International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

# Exploring the Correlation Between Monetary Policy and Food inflation in Zambia

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**Abstract**
This study provided empirical analysis for the relationship between monetary policy and food inflation in Zambia within the time period of the first quarter of 2016 to the second quarter of 2023. It studied this relationship isolating food inflation from overall inflation to provide better policy implications that can enhance welfare for the Zambian populace. The Autoregressive Distributed Lag Model and the Error Correction Model were employed for the short run and long run analysis respectively. The findings postulate that there exists a significant relationship between monetary policy and food inflation. The monetary policy rate and the growth in the broad money have a destabilising relationship with food inflation. The depreciation in the domestic currency to foreign currency increase food inflation in the long run. Whereas the exchange rate channel plays a role of greater significance amongst the studied monetary policy tools. Inflation targeting, although significant, adds inflationary pressure of domestic food inflation, highlighting the need for stern policies that can individually factor in food inflation.

**Keywords:** Inflation, Monetary Policy, Inflation, Monetary Policy,

## 1.0 Introduction

Within an economy consumption spending is captured by a fixed basket of goods and services, known as the consumption basket, and is used as an index, to measure changes in the general price level. The upward movement of the general price level over time is referred to as inflation and is quantified as a percentage variation of the consumer price index (Ibrahim, 2019). Hence, food inflation is the rate of increase in food prices over time. Monetary policy is a set of tools and actions used by a country's central bank with the aim of achieving macroeconomic objectives such as price stability, economic growth, and full employment. These tools include interest rates, money supply, exchange rates, and other instruments. The Bank of Zambia is responsible for delegating and conducting monetary policy. Its primary monetary objective is price stability, which is set to be attained by maintaining inflation within the target range of 6-8 percent over the medium term (Bank Of Zambia, 2016). The stance the central banks take can moderate aggregate demand which can help maintain price stability.This chapter introduced the topic under study and the research problems discovered that will be justified. Thereafter, the researcher specified the aim of the study through objectives implementing questions, and a hypothesis that the findings can satisfy. Zambia has been reclassified as a low-income country, with inadequate food security. Approximately, 3.8 million Zambians have been assessed to be lacking sufficient food consumption, showing a reduction in

their access to food (World Food Programme, 2023). In May of 2011, year-on-year food inflation hit a record low of 3.50 percent and peaked at 31.60 percent in August of 2021. It has been recorded at 12.0 percent at the end of the third quarter of 2023 (ZamStats, 2023). The Bank of Zambia recently increased the monetary policy rate by 50 basis points following the deviation of inflation from the target in July 2023 (Bank of Zambia, 2023).

In the second quarter of 2023, the annual inflation rate in Zambia continues to be above the target range of 6-8 percent at 9.9 percent, where food and non-food inflation stand at 11.5 percent and 7.9 percent respectively. The Bank of Zambia is responsible for controlling inflation and bringing it back to its target range through monetary policy controls. However, when the fluctuations in inflation are mainly driven by the changes in food inflation, to what extent can monetary policy influence these fluctuations?

## 2.0 Literature Review

This chapter reviewed the relationship between food inflation and monetary policy within the context of the Bank of Zambia's policy objectives. It delved into the core concepts of food inflation, the monetary policy framework, and the Bank of Zambia's policy objectives. Additionally, the chapter reviewed theories concerning inflation, income, and consumption, shedding light on their relevance to this dynamic interplay. An examination of monetary policy mechanisms and a review of empirical literature provided insight into previous research findings. Moreover, it identified the existing gaps in the literature, serving as the foundation for subsequent analysis and research contributions.

### 2.1 Global Trends on Food Inflation and Monetary Policy

The global economic landscape is currently characterized by weak growth prospects, heightened uncertainties, and elevated inflation. Several factors are contributing to this challenging environment, including the lingering effects of the COVID-19 pandemic, the ongoing conflict in Ukraine, the growing impact of climate change, and rapidly changing macroeconomic conditions (UN DESA, 2023). Following the beginning of 2021, inflation has rapidly increased to new heights, past historic records in all regions around the world, including advanced, emerging, and low-income countries (Amrouk, 2023). Over the period of 2020 to 2022, food prices in the 71 Net Food-Importing Developing Countries have increased, whereas the rate of increase has declined after topping in April 2022. The decline can be attributed to, among other reasons, falling energy and non-energy prices, monetary tightening on commodity prices, and on global economic activity. Economic policies can also play a role in the rate of food inflation as seen in countries in the Net Food-Importing Developing Countries, where the appreciation of the United States Dollar made importation of food more costly in their respective domestic currencies and contributed to domestic inflation (Amrouk, 2023). However, even as global food prices have been on the decline since mid-2022, domestic food inflation has often remained high and continues to increase. This can be attributed to various factors, such as persistently high import costs, local supply disruptions, and market imperfections. According to the World Bank (World Bank, 2023), early 2023 witnessed food inflation above 5 percent in more than 50 percent of low-income, lower-middle-income, and upper-middle-income countries. This ongoing high inflation in developing nations, which are home to a substantial portion of the world's impoverished population, presents an additional obstacle to poverty eradication.

Although there have been recent signs of inflation easing, projections indicate that it will continue to surpass central bank targets throughout 2023. The anticipated decrease in global inflation is primarily attributed to lower food and energy prices, along with weakening global demand. A notable contributing

factor is the resumption of exports from Ukrainian ports under the Black Sea Grain Initiative, leading to declining global food prices (UN DESA, 2023).

In response to these inflationary pressures, central banks in both developed and developing economies have continued to implement tighter monetary policies in 2023. Their objective is to anchor inflation expectations and maintain credibility (Bianchi & Coulibaly, 2023). The effects of these monetary policy adjustments are gradually permeating through the respective economies.

### 2.2 Southern Africa Regional Food Inflation Trends

While global food and energy prices have moderated, the depreciation of domestic exchange rates has kept food prices high in several southern African economies. Furthermore, persistent and prolonged electricity blackouts in South Africa, Lesotho, Zimbabwe, and Zambia have added substantial costs to agriculture and disrupted food supply chains (FEWS NET, 2023). Year-on-year food inflation for the first quarter of 2023, recorded in May averaged at 11.6 percent in Zambia. It remained stable in the second quarter mainly due to prices of fresh fruits and vegetables. Annual food inflation showed a decline compared to 2022 to 11.6 percent from 14.1 percent in the same period. The trend in food inflation in the country shows a decline in household access to food commodities and their consumption patterns (World Food Programme, 2023).

### 2.3 Relationship Between Food Inflation and Overall Inflation in Low-Income Countries

Studies have observed that elevated average food inflation are recorded in low-income countries and countries where food constitutes a substantial portion of the consumption basket (Anand, Prasad, & Zhang, 2015). Bhattacharya (2017) found that nations with elevated food inflation experience high headline inflation, suggesting a direct relationship between headline and food inflation. Chipili (2021) observed that food inflation feeds into non-food inflation in the short-run causing second-round effects similar to the findings of Pourroy & Ginn (2020). This creates a dilemma for an inflation-targeting central bank in response to inflationary pressure from the food sector.

### 2.3 Bank of Zambia Policy Framework

In April 2012, the Bank of Zambia shifted from a Monetary Aggregate Targeting framework to an Inflation Targeting framework which introduced the monetary policy rate as the benchmark for interest rates. The inflation targeting framework focuses on price stability through managing inflation as its core objective (Cheelo & Thandiwe, 2017). The Bank of Zambia employs the policy rate as the primary interest rate to communicate the stance of monetary policy. This regime is expected, amongst other functions, to enhance the transmission of monetary policy through the interest rate channel to establish a stronger relationship between monetary policy and inflation, inclusive of its sub-components (Funjika, Mwila, & Mulenga, 2022).

Therefore, for precision, relevance and accuracy, this study will only capture the changes in monetary policy and food inflation within the domain of the implementation of the inflation targeting framework.

### 2.4 Empirical Literature

The correlation between monetary policy and food inflation has been carried out in different settings with recent literature exhibiting similar findings that a constrictive monetary policy may turn out to be destabilizing to both food inflation and overall inflation (Bhattacharya, 2017; Iddrisu and Alagidede, 2020; Choudary et al, 2022). These studies have looked at the impact and relationship of monetary policy and food inflation in countries with low incomes and a high food composition in the consumption basket. Choudarry (2022) also finds that monetary tightening is not recommended in the presence of a fiscal policy that subsidizes food prices. In addition, similar to Chipili, Choudarry found that exchange rates

significantly impact food prices. Whereas the interaction between monetary policy on food inflation is found to depend on the production cost and aggregate demand channels (Bhattacharya & Jain, 2020). These findings may indicate the presence of a price puzzle, where food inflation increases following a contractionary monetary policy stance.

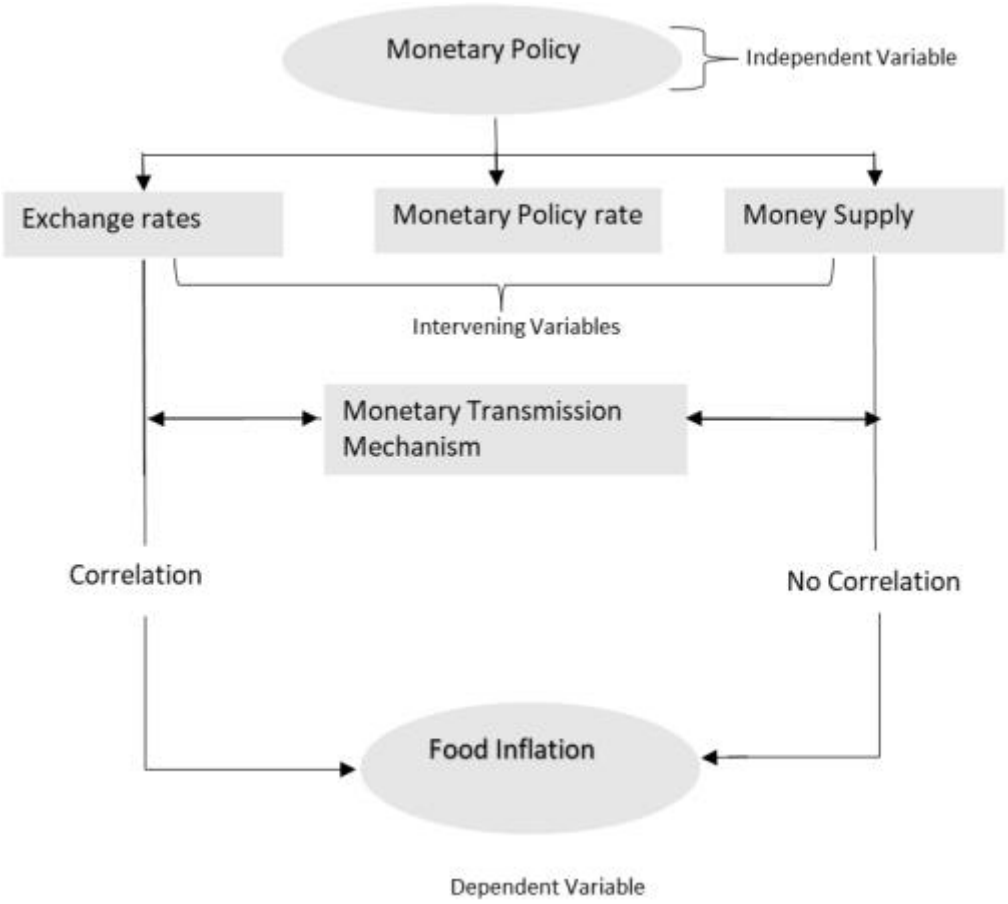



**Figure 1 2.5 conceptual framework of food inflation and monetary policy**

In this conceptual framework, the independent variable is monetary policy, which represents the actions and decisions made by the central bank to control a country's inflation and maintain price stability (Bank of Zambia, 2016). The intervening variables are exchange rates, monetary policy rate, and money supply. These variables act as intermediate factors that are influenced by monetary policy and, in turn, influence the dependent variable, food inflation. The transmission mechanism represents how changes in monetary policy affect these intervening variables and, ultimately, impact food inflation (Mwange, 2022). The dependent variable, food inflation, is the variable of primary interest in this study. It reflects the changes in the prices of food items over time. This establishes a channel on the relationship between monetary policy and food inflation through the transmission of the intervening variables. Based on the models applied to assess the interaction of monetary policy and food inflation in the studies of Haabazoka & Christopher (2016), Chipili (2021), Choudary, et al., (2022). The researcher uses the tools of monetary policy which are exchange rates, monetary policy rate and money supply to conduct the study based on the results of the reviewed literature. These intervening variables will be used to explain the relationship between monetary policy and food inflation through the bridge of monetary policy transmission.

## 2.5 Theoretical Framework

### Keynesian Inflation Theories

The Keynesian inflation theories influenced by John M Keynes emphasize inflation theories such as demand-pull inflation and cost-push inflation (Totonchi, 2011). Demand-pull inflation arises when total demand surpasses total supply and cost-push inflation pertains to price increases caused by changes in supply-side factors like production costs. New Keynesian economics bring out the market imperfections and accentuate the importance of expectations, frictions and policy interventions in modelling inflation outcomes. Chipili (2021) observed that in the short-run food inflation is driven by exchange rates and supply constraints. Therefore, the literature indicates findings consistent with inflation theories under the Keynesian school of thought. In an open economy like Zambia, inflation can mainly originate from monetary and foreign sectors through the money demanded and purchasing power parity, respectively. Usually, as a result of demand-side and supply-side factors (Durevall & Ndung'u, 2001). The increase in aggregate demand in the economy through expansionary monetary and fiscal policies fall under demand-side factors. Whereas supply side factors mirror the increase in the cost of production. Conversely, domestic food supply is also influenced by world food inflation, policy changes, and shocks such as poor harvests (Chipili, 2021)

### Monetary Policy Transmission Mechanism Theory

This refers to the structural systems through which monetary policy changes are channeled to impact the broader economy (Li et al., 2021). Mwange (2022) found the impact of monetary policy through the presence of the interest rates, exchange rates and credit channels of monetary policy transmission. The Interest rate channel, exchange rate channel, and expectations channel are the key transmission channels used in the Zambian Quarterly Models (ZQM). This study made reference to the exchange rate channel and interest rate channel only.

### Interest Rate Channel

Adjustments to monetary policy rate influence the cost of borrowing in an economy. The policy rate is the base rate in which interest rates are configured on. Adjustments in the policy rate affect lending rates which trickles down to affect investments, consumption and finally food prices (Bhattacharya & Jain, 2020).

### Exchange Rate Channel

Exchange rate entails the price of one currency against another. Hence, a devaluation of the Kwacha increases the cost of importing food and food production inputs which result in the increase in food prices. Through this channel, the use of exchange rates as a tool for monetary policy can provide a transmission route on food inflation (Haabazoka & Christopher, 2016). Chisha (2018) found that when breaking down inflation historically, the most significant factor for the majority of the time period has been the real exchange rate gap.

## 3.0 Methodology

### 3.1 Sampling Frame and Sample Size

The sampling method used in the study builds on the time series model that utilizes observations spread across a period of time. According Guntuboyina (2022), a time series model refers to serially collected observations over time from which statistical meaning can be inferred. The data used was primarily secondary data is extracted from historic research done by researchers such as institutions or individuals. This type of data collection is in line with archival research strategies (Saunders, 2009). The sources of

the data collected are as follows: Zambia money supply, M2 collected from the bank of Zambia fortnightly statistics; data on the monetary policy rate and exchange rates, from the Bank of Zambia fortnightly statistics and; food inflation has been collected from the Central Statistics Agency. The study covered data from 2013 quarter 1 to 2023 quarter 2.

**Figure 2.8 Data Sources**

| DATA | SYMBOL | SOURCES |
|---|---|---|
| Zambia Broad Money supply | M3 | Bank of Zambia, fortnightly statistics |
| Monetary policy rate | MPR | Bank of Zambia, fortnightly statistics |
| Exchange rates | USDEXCH | Bank of Zambia, fortnightly statistics |
| Food inflation | FINF | Bank of Zambia, fortnightly statistics, Zambiaa Statistics Agency |
| Non-Food Inflation | NFINF | Bank of Zambia, fortnightly statistics, Zambiaa Statistics Agency |

**4.0 Data Presentation and Analysis**

A stationary time series variable finite variance that is constant overtime, and it does not exhibit seasonality. Stationarity is important as it validates the results of a regression analysis. A non-constant time series on the other hand does not have one or all the characteristics.

Using non-stationary series to run a regression leads to an output that is spurious (Asteriou & Hall, 2021). Furthermore, non-stationary time series contain a mean or variance that are time dependent, implying its variance will approach infinity as time goes to infinity. Both dependent and independent variables are to be stationary. A variable can be stationary at level, I(0), or at first difference, I(1). To test for stationarity, the Augmented Dickey-Fuller test was used. The decision rule for this test is that the variable is stationary if it is greater than the 5 percent critical value. From the different time series regression models, this study utilized the Autoregressive Distributed Lag (ARDL) and Error Correction (EC) Models. The basis of this model selection was arrived at by assessing the characteristics of the variables of interest. The combination of the models are used to analyze the short-run and long-term relationship between two or more time series variables and are used by economists to understand how different variables are related to each other in the short run and long-run (Belete & Chaminuka Petronella, 2019). Pre-estimation tests are carried out on the variables to determine their nature which will serve as a guide on the appropriate model to use. These tests include the Augmented Dickey-Fuller Unit Root Test, Optimal lag Length, Johansen Cointegration Test and the Bounds Test.

**Optimal Lag Selection**

A lag is a shift back in time of a variable. The Autoregressive Distribution Lag Model employs the lagged values of the dependent variable and independent variable within the regression. The choice of the lag length defines the optimal lag selection. According to the findings of Liew (2004), the Akaike Information Criterion (AIC) and Final Prediction Error (FPE) when applied to samples below 60, outperform other criteria in that they reduce the likelihood of underestimating while increasing the likelihood of recovering the true lag length. This study selected the lag length under the Akaike Information Criteria.

**Cointegration**

Cointegration is the co-movement among variables over the long run. The time series of the deviations from the cointegrating linear combination is stationary if the two time series are cointegrated. Consequently, a long run equilibrium can only exist because of actual economic factors which is relevant

in conducting this study (Kočenda & Černý, 2015). As such, cointegration is the prerequisite for the existence of an error correction model. The Johansen cointegration test and bounds test were used to test the presence of cointegration.

**Empirical Model Specification**

In the short run, the ARDL is specified as follows

$$\Delta FINF_t = a_{01} + \sum_{i=P}^{p} a_1 \Delta FINF_{t-P} + \sum_{i=p}^{q1} a_2 \Delta MPR_{t-p} + \sum_{i=P}^{q2} a_3 \Delta M3_{t-P} + \sum_{i=P}^{q4} a_4 \Delta USDEXCH_{t-P} + \sum_{i=P}^{q5} a_5 \Delta NFINF_{t-P} + e_t$$

Once cointegration has been confirmed, the Error Correction Model is applied. Within this model, a variables departure from the long-run equilibrium determines both its current direction and magnitude of movement. The long-run model specification of food inflation with the determined lag structure is as follows

$$\Delta FINF_t = a_{01} + \sum_{i=P}^{p} a_1 \Delta FINF_{t-P} + \sum_{i=p}^{q1} a_2 \Delta MPR_{t-p} + \sum_{i=P}^{q2} a_3 \Delta M3_{t-P} + \sum_{i=P}^{q4} a_4 \Delta USDEXCH_{t-P} + \sum_{i=P}^{q5} a_5 \Delta NFINF_{t-P} + \lambda ECT_{t-1} + e_t$$

$$ECT_t = a_{01} + a_1 FINF_{t-p} + a_2 MPR_{t-p} + a_3 M3_{t-p} + a_4 EXGRT_{t-p} + a_5 NFINF_{t-p} + e_t$$

**Where;**

**FINF = Food Inflation**

**NFINF = Non-Food Inflation**

**MPR = Monetary Policy Rate**

**USDEXCH = Exchange rate of the Kwacha against the dollar**

**M3 = Broad Money Supply**

**4.1 Assessment of Findings and Analysis**

**Unit Root Test**

To determine the presence of unit roots in the variables, stationarity tests were conducted on each variable. The Augmented Dickey Fuller test was employed using the Akaike Criterion. The null hypothesis under this test states that the variable has a unit root, indicating non stationarity, whereas the alternative states that the variable has no unit root, it is stationary.

The rule of thumb in absolute terms is that if the t statistic of the Augmented Dickey Fuller test is greater than its critical values, reject the null hypothesis. On the other hand, if it is less than the critical values, accept the null hypothesis. Equally the p-value of the Augmented Dickey Fuller test serves as a rule of thumb. If the p-value is less than 5%, reject the null hypothesis. Whereas if the p-value is greater than 5% accept the null hypothesis.

| VARIABLE NAME | t-ADF Level | 5% Critical Value | Prob-ADF Level | t-ADF First Difference | 5% Critical Value | Prob-ADF Difference | Order of Integration |
|---|---|---|---|---|---|---|---|
| FINF | -1.298 | -1.9449 | 0.176 | -3.963 | -1.949 | 0.0002 | I(1) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| NFINF | -0.771 | -1.949 | 0.3758 | -6.1438 | -1.949 | 0.0000 | I(1) |
| MPR | -0.336 | -1.949 | 0.5576 | -4.405 | -1.949 | 0.0000 | I(1) |
| M3 | 3.805 | -1.949 | 0.999 | -4.432 | -1.949 | 0.0000 | I(0) |
| USDEXCH | 1.055 | -1.949 | 0.2977 | -5.089 | -1.949 | 0.0000 | I(1) |

Using the rule of thumb, the results of the Augmented Dickey Fuller test reveal that food inflation is non stationary at level, that is, in its ordinary state. Due to the presence of non-stationarity the test was run but at first difference. The results prove it is stationary at first difference. Furthermore, the results of the Augmented Dickey Fuller test as shown below, indicate that the USD/K exchange rate is non-stationary at level, I(0). But stationary at first difference, I(1). At level, broad money supply is stationary as the results above indicate. The results of the Augmented Dickey-Fuller unit root test show that non-food inflation becomes stationary at first difference, whereas it is non stationary at level. The results of the Augmented Dickey-Fuller unit root test reveal that the monetary policy rate is non-stationary at level, but stationary at first difference.

**Lag Structure**

To determine each variables lag structure, the VAR Lag Order Selection Criteria was used. The results show that for all the information criteria, the lag length of 1 was chosen by each of the criteria. This can be depicted as the selections with the asterisk symbol. According to Liew (2004), the Akaike Information Criterion, and the Final Prediction Criterion outperform the other information criterion. However, the results still indicated that the lag length selected by these two were still similar to the lag length selected by the rest of the criteria, which is 1 lag length.

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 189.9295 | NA | 5.24e-11 | -9.483566 | -9.270289 | -9.407044 |
| 1 | 318.3977 | 217.4077* | 2.63e-13* | -14.78963* | -13.50997* | -14.33050* |
| 2 | 339.0017 | 29.58517 | 3.52e-13 | -14.56419 | -12.21814 | -13.72245 |
| 3 | 357.8046 | 22.17782 | 5.78e-13 | -14.24639 | -10.83396 | -13.02204 |

**Cointegration**

Cointegration measures the long-run relationship between multiple variables and has been tested for using the Bounds test. The regression equation was tested by running a bounds test to determine cointegration. The results indicate that there is cointegration, and the implication was the existence of both a short-run and long-run relationship in the model. The basis of the test is that, if the trace statistic and maximum statistic are, if greater than the 5% critical value, accept the null hypothesis which states that there is no cointegration in the model. Whereas if the statistics are less than the critical value, reject the null hypothesis. The other test basis, is if the F-statistic if greater than the upper bounds, I(1) of the eigen value, then there is cointegration in the model. The result was indicated that using the F-statistic, there was cointegration.

| **F-Statistic (F-Bounds Test)** | **I(1) 10%** | **I(1) 5%** | **I(1) 2.5%** | **I(1) 1%** |
|---|---|---|---|---|
| 9.9565 | 3.52 | 4.01 | 4.49 | 5.06 |

Due to the presence of cointegration, the short run and long run regression estimations are run. The short run model was run using the ARDL mode, whereas the long run was run using the Error Correction Model. The error correction term was determined and it met its expected standards.

**Results**

The specified lag length for each variable under the ARDL and bound test was; finf(2), usdexch(2), m3(0),

mpr(1), nfinf(0).

**Short-run Results**

In the short run, factors of production remain constant.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.115633 | 0.036322 | -3.183602 | 0.0034 |
| FINF(-1)* | -0.731512 | 0.110054 | -6.646833 | 0.0000 |
| USDEXCH(-1) | 0.009585 | 0.003269 | 2.932130 | 0.0064 |
| M3** | -4.95E-07 | 3.70E-07 | -1.336895 | 0.1913 |
| MPR(-1) | 0.643687 | 0.253602 | 2.538178 | 0.0166 |
| NFINF** | 0.569741 | 0.160046 | 3.559853 | 0.0013 |
| D(FINF(-1)) | 0.379798 | 0.098073 | 3.872610 | 0.0005 |
| D(USDEXCH) | -0.000727 | 0.003017 | -0.240924 | 0.8113 |
| D(USDEXCH(-1)) | -0.006065 | 0.003917 | -1.548532 | 0.1320 |
| D(MPR) | 2.164243 | 0.451561 | 4.792801 | 0.0000 |

In the short run, the previous quarters food inflation is statistically significant, and contributes to the current quarters food inflation. A percentage increase in the previous quarters food inflation will decrease the current quarters food inflation by 0.73 percent. Implying that in the short run, upward movement in food inflation from previous quarters may out pressure on demand, hence, in the next quarter, demand for food will decline, reducing inflationary pressure om current food prices, holding all else equal. Secondly, in the short run, the lagged value of the exchange rate is significant and will result in the upward movement of food inflation by 0.009 units for a K1 increase in exchange rates. This may be explained through the shift to domestic food commodities as imported food commodities seem more expensive. In reality, food prices change in the short run from the retailer's side.

Thirdly, the monetary policy rate from the previous quarter was found significant, hence a 1 basis point increase in the monetary policy rate from the previous quarter will result in an increase in current food inflation by about 0.64 percent. Lastly, in the short run. Non-food inflation was found to feed into food inflation and is significant in explaining food inflation. Food inflation in the current quarter will increase by about 0.569 for a percentage increase in non-food inflation within the current quarter. This present evidence of second round effect in the short run.

**Long-run Results**

In the long run, factors of production are flexible.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| USDEXCH | 0.013103 | 0.004091 | 3.202561 | 0.0032 |
| M3 | -6.77E-07 | 5.10E-07 | -1.326466 | 0.1947 |
| MPR | 0.879940 | 0.286305 | 3.073439 | 0.0045 |
| NFINF | 0.778854 | 0.202445 | 3.847240 | 0.0006 |

In the long run, the exchange rate is significant to explain the food inflation. The results indicate that a K1 increase in exchange rate will result in a 0.013 unit increase in food inflation.

In the lonf run where factors of production are flexible, this may be the case when the Kwacha depreciates, imported food items become expensive in price, imported raw materials add to the cost of production, which further adds to the rising food inflation. Broad money is statistically insignificant in both the short run and the long run. This means that, for any changes in the quantity of broad money within the country, food inflation is not impacted. The monetary policy rate was found statistically significant, implying that a 1 basis point increase in the policy rate will result in approximately a 0.88 percent increase in food inflation. This goes against the aim of inflation targeting. This may be that in the long run, the policy rate

increases the cost of production for domestic food items, and the demand for food does not change as much as to reduce inflationary pressure. Even still in the long run, non-food inflation feeds into food inflation showing statistical significance and implying that a percentage increase in non-food inflation will increase food inflation by 0.779 percent. This may represent the structural and capital side of the production of food.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.115633 | 0.015142 | -7.636621 | 0.0000 |
| D(FINF(-1)) | 0.379798 | 0.082754 | 4.589489 | 0.0001 |
| D(USDEXCH) | -0.000727 | 0.002491 | -0.291841 | 0.7724 |
| D(USDEXCH(-1)) | -0.006065 | 0.003577 | -1.695382 | 0.1004 |
| D(MPR) | 2.164243 | 0.384201 | 5.633100 | 0.0000 |
| CointEq(-1)* | -0.731512 | 0.097388 | -7.511351 | 0.0000 |

The error correction term, also known as the speed of adjustment was denoted as “cointEq”. It holds significance and aligns with expected criteria: it must be between -1 and 0, negative, and statistically significant. The results indicate the significance of the error correction term, and meets the criteria. It implies that about 73 percent of the disequilibrium of food inflation in the previous quarters are corrected for in the current quarter. The variables included in this study do not explain all the variation in food inflation. This ay be due to the consideration of the monetary policy only, on food inflation dynamics. The unexplained variations in food inflation may be highly contributed to supply side factors such as maize prices, shocks in the weather (Chipili, 2021) and other agricultural factors.

**Autocorrelation**

The Breush-Godfrey Serial Correlation statistic test was conducted to test for the presence of autocorrelation. The results indicate that there is no autocorrelation as the probability value of the observed R-squared value is above 5 percent, which indicates the absence of autocorrelation. Thus his model did not suffer from autocorrelation.

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

| | | | |
|---|---|---|---|
| F-statistic | 1.748025 | Prob. F(2,28) | 0.1926 |
| Obs*R-squared | 4.439985 | Prob. Chi-Square(2) | 0.1086 |

**Heteroskedasticity**

The Breusch-Pagan-Godfrey test was conducted to test for the presence of heteroskedasticity. The null hypothesis states that the residuals are homoscedastic, while the alternative hypothesis states that the residuals are heteroskedastic. To reject the null hypothesis, the p-value should be less than 5 percent, and to fail to reject the null hypothesis, the p-value must be greater than 5 percent. The p-value of the test is 0.582, greater than 5 percent or 0.05. hence the model does not suffer from heteroskedasticity.

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

| | | | |
|---|---|---|---|
| F-statistic | 2.326996 | Prob. F(9,30) | 0.0400 |
| Obs*R-squared | 16.44424 | Prob. Chi-Square(9) | 0.0582 |
| Scaled explained SS | 12.47312 | Prob. Chi-Square(9) | 0.1879 |

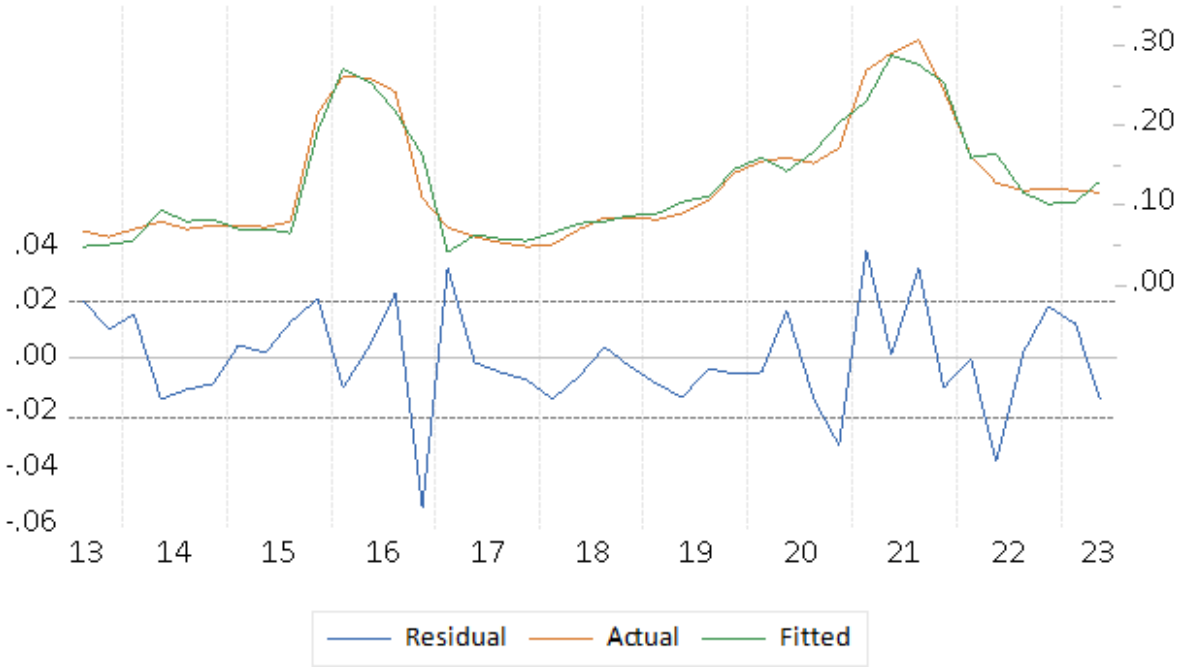
**Multicollinearity**

Serial multicollinearity is present among the independent variables if the probability percentage is close to 1. The results as shown below indicated that there was no multicollinearity among the independent variables of the model. Hence the effect of each independent variable can explained secondary effect of other independent variables. This has shown that the statistical inferences are reliable.

| | FINF | NFINF | M3 | MPR | USDEXCH |
|---|---|---|---|---|---|
| FINF | 1.000000 | 0.831800 | 0.450271 | 0.068008 | 0.604981 |
| NFINF | 0.831800 | 1.000000 | 0.331694 | 0.005576 | 0.546552 |
| M3 | 0.450271 | 0.331694 | 1.000000 | -0.554720 | 0.927117 |
| MPR | 0.068008 | 0.005576 | -0.554720 | 1.000000 | -0.483640 |
| USDE... | 0.604981 | 0.546552 | 0.927117 | -0.483640 | 1.000000 |

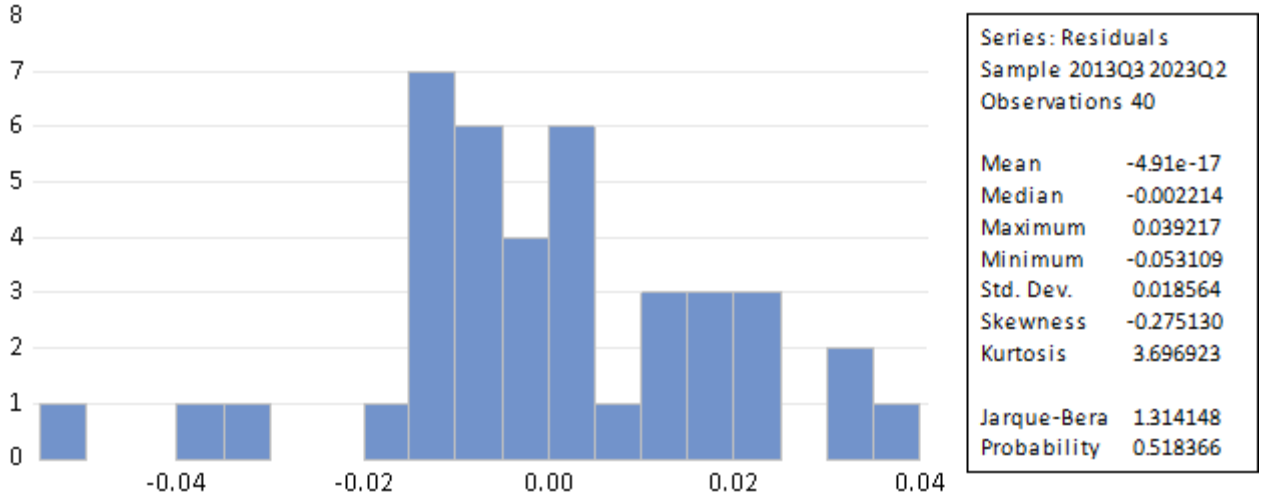
**Linearity**

This tests if the data is linear in parameters. A line graph has been used to test linearity.



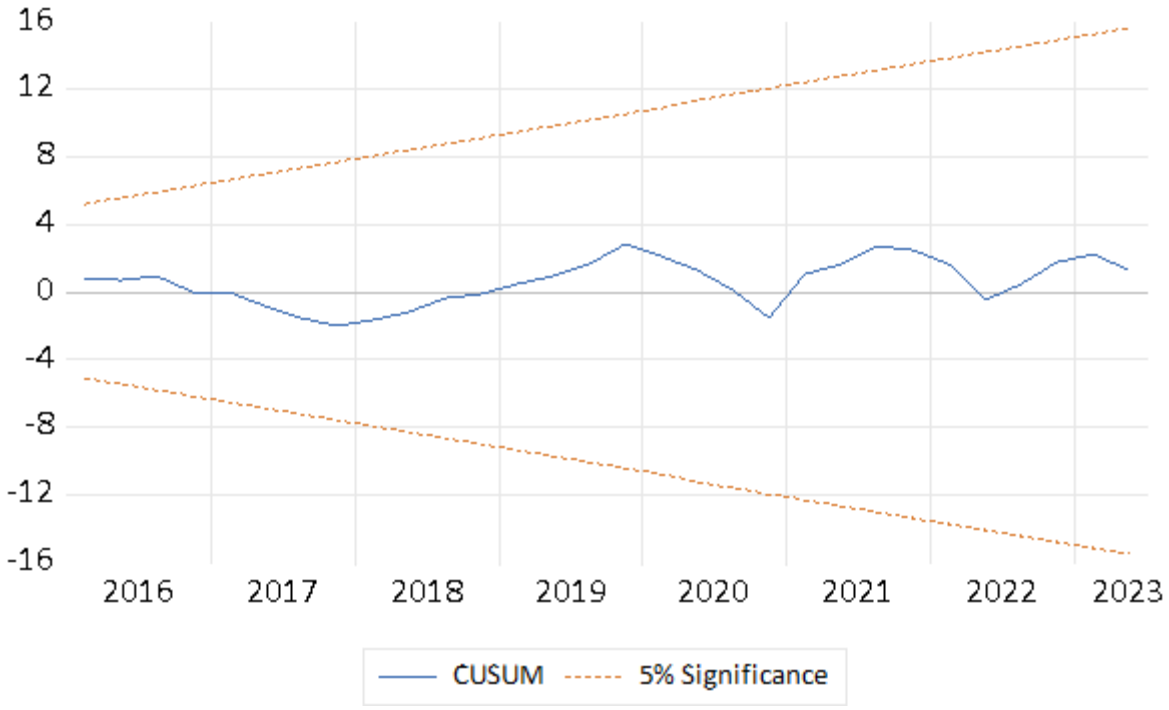

**Normality**

Normality was tested using the Jarque-Bera test. The rule of thumb is that the probability of the Jarque-Bera test should be greater than 5 percent to show normality is present among the residuals. The results indicated a probability value of 0.518, therefore, the model id normal.




**Assessment of Reliability**

Reliability can be measured through the stability of the model. If the model is stable, it indicates that it is consistent and robust over time. The recursive estimates of the OLS were used, displaying the CUSSM test output. The results showed that the model was stable as it was within the 5% significance.




**4.2 The Impact of the Monetary Policy Rate on Food Inflation**

The first objective was to determine the impact of the monetary policy rate on food inflation in Zambia. The impact of the monetary policy rate on food inflation was analyzed and the results conclude that in the short run, the monetary policy rate has a positive significant relationship with food inflation in the current and previous quarters respectively. This positive relationship tends to affect the intended purpose of the monetary policy rate and causes a destabilizing effect on food inflation. Implying that the increase in the monetary policy rate will in the short run cause an increase in food inflation. In the long run the policy rate has a positively significant relationship with food inflation, indicating an upward relationship. In theory, the monetary policy rate should have a negative relationship with inflation, including its sub-component, food inflation. However, similar to the studies of Chipili (2021), Bhattacharya and Jain (2020), Choudary (2022) that found the monetary policy rate to be destabilizing on food inflation. This may be due to associated increased costs of production or reduction in output due to the reduction in borrowing and spending in the economy, holding demand for food constant.

**4.3 The Effect of Changes in Money Supply on Food Inflation**

The second objective was to determine the effect of the money supply of food inflation in Zambia. In the short run and long run, broad money supply is not a statistically significant variable or tool in controlling and explaining food inflation, as its transmission to food inflation is insignificant. This contradicts the quantity theory of money explained.

**4.4 The Effect of Exchange Rates on Food Inflation**

The third objective was to determine the effect of exchange rates on food inflation in Zambia. In both the short run and long run, the upward movements of the Kwacha against the Dollar have a positive effect on food inflation, resulting in its slight upward movement. Chipili (2020) found that the exchange rate does have a significant and positive relationship with food inflation. The results of this study, confirm with the researchers' findings. The depreciation of the Kwacha to the Dollar will positively affect food inflation, causing an increase similar to the findings of Chisha (2018). The increase is significantly attributed to the

changes in the USD/K exchange rate. This implies that a weakening Kwacha makes imported good expensive, particularly, imported food and agricultural raw material.

### 4.4 Monetary Policy Transmission Channels

From the results collected, the effective monetary transmission channels are the exchange rate transmission channel and the interest rate transmission channel through the policy rate. This confirms the presence and effectiveness of these transmission channels, similar to the findings of Mwange (2022) channel in "An Empirical Investigation of the Impact of Monetary Policy on Economic Growth in Zambia" that utilized quarterly data from 2001q1 to 2021q2.

## 5.0 Conclusion and Recommendations

This study sought to comprehend the relationship between monetary policy and food inflation in Zambia and concluded that there is a significant relationship relationship between monetary policy and food inflation in Zambia. The Bank of Zambia should craft appropriate policy responses that can address both food inflation and non-food inflation, as the later feeds into the former. Additionally, the bank of Zambia may establish policies that favour food production in times of climate shocks to dampen the tightening of agriculture. Stern policy attention is needed that provides consistent actions to reduce the inflationary pressure from depreciating exchange rates. Moreover, a productive manufacturing and agriculture base should be emphasized, allowing for short-term structural changes in demand for food. On the other side of it, the actions and responsibilities of the Bank of Zambia can be met by policy intervention by the Government of Zambia to enable efficient and effective food inflation control measures.

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