.75	20.34
Consumer Price Index	154	93.468	21.200	56.48	136.71
Inflation Deviation	154	-18.390	26.198	-80.370	17.5

Source: Computations using study data

The results highlight the significant fluctuations in food and non-food inflation rates during the review period. Food inflation ranged from -1.15% to 21.52%, with an average of 9.08% and a standard deviation of 4.33. This variance indicates significant volatility in food prices, which impacts consumer purchasing power. In contrast, non-food items, such as alcohol, exhibited even greater volatility, peaking at 101.1%, with an average price increase of 73.56% and a standard deviation of 13.84, suggesting more substantial price fluctuations compared to food items.

The weighted average of food and non-food beverages remains constant throughout the study, indicating consistent consumer spending patterns on these goods. The international food price index, with values ranging from 48.1 to 155.6 and an average of 96.03, reflects the high cost of

imported food, which directly influences domestic food prices. These international price changes affect domestic markets differently because of the varying elasticities of demand and supply.

Exchange rates also showed considerable variation, from 84.9% to 159.7%, with an average of 111.86 and a standard deviation of 17.52. This variability in exchange rates further complicates the relationship between international and domestic food prices, particularly due to Kenya's heavy reliance on imports. Interest rates during the study period ranged from 11.75% to 20.34%, averaging 14.65%, indicating high borrowing costs that could deter investments and reduce consumer spending. The Consumer Price Index varied significantly from 56.48% to 136.7%, with an average of 93.47%, indicating a rapid inflation rate that severely affects consumer purchasing power and overall economic performance. These findings underscore the complexity of managing inflation in Kenya, which is affected by global market trends and local economic conditions.

Diagnostic Tests

Time Series Unit Root Test

The time series unit root test, which is essential for verifying the stationarity of the variables under study, employed the Augmented Dickey Fuller (ADF) method. The test was applied at the 5 percent significance level across all variables, this test assessed their stability over time. It was conducted at both the intercept and trend levels, and at the intercept alone, to minimize the risk of misleading results. This rigorous approach ensured the reliability of the analysis by confirming the absence of spurious behavior in the data, which could skew the findings. The detailed results of this test are thoroughly recorded in Table 2, serving as the basis for further analysis and discussion.

Table 2: Stationarity Test Results

Variable	Level	t-Statistics	P-value	Comment
Consumer Price Index I(1)	Intercept	-7.5419	0.000	Stationary
	Trend and Intercept	-7.7084	0.000	Stationary
Domestic Food Price index I(1)	Intercept	-6.6273	0.000	Stationary
	Trend and Intercept	-7.0229	0.000	Stationary
food Inflation I(1)	Intercept	-10.8769	0.000	Stationary
	Trend and Intercept	-10.8598	0.000	Stationary
International Food Price Index I(1)	Intercept	-8.8657	0.000	Stationary
	Trend and Intercept	-8.9745	0.000	Stationary
log domestic food price index I(1)	Intercept	-7.2428	0.000	Stationary
	Trend and Intercept	-7.2248	0.000	Stationary
log international food price index I(1)	Intercept	-8.5579	0.000	Stationary
	Trend and Intercept	-8.6879	0.000	Stationary
Non-food Inflation I(1)	Intercept	-11.5958	0.000	Stationary
	Trend and Intercept	-11.5799	0.000	Stationary
Exchange Rate I(1)	Intercept	-7.6467	0.000	Stationary
	Trend and Intercept	-7.8871	0.000	Stationary
Interest Rates I(1)	Intercept	-9.9741	0.000	Stationary
	Trend and Intercept	-9.9471	0.000	Stationary

The analysis primarily tested whether the time-series data exhibited nonstationarity (unit root) or stationarity. Rejecting the null hypothesis confirmed that the variables achieved stationarity once after differencing. Conversely, accepting the alternative hypothesis signifies non-stationarity, irrespective of observation at the level or after differencing. This decision was based on intercept-only and trend-inclusive tests.

The findings outlined showed that all variables reached stationarity after the first differencing, considering both intercept-only and intercept-with-trend scenarios. This was determined by p-values associated with the t-statistics, which were below the 0.05 threshold at a 5% significance level, leading to the rejection of the null hypothesis of non-stationarity. Thus, data variance does not depend on time, suggesting a return to a long-run deterministic path. This minimizes the likelihood of spurious results—false acceptance or rejection of true results—underscoring the importance of verifying stationarity for all study variables before conducting any further analysis.

Correlation Test results

The Spearman Moment of Correlation test was conducted to ensure a low correlation among all the variables used in the model. Initially, variables not expressed as percentages, ratios, or indices were normalized using natural logarithms. However, because all variables already met this criterion, no conversions were necessary. The correlation analysis was conducted at the 5 percent statistical level, revealed that the weight of food in the consumer basket is highly correlated with the domestic food price index, thus precluding their joint use in the model. The results varied among the variables; some displayed negative correlations, while others showed positive correlations. A correlation coefficient threshold of 0.8 distinguished between modest and significant relationships, aiding in evaluating the strength of associations among factors. Notably, the exclusion of the food component's weight from the consumer price index is significant in the context of Kenya's inflation targeting and its effects on food price stability. Variables which were highly correlated were not used in the same model. This was necessary to avoid chances of getting spurious results.

Co-integration test

The Johansen co-integration test was applied to analyze the long-term relationships between variables that achieved stationarity after first differencing. Conducted at a 5 percent significance level, this test rigorously evaluated the connections between the variables, considering trends to ensure the precision and pertinence of the results. The test, conducted at a 5 percent significance level, confirmed cointegration among the variables, with four out of ten equations showing cointegration. The test shows that Vector Error Correction Model (VECM) was applicable to estimate these relationships, enhancing the understanding of the dynamics within the data.

Empirical Results

The empirical analysis focused on three objectives that are crucial to understanding Kenya's inflation dynamics, especially the impact of food prices. The study first examined how food prices affect the overall inflation rate, highlighting their significant role owing to their volatility and substantial weight in the consumer price index. Second, it explores the effects of international food prices on domestic prices in Kenya, which is crucial for assessing how global market fluctuations influence local economic conditions. Finally, the analysis evaluated the effectiveness of inflation targeting by the Central Bank of Kenya in managing food price volatility and economic stability. The results were presented based on the objectives of the study as follows;

Impact of food prices on the overall inflation in Kenya

The This study evaluates the impact of food prices on overall inflation in Kenya using a Vector Error Correction Model (VECM). VECM is well suited for analyzing time-series data that, although nonstationary, exhibit long-term equilibrium relationships. This model facilitates an understanding of the adjustment speed and direction of variables in achieving equilibrium post-shock. Food prices, which constitute approximately 36% of Kenya's consumer price index, significantly influence the country's inflation rate. For example, in February 2024, Kenya recorded a year-on-year decrease in food inflation to 6.9%, the lowest during the study period. This underscores the direct effect of food price changes on national inflation dynamics.

The VECM results, presented in Table 3, elucidate the short- and long-term interactions between food prices and overall inflation, revealing the responsiveness of inflation to food price fluctuations over time. Although the specific results are not detailed here, the findings provide a thorough analysis of the interplay between food prices and inflation, offering critical insights for effective inflation management by policymakers.

Table 3: Impact of food prices on the overall inflation in Kenya

		Coefficients						
Variables	Adjustment Speed	CPI	FII	NFI	PDev	Weight	Exch Rate	Constant
CPI	-0.5082*** (0.1208)	0.04169** (0.1703)	0.144** (0.0719)	-0.0071 (0.012)	0.1446** (0.0719)	-0.248** (0.4221)	18.83** (8.971)	0.0876** (0.0459)
FII	0.0016 (0.0055)	-0.004 (0.0076)	-0.298** (0.407)	0.001 (0.006)	-0.004** (0.0017)	0.0018 (0.003)	0.0078 (0.0013)	-0.0033** (0.002)
NFI	3.741*** (0.7266)	-2.0335** (1.0138)	0.0029 (0.053)	-0.2609** (0.0809)	-0.8188** (0.4327)	0.4315** (0.1749)	0.9552** (0.2266)	0.0086* (0.2626)
Price Dev	-0.0002*** (6.84e-06)	-0.6412 (0.9880)	0.0068 (0.0032)	-0.0045 (0.0693)	0.4762** (0.2354)	-0.2237 (0.4102)	0.0689 (0.1617)	-0.4758** (0.2667)
Weight	0.0003*** (0.0006)	-0.3443 (0.9204)	-0.401** (0.0802)	0.0051 (0.0668)	-0.0040 (0.3971)	-0.1334 (0.3952)	0.0554 (0.1555)	-0.4291 (0.2496)
Exch rate	-1.0814** (0.3610)	-0.6495 (0.5037)	0.0141 (0.0314)	0.0587 (0.0402)	0.3747** (0.1126)	-0.2028 (0.2074)	-0.2110** (0.0869)	0.0924** (0.1305)

Source: Computations from study data

This study examines the dynamic relationship between past inflation values and current overall inflation by employing a Vector Error Correction Model (VECM). The findings indicate a significant negative speed of adjustment for past overall inflation values, represented by a coefficient of -0.5082, significant at the 1 and 5 percent levels. This suggests that past inflation quickly adjusts towards a long-term equilibrium at a rate of 50.82 percent annually. Additionally, past short-term inflation significantly impacts current inflation, with a 4.17 percentage point increase for every one percent increase in past inflation. These results confirm previous findings by Wanjiku and Muriithi (2022) and Hoang et al. (2020), who noted significant impacts of past inflation on current levels, although Berg *et al.,* (2005) found no effect of past food inflation on current levels.

Further analysis revealed that past overall inflation does not cause non-food inflation but significantly affects food inflation and price deviations between international and domestic food prices. It also affects exchange rates and the weighting of food prices in consumer spending. The food inflation index shows a significant positive effect on overall inflation, with a 14.4 percentage point increase for each one percent increase in the food inflation index. In contrast, non-food inflation has a negligible and statistically insignificant effect on overall inflation. Price deviations between international and domestic food prices significantly increase overall inflation, indicating a 14.46 percentage point rise for every one percent increase in this difference.

Finally, a negative coefficient for the weight of food in the consumer basket suggests that increased spending on food reduces overall inflation slightly in the short run, whereas changes in the exchange rate increase inflation, underscoring the influence of currency valuation on import prices and overall economic inflation.

Table 4: Long-run impact of food price on overall inflation

Dependent Variable: Overall Inflation (CPI)				
Independent Variables	Coefficients	Standard error	z	P>|z|
_cel Consumer Price Index	1			
Non-food inflation	-0.1302	0.0222	-5.88	0.000
Price Deviation	-0.0015	0.005	-0.28	0.780
Inflation targeting	-00005	0.006	-0.01	0.994
Exchange rate	-0.1416	0.0296	-4.77	0.000
Food inflation	-0.2215	0.0388	-5.71	0.000
Constant term	-0.2278			
Chi-Square	142.87	P>Chi-Square		0.000
Der (Sigma_m1)	0.0003	Log Likelihood		-885.89
Durbin Watson	2.077	Observations		151

Source: Computations from study data

The results indicate that the model is appropriate for analysis, as evidenced by a chi-square probability value below 0.05 at a 5 percent significance level. Additionally, the Durbin Watson statistic of 2.08 suggests no serial autocorrelation, affirming the model's reliability. According to the rule of thumb, a Durbin Watson value above 1.8 confirms the absence of serial autocorrelation, leading to the conclusion that there is no serial autocorrelation between the error terms and the independent variables used in this study.

In the long-term analysis, the variables considered have a negative and significant impact on overall inflation at the 5 percent significance level. The exceptions were price deviations and inflation targeting, which involve the difference between international and domestic food prices. These findings underscore the complex influence on inflation and highlight specific areas that may require targeted economic policies.

Effect of international food price on domestic food price in Kenya

The second objective of this study was to explore how international food prices affect domestic food prices in Kenya. To achieve this, the study utilized a Vector Error Correction Model (VECM) regression. The results, detailed in Table 5, highlight the rate at which domestic prices respond to international food price changes, and establish a long-term equilibrium relationship.

Table 5: Effect of international food price on domestic food price

	Coefficients							
Variables	Adjustment Speed	DFPI	CPI	NFI	IFPI	Exch rates	Price Dev	Constant
DFPI	-0.0556** (0.0230)	-0.133 (0.1695)	0.0028** (0.0036)	0.0017 (0.0029)	0.0098** (0.016)	0.0069* (0.0063)	-0.004** (0.0082)	0.0053** (0.0095)
CPI	4.4724*** (1.063)	-1.203 (7.830)	0.0417 (0.168)	-0.0218* (0.0134)	-18-83 (8.971)	-0.0153 (0029)	-0.0816 (0.0377)	0.0356** (0.0436)
NFI	-32.928 (6.394)	35.89 (47.10)	-2.034** (0.081)	-0.261** (0.081)	-0.8188 (0.4327)	0.4315** (0.1749)	0.9552** (0.2266)	0.008** (0.2626)
IFPI	1.305 (6.072)	-5.605 (44.72)	-0.268 (0.962)	-0.0033 (0.0768)	-0.108 (0.411)	4.687 (51.24)	-0.587** (0.2151)	-0.433** (0.2493)
Exch Rates	-9.518** (3.177)	4.773 (23.40)	-0.649 (0.504)	0.0587 (0.0402)	0.128 (0.215)	-0.211** (0.087)	0.375** (0.1126)	0.0924 (0.1304)
Price Dev	-3.214 (6.287)	9.036 (46.31)	-0.6033 (0.997)	0.0144 (0.0796)	29.22 (53.05)	0.0913 (0.172)	0.429** (0.223)	-0.509** (0.2582)

Source: Computations from study data

The results indicate that the domestic food price index (DFPI) adjusts to equilibrium at a rate of 5.56% per period, as evidenced by a statistically significant negative adjustment speed of -0.0556 at the 5% significance level. However, the correlation between the past and present DFPI values was not statistically significant, suggesting no persistent relationship between them.

The Granger causality tests reveal that the consumer price index, international food price index, exchange rate, and price deviations influence the DFPI, whereas non-food inflation does not. The constant term in the model is positive (0.0053) and significant, implying that the DFPI persists even without the studied factors, influenced by elements such as production costs, taxes, and market supply dynamics.

The overall inflation coefficient (CPI) is 0.0028, significant at the 5% level, indicating that a 1% increase in the CPI leads to a 2.8% increase in the DFPI, a less-than-proportional response to general inflation increases, as noted by Oduor et al. (2021). Conversely, the coefficient for non-food inflation is small (0.0017) and insignificant, suggesting a minor impact on the DFPI.

The international food price index significantly affects DFPI, with a 1% increase in international prices raising DFPI by 0.98%, reflecting Kenya's dependence on imports. This relationship is supported by findings from Ben Hassen and EI Bilali (2022) and Jagtap et al., (2022). The impact of the exchange rate is also significant, where a 1% increase in the exchange rate raises the DFPI by 0.69%. However, price discrepancies between international and domestic markets show a negative effect, where greater disparities increase the DFPI, aligning domestic prices more closely with the global market trends.

Effect of inflation targeting on food inflation in Kenya

The final objective of this study was to examine the impact of the Central Bank of Kenya's inflation-targeting policies on food inflation. Using a Vector Error Correction (VEC) model for short-term estimation, we assessed how various factors influence food inflation, with the findings presented in Table 8. Inflation targeting aims to stabilize prices, with a focus on price stability as the main goal. This policy is particularly important in Kenya, where food prices heavily influence overall inflation because of their significant share in the consumer price index. The VEC model analysis helps to elucidate the immediate effects of these policies on food inflation, tracking how

food prices adjust to changes in the target inflation rate set by the Central Bank. The analysis is critical given the large role of food in Kenya's consumer price index and the country's exposure to global price shifts. It provides essential insights into the effectiveness of the Central Bank's inflation targeting in stabilizing food prices and offers valuable data for policymakers, economists, and stakeholders in food security and economic stability.

Table 6: Effect of inflation targeting on food inflation

	Coefficients							
Variables	Adjustment Speed	FI	FPI	CPI	IFPI	Exch rates	INFL TARG	Constant
FI	-0.333*** (0.125)	-0.407*** (0.102)	26.73 (28.62)	0.0295** (0.588)	0.096 (0.259)	0.054** (0.107)	0.247** (0.0944)	0.181** (0.168)
FPI	0.0015** (0.0006)	-0.0007 (0.0006)	0.0092 (0.168)	-0.0071 (0.0034)	0.0039 (0.0015)	-0.0055 (0.006)	0.005 (0.0055)	0.0024 (0.0099)
CPI	0.0873** (0.0353)	-0.042** (0.0287)	0.086 (0.072)	-0.191 (0.165)	-11.77 (9.086)	0.0051 (0.029)	0.011 (0.0265)	0.0159 (0.0473)
IFPI	-0.211 (0.193)	0.166 (0.157)	-0.208 (0.398)	-0.335 (0.906)	16.44 (49.73)	0.107 (0.164)	-0.427** (0.145)	-0.346 (0.259)
Exch Rates	-0.334** 0.101	0.155** (0.082)	-37.93 (25.97)	-0.169 (0.473)	0.202 (0.208)	-0.213** (0.086)	0.261** (0.075)	0.1922 (0.1354)
INFL TARG	-0.315** (0.199)	0.210** (0.162)	34.46** (51.30)	-0.438 (0.934)	-0.336 (0.4104)	-0.248 (0.422)	0.504** (0.149)	-0.396** (0.268)

Source: Computations from study data

The findings in Table 6 indicate that the speed of adjustment for food inflation is significant at -0.333, meaning that past disequilibrium in food inflation adjusts to equilibrium at a rate of 33.3% annually. Additionally, a significant negative coefficient of -0.47 for past food inflation values suggests that they influence current inflation levels, indicating that high past inflation typically leads to subsequent price stabilization efforts. The study also found that the consumer price index (CPI), exchange rates, and inflation targeting policies significantly influence food inflation in Kenya, whereas the food price index (FPI) and the international food price index (IFPI) do not.

Regarding the food price index, a coefficient of 26.73, although statistically insignificant, suggests that any unit increase in the FPI could raise food inflation by approximately 26.73 percentage points. This contrasts with findings from Nigeria by Okwori and Abu (2017) but aligns with Musa (2021), who noted a similar trend in an unspecified economy. The CPI coefficient of 0.0295, significant at 5%, indicates that a 1% increase in CPI leads to a 2.95% increase in food inflation, supporting the findings of Ben Hassen and EI Bilali (2022). The exchange rate coefficient of 0.054 suggests that a 1% increase in exchange rates results in a 5.4% increase in food inflation, reflecting the impact of import costs in import-dependent countries such as Kenya. This was confirmed by Amanda et al. (2023), but contradicted by Ha et al. (2020). An inflation targeting coefficient of 0.247, significant at the 5% level, implies significant shifts in food prices when inflation deviates from targets, confirming the findings of Jagtap *et al*., (2022).

Overall, the analysis in Table 7 demonstrates the long-term impact of inflation targeting food inflation, highlighting its critical role in stabilizing prices in developing economies and managing food price volatility. This evidence underscores the effectiveness of inflation targeting as an economic strategy in regions where food prices are crucial for economic stability and consumer welfare.

Table 7: Long-run effect of inflation targeting on food inflation

Dependent Variable: Food Inflation				
Independent Variables	Coefficients	Standard error	z	P>|z|
_cel Food Inflation	1			
Consumer price index	9.008	1.074	8.39	0.000
Price Deviation	-0.005778	0.043	-0.29	0.770
Inflation targeting	-0.01578	0.0539	-0.29	0.894
Exchange rate	1.073	0.2444	4.39	0.000
Non-food inflation	52.75	6.897	7.65	0.000
Constant term	0.1679			
Chi-Square	94.107	P>Chi-Square		0.000
Der (Sigma_m1)	0.00005	Log Likelihood		-531.39
Durbin Watson	2.32			

Source: Computations from study data

The results demonstrate the suitability of the model for analyzing the effects of inflation targeting on food inflation in Kenya, as evidenced by a chi-square probability value below 0.05. The Durbin Watson value was 2.32 indicates no serial autocorrelation among variables. Despite the negative coefficient suggesting a minor impact, inflation targeting insignificantly affects long-term food inflation.

Long-term data reveal a significant positive correlation between overall inflation and food inflation, with a coefficient of 9.008, supporting the hypothesis that a higher overall inflation increases food inflation. This aligns with Oduor *et al.*, (2021), who suggest that rising general prices significantly impact food prices, escalating the overall inflation rate. Conversely, this study indicates that variations between international and domestic food prices minimally influence Kenya's food inflation, with a minor negative coefficient of -0.0058, contradicting Amanda et al. (2023), who noted a substantial impact.

Furthermore, the exchange rate significantly boosts food inflation in the long run with a coefficient of 1.073, opposing Ha *et al.*, (2020), who observed no significant short- or long-term effects. Non-food inflation significantly raises food inflation by 52.75 percentage points for each percentage increase in non-food prices. Inflation targeting has a negligible and statistically insignificant negative effect, reducing food inflation by 1.58 percentage points per percent deviation from the target. This finding contradicts Jagtap et al. (2022), who reported a beneficial effect of inflation-targeting food inflation, highlighting the complex dynamics between policy measures and economic indicators.

CONCLUSION AND POLICY IMPLICATIONS

This study aimed to analyze the impact of food prices on overall inflation in Kenya, the effect of international food prices on domestic prices, and the influence of inflation-targeting food inflation. The results indicate that, in the short term, food inflation, discrepancies between international and domestic food prices, and exchange rates significantly impact overall inflation. However, in the long run, non-food inflation and exchange rates predominantly influence overall inflation because

of the essential use of non-food goods, such as petroleum, in production processes, which affects food prices when their costs rise.

The findings revealed that international food prices significantly influence domestic food prices because of Kenya's heavy reliance on imported goods, impacting local prices in both the short and long run. The analysis also showed that, while inflation targeting significantly impacts food inflation in the short run by aligning prices with set targets, it does not significantly affect food inflation in the long run.

Overall, the study confirms that food prices and inflation targeting play crucial roles in inflation dynamics in Kenya. Despite the effectiveness of inflation targeting, its long-term impact on stabilizing food prices is minimal, suggesting the need for a multifaceted approach to enhance tax system responsiveness and revenue generation.

These findings have several significant policy implications. Government and monetary authorities should implement macroeconomic policies that control money supply to curb aggregate demand and manage inflation, thereby stabilizing food prices and improving living standards. Maintaining stable exchange rates is essential to support affordable food prices and discourage excessive imports, which can distort local markets. Additionally, effective inflation targeting requires robust support through comprehensive policies that integrate domestic and international economic dynamics to ensure price stability and sustainable economic growth.

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