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THE EFFECTS OF FISCAL AND MONETARY POLICY ON ECONOMIC GROWTH IN ZAMBIA

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ABSTRACT

This study assesses the impact of fiscal and monetary policy shocks on economic growth in Zambia for the period 2010Q1 to 2022Q4 using money supply and the monetary policy rate as monetary policy instruments and fiscal policy instruments such as government expenditure and fiscal policy outcomes in the form of government revenue. Government expenditures excluded interest payments from total expenditure as the data did not explicitly provide lines for government expenditure in the domestic economy. Government revenues were modelled as policy outcomes of fiscal policy to rule out the possibility of having to pinpoint the accurate form of tax tools or instruments such as the income tax rate, value-added tax rates, or rates associated with customs duty.

This study uses vector autoregression (VAR) model to conduct the empirical analysis of the impact of monetary and fiscal policy shocks on economic growth. Within the VAR framework, the Structural VAR (SVAR) was used to model the dynamic relationship among the different variables and trace out the impact of shocks from monetary and fiscal instruments using impulse response functions. The SVAR uses a recursive identification strategy and ordered the exogenous copper prices first, followed by GDP, inflation, a monetary policy instrument and a fiscal policy instrument. Consistent with theory, the results of the impulse response functions show that money supply positively affects GDP but also drives inflation up. On the other hand, the bank policy rate did not have a significant effect on GDP on its own but it seemed to slow down inflation. In the same vein, both government revenue and expenditure serving as fiscal instruments did positively affect GDP but also edged inflation upwards across the 20-period horizon.

1. INTRODUCTION

Developing nations are distinguished by a wide range of resource endowments, institutional frameworks, and economic structures but they seemingly face similar challenges with regards to attaining sustainable economic growth. In Zambia, like most other countries, monetary and fiscal policy play an important role in shaping the economic landscape as both policies influence inflation, aggregate demand, employment, and ultimately economic growth.

Consistent with the statements of several central banks such as the Bank of Zambia and the South African Reserve Bank, monetary policy is an explicit outcome in which monetary policy authorities directly target or influence (nominal) short-term interest rates, stock of money and nominal exchange rates. Typically, the primary objective of such monetary policy conduct is to achieve price stability as the main goal along with economic growth on a sustainable path. For their purposes and in recent times, most central banks are implicit or explicit inflation targeters and thus adjust short-term rates to achieve price stability, see also Brando-Marques et al. (2020) who also provide a detailed analysis concerning monetary policy conduct, its evolution, and transmission in emerging markets and developing economies. Additionally, most of the central banks across the globe employ a mix of countless economic tools to efficiently execute monetary policy with one major objective in mind, attaining price stability (i.e. moderate and stable inflation) and long-term economic growth.

The Bank of Zambia is responsible for creating and carrying out monetary policy in Zambia. A Bank of Zambia (2023) report highlights that the central bank draws its mandate or functions from the Banking and Financial services Act chapter 387 and the Bank of Zambia Act number 43 of 1996 of the Laws of Zambia. The Bank of Zambia mission statement is centered around achieving and maintaining both price and financial system stability in order to attain sustainable economic development. This is further evidenced in the mandates of most central banks being generally anchored on price and financial system stability and is supported by Friedman (1968) who contends that monetary authorities implement monetary policy to warrant stable financial systems by influencing the level of credit and cost of credit available in an economy as they pursue the broader objectives of sustainable growth by ensuring that prices are stable and there exists a healthy balance of payments.

Kamin (1998) further postulates that policy makers need to demonstrate a clear and thorough understanding of how shocks emanating from monetary policy actions are transmitted and the importance of various channels that affect the real sector of the economy if monetary policy is

to be targeted in the right direction and with the right force. Since monetary policy affects economic growth through a variety of mechanisms, modifications to the monetary policy stance, such as adjustments to the money supply, interest rates, or other tools, can have a significant impact on investment, consumption, and overall economic activity. This will therefore have an impact on economic growth, employment, and production.

Fiscal policy relates to a macroeconomic policy that involves changes in government spending and taxation to influence aggregate demand. It can be categorized into two broad areas; expansionary and contractionary fiscal policy. Expansionary fiscal policy is implemented when governments want to boost growth, reduce cyclical unemployment, or theoretically increase demand-pull inflation when it is below target, though in practice, management of inflation falls under the reserve of the central bank. This is achieved by increasing aggregate demand when the economy is in a recession or growth is sluggish. On the other hand, contractionary fiscal policy is used when the economy is overheating or facing high levels of demand-pull inflation. In practice, contractionary fiscal policy is used to reduce the budget deficit and ultimately the level of national debt by spending less than the government raises in taxes. Overall, fiscal policy is also used to redistribute income by taxing high-earning individuals and increasing social spending on the vulnerable in society.

Within this context, the objective of this study is to investigate the dynamic relationship that exists between fiscal policy, monetary policy, and economic growth in Zambia. For this study, the research question is as follows: What is the effect of fiscal and monetary policy shocks on economic growth in Zambia?

The study uses a Structural Vector Autoregressive (SVAR) model for the period 2010Q1 to 2022Q4 and generate impulse response functions for various shocks on different variables. Impulse response functions describe the evolution of variables of interest along a specified time horizon in response to a structural shock associated with another variable in the system. This is a pure shock or innovation that is unrelated to any other shock and thus it allows us to establish the impact of one variable on another variable with the knowledge that this shock is completely unrelated to any other shock, see also Stock and Watson (2001).

It is worth noting that most studies that have been conducted in Zambia around this topic have only focused on the effect of monetary policy on economic growth, thereby neglecting the effect of fiscal policy or the joint effect of the two policies. The motivation to assess the impact of fiscal and monetary policy on economic growth stems from the significance of both policies

in shaping economic outcomes. Therefore, this study seeks to contribute to the literature by jointly assessing the effects of fiscal and monetary policy on economic growth in Zambia. It also includes copper prices because mining is Zambia's major economic mainstay. According to the African Development Bank (2022), the economy of Zambia continues to be heavily reliant on copper with more than 70 percent of the export earnings being attributed to copper sales. This illustrates the importance of copper in Zambia and therefore justifies the need to include copper prices in the analysis. Although externally determined, the price of copper will affect economic growth since copper is a major export earner.

The use of fiscal and monetary policy allows for the stabilization of the upward and downward movement of economic activity. In the eventuality of a negative shock, such as shocks in commodity prices, fiscal and monetary policy can seek to stabilize the effects of such a shock on the economy.

The relevance and motivation of this study is also based on Zambia being an emerging economy that is commodity dependent and currently grappling with unsustainable debt. Understanding the effects of monetary and fiscal policy on economic growth will provide a basis for policy formulation that will steer the economy in a direction that seeks to improve debt service, reduce the fiscal deficit and ultimately stimulate growth. To the best of our knowledge, this is the first study that employs the VAR/SVAR model to jointly investigate the existence of this dynamic relationship between fiscal and monetary policy and economic growth in Zambia using an updated data set. Therefore, this gives a snapshot of the dynamic interplay between the monetary and fiscal policy shocks and other variables including growth. In general, a VAR allows us to model the dynamics of the shock mentioned above over the business cycle.

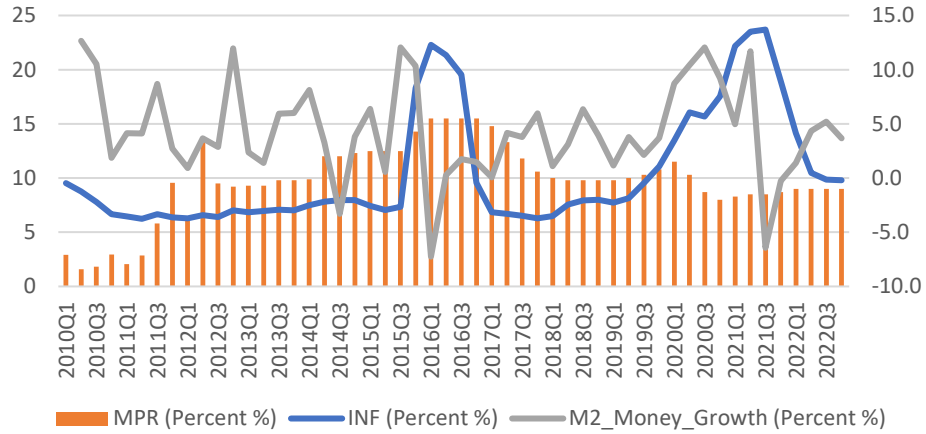
The rest of the paper is organized as follows. Section 2 provides a brief background of the Zambian economy including some key developments in monetary and fiscal policy. Section 3 provides an overview of the relevant theoretical and empirical literature on the effects of fiscal and monetary policy on economic growth. Section 4 describes the data and methodology that this study employs. Section 5 presents the empirical findings and interpretations. Section 6 concludes the paper with a summary of findings and possible recommendations.

2. BACKGROUND

In the timeframe under review, Zambia's macroeconomic landscape has presented a complex mix of opportunities and challenges, similar to that of many other African countries. During this period, the country faced several challenges, such as budgetary concerns, commodity price volatility, and external shocks. This section provides a summary of the evolution of some of the major macroeconomic variables.

Figure 1 shows that inflation hovered around 7 percent between 2010Q1 and 2015Q3 but started edging upwards from October 2015. The initial jump as recorded by the Central Statistics Office (CSO) now called Zambia Statistical Agency (ZAMSTATS) was from 7.7 percent in September to 14.3 percent in October of 2015. The CSO (2015) attributed this increase in annual inflation to changes in both food and non-food items.

Figure 1: Inflation, M2 growth & Monetary policy rate trends



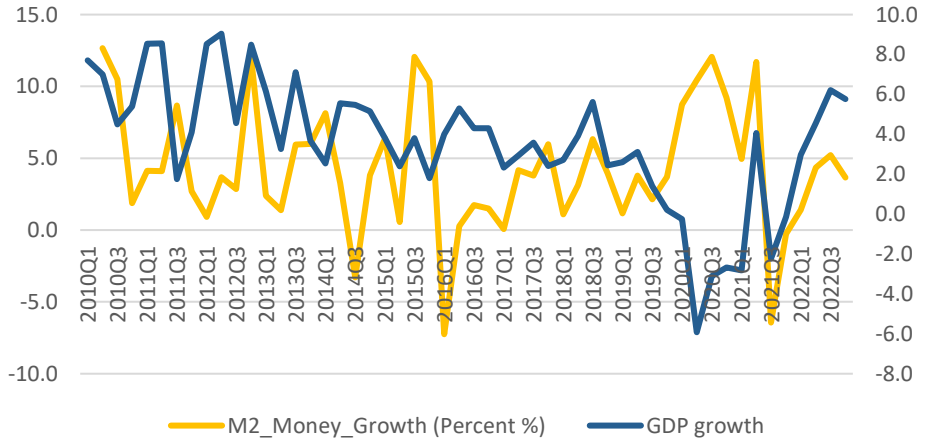
This increase continued in the subsequent months and reached highs of 22.9 percent in March 2016. However, the annual rate of inflation saw a steep decline by 6.4 percentage points from 18.9 percent in September 2016 to 12.5 percent in October 2016. This sharp decline was attributed to the "base effect" which CSO (2016) defines as the impact of an unusual price change in the previous year on the annual inflation rate. Inflation further maintained an average of 8 percent between 2017Q1 and 202019Q3. Post 2019Q3 saw a steady but sharp increase in the annual inflation rate to the highest value recorded in the period under review of 24.6 percent in June and July 2021. This increase was attributed to an increase in prices of food items. From 2021Q3, a decline to single digit inflation was observed, closing with an average of 9.8 percent in 2022Q4.

In an effort to improve how monetary policy is conducted, the Bank of Zambia (2012) introduced the policy rate whose objective is to better anchor inflation expectations and

influence commercial banks' decisions on pricing their credit products. Policy rates operate by influencing interest rates in the inter-bank markets, and in turn, interest rates in the economy as they serve as base rates for commercial banks' pricing of credit products. The introduction of the policy rate also changed the operational target of monetary policy from reserve money to the interbank rate. Figure 1 shows that in the second quarter of 2012, the policy rate averaged 9 percent. According to a BoZ (2015) report, the policy rate averaged 12.5 percent, and to further address rising volatility in the exchange rate and curb inflationary pressures, the statutory reserve ratio was revised upwards from 14 to 18 percent in 2015Q2. The policy rate was maintained at 15.5 percent in 2016 but was also met with removal of quantitative restrictions in order to ease access of commercial banks to central bank liquidity (BoZ, 2016). By end of 2017, the policy rate had dropped first from 14 percent to 10.25 percent. This was necessitated mainly by movements in inflation which was declining to its medium target range of 6-8 percent. Following the persistence of Covid-19 pandemic in 2020, the policy rate was maintained around 8 percent to moderate risks to financial stability and support economic growth. By end 2021, the rate edged up to 9 percent in an effort to maintain inflation within the medium-term target range of 6 to 8 percent.

The growth of money supply has averaged 4 percent over the period 2012Q1 to 2022Q4. Figure 1 also gives a picture of relationship between money supply growth and inflation. Periods of heightened inflation such as 2016Q1, 2021Q1 and 2021Q3 are preceded by sharp increases in the growth of money balances. Similarly, periods in which inflation starts slowing down are

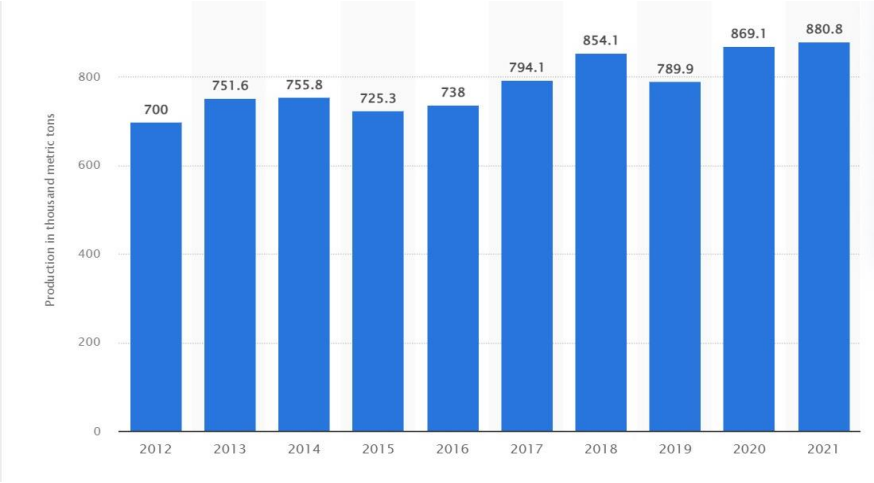
Figure 2: M2 & GDP growth trends



also preceded with sharp declines in the growth rate of money balances. Figure 2 plots the relationship between growth in money balances and GDP growth. The relationship between the two series is ambiguous as there is no consistent pattern or co-movement between them.

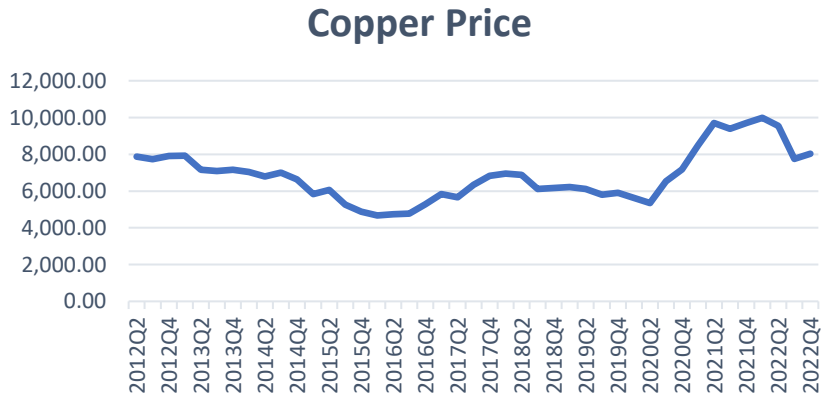
Despite copper being Zambia's main driver of the economy, production has remained relatively flat over the decade under review. Figure 3 gives a snapshot of annual production numbers in thousand metric tons.

Figure 1: Annual Copper production



Comparing the above annual production numbers to the quarterly average prices of copper on the international market gives some insight into the paradox that Zambia faces. With increasing copper prices, the expectation is that economic growth is accelerated. However, with the relatively flat production of under 880 thousand metric tons per year, expected gains from increased prices remain minimal and GDP growth remains relatively low.

Figure 2: Copper price trend



3. REVIEW OF LITERATURE

The intricate relationship between monetary and fiscal policy decisions and how they affect economic growth has been a crucial area of interest for macroeconomic research for many years. This is attributed to the fact that governments and central banks across the world seek optimal outcomes for their policy interventions in driving economic growth. Although theoretical models aim to offer plausible pathways by which these policies function, real-world data testing produces empirical evidence that is critical for validating these theories and offering policy direction. This section offers a theoretical framework and an empirical summary of research done to evaluate how monetary and fiscal policies affect economic growth.

3.1 Theoretical review

- **Monetary Policy**

Milton Friedman, a well-known economist, introduced the idea of monetarism. This school of thought holds that the sole thing that influences the price of goods in the economy is the money supply. It follows that, in order to eventually balance the money supply growth rate with the rate of output growth, government intervention through the central bank controls the money supply growth rate. According to the monetary theory, inflation happens when the money supply expands more quickly than the pace at which the country's income is growing (Schmitt-Grohé, 2022). Takahashi (1971), however, discovered that the short- and long-term effects of the money supply on economic growth differ. According to him, the money supply has a significant impact on real variables and the level of prices in the short term. On the other hand, over time, changes in the money supply mostly affect prices and other nominal factors rather than real ones like output. This result is explained by the long-term neutrality of money, which asserts that variations in the money supply will lead to variations in the level of prices but output stays constant.

Two steps can be used to describe the monetarists view of the transmission mechanism which aims to create a direct connection between the monetary sector and the economy. First, as real balances rise, portfolio disequilibrium is created (Dornbusch, 2010). The excess supply of money created by increased money supply throws the money market out of balance. Consumers will have to buy other financial assets like bonds to get out of this situation which will raise the cost of bonds. Since the price of bonds and interest rates are inversely related, rising bond prices result in falling interest rates. In light of the aforementioned, the relationship between

interest rates and aggregate demand activates the second stage of the transmission mechanism. Because interest rates and aggregate demand are negatively correlated, a declining interest rate will boost output and aggregate demand. As a result, monetary policy, which changes the money supply, influences growth by way of promoting aggregate demand's interest-responsive components. It is important to highlight that this requires the existence of two necessary relationships: interest rates must affect changes in aggregate demand in addition to being sensitive to changes in the money supply.

The Keynesians represent another school of thinking with a distinct perspective on monetary policy. They contend that there is little correlation between the amount of money in circulation and the level of national income and therefore monetary policy is ineffective in promoting economic growth. Rather, they argue that shifts in money supply directly impact price levels without influencing other factors (Blinder, 2023). Furthermore, this school of thought asserts that when aggregate demand exceeds aggregate supply, a general price level increase is produced. An increase in the money supply will raise aggregate demand, which will raise inflation in an economy that is operating at its ideal level of employment output. This occurs because an economy cannot raise its aggregate supply in response to an increase in aggregate demand while it is operating at full employment of output and maximizing the use of its limited resources.

Generally, Keynesians prefer a situation in which an interest rate decline is not caused by portfolio imbalance. According to Khabo and Harmse (2005), we get into a liquidity trap when there is no decline in interest rates following an increase in money supply. A liquidity trap occurs when interest rates are near zero, making it impossible for the central bank to use monetary policy to affect the economy. Extremely low interest rates can cause the money supply to become less responsive to changes in the rate of return, which deters investors from buying bonds since they would have a poor rate of return and would instead choose to hold onto their money. On the basis of this justification, proponents of Keynesian economic policy favor the use of fiscal policy to influence economic growth.

- **Fiscal Policy**

Economists have established theoretical models of fiscal policy to further understand and examine the effects of changes in government spending on a range of economic variables. This section discusses a few of these theoretical models and how they govern government intervention on economic variables.

John Maynard Keynes developed the Keynesian model which places a strong emphasis on the role that taxation and spending by the government play in keeping the economy stable. He argues that fiscal policy is necessary to stabilize the economy (Barro, 1999). For example, during economic booms, lower spending or higher taxes avoid overheating. During recessions, larger government spending or tax cuts encourage demand.

On the other hand, the link between investment, growth, and employment is captured by the Harrod-Domar model. The model acknowledges the importance of government spending, particularly in generating demand and promoting economic growth, even though it is not specifically focused on fiscal policy. The model further suggests that government expenditure can have a multiplier effect and promote general economic growth. However, Hochstein (2017) also argues that with deviation of investment from a critical growth path, full employment can degenerate into economic depression or hyperinflation.

Neoclassical models combine classical and Keynesian concepts; examples are the Real Business Cycle (RBC) and New Keynesian approaches. Neoclassicals highlight the importance of efficient resource allocation and market dynamics. Real Business Cycle models argue that fiscal policy has limited effectiveness by attributing economic fluctuations to real shocks. To explore how government intervention might correct market flaws and stabilize the economy, new Keynesian models incorporate market imperfections. Barseghyan et al (2013) highlight that according to the RBC model, fiscal policy is countercyclical. Government expenditure increases during booms and decreases in recessions whereas tax rates fall during booms and edge upwards during recessions.

Ricardian equivalence theory challenges the traditional view that fiscal policy, particularly deficits, can be used to influence investment, and consumer behavior, and boost aggregate demand (Dalyop, 2019). It asserts that consumers respond to fiscal policy in such a way that makes fiscal policy ineffective. A practical scenario is when the government cuts taxes to stimulate the economy but people choose to save the tax cuts as opposed to spending. This behavior by consumers means that the fiscal multiplier will be zero as the aggregate demand remains unchanged thereby leading to no systematic macro effects.

Endogenous growth models underscore internal causes that propel long-term economic growth, thereby setting them apart from the conventional models discussed above. Important components of this model include human capital accumulation, infrastructural investment, research and development, and institutional quality (Romer, 1986). These approaches rely

heavily on fiscal policy to establish incentives for investment, innovation, and education. For example, by boosting productivity and innovation, government spending on infrastructure projects, research and development incentives, and education can promote long-term economic growth.

Empirical review

In his study, Musa (2022) used quarterly time series data from 1986Q1 to 2017Q4 to evaluate the impact of monetary policy on economic development in Nigeria. In order to evaluate the impact of monetary policy using an Inflation Targeting (IT) framework on economic growth in Nigeria, a Structural Vector Autoregressive (SVAR) study was conducted. The results demonstrated that monetary policy positively impacted economic growth. Even while growth was positively impacted by the monetary policy rate (MPR), this effect was rather small-only 3 percent. Although it only accounted for 7% of economic growth, broad money (M2) also experienced a positive shock. The author came to the conclusion that while inflation targeting was a useful instrument, it was not sufficient on its own and needed to be combined with additional policy instruments.

Similarly, Onderi (2015) estimated the impact of monetary policy shocks on prices and economic development in Kenya from 1992 to 2013 using a structural vector autoregression model. Three distinct monetary policy tools were used in the study: real effective exchange rates (REER), interbank lending rates (ILR), and broad money (M3). The study's findings demonstrated that monetary policy based on the quantity based nominal anchor (M3) had a very quick rate of adjustment and only minor influence on prices and economic growth. On real GDP, however, the effects of innovations on the price-based nominal anchors (REER and ILR) were comparatively short-lived. The study suggested that since quantity based nominal anchors produced higher returns, the Central Bank of Kenya should prioritise deploying them over price-based anchors.

In contrast, Lovcha (2018) contended that the observed persistence of inflation and a host of other variables are typically ignored in structural VAR studies on the impact of monetary policy actions. In order to account for this, the author used a structural fractionally integrated VAR (FIVAR), which integrates both long and short-memory components, to analyse the consequences of the monetary policy shock. The results suggested that this methodology accurately described variables like inflation, with long memory contributing significantly to the persistence of these variables' reaction to shocks in monetary policy. The report goes on to

say that ignoring this kind of persistence leads to an inaccurate evaluation of the monetary policy shock's consequences, weakening its influence on the business cycle.

Agbonlahor (2014) used time series data covering the years 1940-2012 to examine the effect of monetary policy on economic growth in the United Kingdom. Using the vector error correction model (VECM), the effects of each endogenous variable were examined. The study discovered that the money supply and inflation rate play a major role in propelling growth in the United Kingdom. According to the paper, authorities in the UK should prioritise increasing economic growth by making sure that the expansion of money supply is commensurate with the increase of the country's actual gross domestic product.

Chipote (2014) used data from 2000 to 2010 to investigate the impact monetary policy plays in forecasting economic growth in the Sub-Saharan nation of South Africa. Johansen co-integration and the Error Correction Model (ECM) were used in the investigation. The money supply, the repo rate, and the exchange rate were determined to be unimportant monetary policy instruments in promoting growth in South Africa. But it was discovered that role of inflation was substantial in the growth dynamics of the country.

On the fiscal policy front, Tendengu et al (2022) examined the effect of fiscal policy instruments on economic growth in South Africa using the Autoregressive distributed lag model for a period spanning from 1988 to 2018 (quarterly data). The results suggest that there is a positive relationship between fiscal policy instruments such as public consumption spending, public sector spending, taxation, and economic growth. The study further recommended that the government needed to differentiate productive spending from unproductive expenditure and channel more resources to productive sectors. With this recommendation, the study concluded that the economy is likely to perform better if resources are redirected from government expenditure to more investment spending.

In another study relating to South Africa, Ocran (2009) examined the effects of fiscal policy associated with increases in government expenditures, tax revenue, and budget deficits on the South African economy. The study used the structural vector autoregressive (SVAR) model on quarterly data from 1990 to 2008. The results suggest that fiscal policy instruments have mixed effects on economic growth and interest rates. This was established through inferences drawn from the impulse response functions that represented the response of real output and interest rates to shocks from fiscal policy instruments such as tax revenues, budget deficit, and government investment and consumption expenditure. The effect of fiscal policy on output was

modest but persistent whereas the response from interest rate was temporary and substantial in most cases.

In Pakistan, Javid and Arif (2009) investigated the dynamic effects of changes in government spending on Pakistan's economy using an unrestricted VAR analysis and data from 1971 to 2008. The results of this study suggest that not only does government expenditure react strongly negatively and persistently to its shock, but it also hurts consumption, output, and exchange rate. Conversely, an increase in government spending led to an appreciation of the real exchange rate and an increase in interest rates. Using the tax-to-GDP ratio in the VAR model left the results unchanged, that is, the tax shows a negative response to shocks in government spending.

Agu et al (2015) conducted a study to determine the impact of various components of fiscal policy on the Nigerian economy. Their study used an ordinary least squares (OLS) approach coupled with simple descriptive statistics to ascertain the relationship between economic government components and to explain growth rates respectively. The results of this study suggest that government spending increases with an increase in revenue. The fact that investment spending was found to be substantially lower than recurrent expenditure in Nigeria, the study uses this to justify the poor economic growth the country was experiencing. Further, this establishes a positive correlation between government spending on economic services and economic growth. The study concluded that in public spending, the stability and predictability of the public incentive system will drive the effectiveness of the private sector.

Blanchard and Perotti (2002) undertook an empirical characterization of the dynamic effects of changes in government spending and taxes on output. The study assessed the dynamic effects of shocks in government spending and taxes on U.S. activity in the postwar period. Using the structural VAR approach, the results indicate that positive shocks to government spending will have a positive effect on output whereas positive shocks to taxes negatively affect output. However, both an increase in taxes and government spending negatively affect investment spending.

The theoretical and empirical body of literature reviewed in this section underscores the multifaceted nature of the effects of fiscal and monetary policy on economic growth. The dynamic interactions between these policies, their impact on various sectors of the economy, and the challenges posed by external factors such as commodity prices for resource-rich countries accentuate the need for well-coordinated and contextually relevant policy

approaches. As such, this study endeavors to contribute to the body of knowledge by empirically assessing the effect of fiscal and monetary policy on economic growth in Zambia by also incorporating the role of copper prices in the economy.

4. DATA AND METHOD

This paper aims to evaluate the effect of fiscal and monetary policy on economic growth in Zambia. This section presents a discussion and justification of variables that have been adopted for this study, model specification, and choice of ordering the variables in the model.

4.1 Data Description

The study uses quarterly time series data spanning from 2010Q1 to 2022Q4. The variables considered in this study are commodity prices for copper, gross domestic product (GDP), inflation, monetary policy rate, money supply, government expenditures, and government revenues. GDP was sourced from the Zambia Statistics Agency (ZAMSTATS). Copper prices and monetary policy variables such as inflation, monetary policy rate, and money supply were obtained from the Central Bank of Zambia. Fiscal policy variables (government revenues and expenditure) were obtained from the Ministry of Finance and National Planning. Because of constraints, monthly inflation and the monetary policy rate which are recorded as percentages and copper prices were averaged in each quarter to provide quarterly values across the period under review. Other monthly variables such as money supply, government revenues, and expenditures which are reported in absolute figures were converted to quarterly values by taking the sum of all the months in a quarter. On the other hand, real GDP (i.e. at constant prices) is available on a quarterly basis.

4.2 Choice of Variables

The total market value of the commodities and services generated by a nation is its gross domestic product, which is mostly used as a measure of the nation's economic health. The rate of growth in general product prices over a specified time period is known as inflation, and it is a measure of a nation's cost of living.

Although in the strictest sense, fiscal policy and in particular the taxation side needs to be examined with tax tools or instruments, we resort to examining tax revenues. This is consistent with numerous kinds of literature and rules out the possibility of having to pinpoint the accurate form of tax tool or instrument, e.g. the income tax rate, value-added tax rates, or rates associated with customs duties. Additionally, data for these tax instruments is difficult to access for both advanced and developing economies, this is well described by Vegh and Vuletin (2015). As a result, and consistent with their description, we use tax revenues to examine how this variable interacts with other macroeconomic variables in the Zambian economy and this is within the context of acknowledging that tax revenues are policy outcomes and are not tax instruments or

tools, see also Rossi (2014). Further, grants are excluded from the computation of government revenues as they are influenced by external factors and not directly linked to fiscal policy adjustments. On the other hand, government expenditures excluded interest payments from total expenditure as the data does not explicitly provide lines for government expenditure in the domestic economy. This data was manually computed by the author from the 2010 to 2022 fiscal tables obtained from the Ministry of Finance and National Planning in Zambia.

Central Banks monitor and observe money supply measures such as M1 and M2. A measure of the money stock classified as M2 comprises M1 (cash and coins held by the general public outside the banks, checkable deposits, and travellers' checks) as well as savings deposits, small-time deposits, shares in retail money market mutual funds, and savings deposits (including money market deposit accounts). As a result, this measure of money stock has historically been monitored by central banks because increases in supply of these measures can generate inflation, see also the Federal Reserve Bank of St. Louis and the Bank of Zambia[1].

In assessing whether Zambia was ready for inflation targeting, Simatele et al (2015) indicated that in April 2012, the central bank introduced the monetary policy rate which replaced reserve money targeting as the main monetary policy tool. As such, this study adopts the monetary policy rate as a monetary policy instrument. Since the MPR was only introduced in April 2012, the study uses average inter-bank rates as a proxy for MPR from 2010Q1 to 2012Q1.

It is important to underscore the fact that the sample size and most of the variables used are mainly based on the availability of data as some data beyond certain timeframes is not available, a prime example is quarterly GDP prior to 2010.

[1] https://www.boz.zm/monetary-policy.htm and https://fred.stlouisfed.org/ and https://www.stlouisfed.org/financial-crisis/data/m2-monetary-aggregate

4.3 Model Specification

The model specification for this study follows the work of Rüth (2018), who uses a structural vector autoregressive (SVAR) model to empirically assess fiscal-monetary policy interactions and their effects on the broader economy. Additionally, this approach, variable ordering and model specification is consistent with other SVAR related studies such as Finck et al. (2023) and Mateane et al. (2024), along with monetary policy-related studies that characterize that inflation, output and possibly financial variables influence monetary policy conduct and are part of the information set of monetary policy authorities, see Clarida et al. (1998), Lubik and Schorfheide (2007), Proano and Lojak (2020) and Mateane and Proano (2020). The mathematical representation is specified as follows:

$$\boldsymbol{A_0 X_t = \sum_{l=1}^{P} A_l X_{t-l} + \varepsilon_t} \ ,$$

where $E\{\varepsilon_t\} = 0$ and $E\{\varepsilon_t \varepsilon_t'\} = \sum_{\varepsilon}$. The intercept is omitted for notational convenience. For lag, l=1,.., p, the matrix A_l captures the matrix lag polynomial variance-covariance matrix accounting for impulse response functions of the shocks to the element X (Ocran, 2011). A_0 comprises contemporaneous coefficient, and ε_t represents a (k*1) column vector that contains identically normally distributed, serially uncorrelated, and mutually orthogonal white noise shocks. X_t represents an N*1 vector of endogenous fiscal and monetary variables.

Cholesky Decomposition

According to Ocran (2011), recovering the structural shocks that impact the endogenous variables in the system involves the implementation of a long-run identification approach based on the Blanchard-Quah decomposition framework. The framework applies the restrictions on the variance-covariance matrix of model residuals using the $(n^2-n)/2$ formula. The VAR estimated in this study consists of 5 Variables and is ordered as follows: Copper Prices, Output, Inflation, Monetary Policy measures or instruments, and fiscal measures.

We order our VAR in this manner because copper prices and commodity prices are determined in international markets and these cannot be influenced by Zambia's macroeconomic variables within the same quarter or period. However, we order output above inflation to account for the fact that changes in inflation may not influence economic activity within the quarter. Moreover, we order the monetary policy measure below output, inflation, and copper prices, see also Rüth (2018), Finck et al. (2023) and Mateane et al (2024) concerning the ordering of variables in a

VAR and also Mateane and Proano (2020) concerning the variables that form part of the information set that influences monetary policy conduct. Additionally, and in a related manner to my several VAR specifications, see Eickmeier et al. (2009) for a VAR based study that estimates a VAR based on the levels of the log of real GDP, GDP deflator inflation, interest rates and the log of real loans. These authors estimate their VAR in levels with non-stationary variables and argue that they are informed by the outcome that first differencing of variables can result in the loss of information concerning the long-run relationships between variables. However, inasmuch they provide this assertion, they are only interested in the short-run dynamics between variables and in their log-level form and they do not examine any cointegration between variables of interest in their study.

Nonetheless, our ordering is informed by Zambia being an inflation targeting regime and as a natural consequence, inflation and output are a piece of crucial information set for policy rate decision-making, including possibly the copper process because of Zambia's copper dependence.

Also, for Robustness, multiple VARs are assessed and ordered as follows;

- VAR 1 - Commodity Prices, Annual Output Growth, Annual Inflation, Monetary Policy Rate, Government Expenditure
- VAR 2 - Commodity Prices, Annual Output Growth, Annual Inflation, Monetary Policy Rate, Tax Revenues for Robustness
- VAR 3 - Commodity Prices, Annual Output Growth, Annual Inflation, M2 Growth, Government Expenditure
- VAR 4 - Commodity Prices, Annual Output Growth, Annual Inflation, M2 Growth, Tax revenues.

5. EMPIRICAL RESULTS

Time series data is prone to estimation errors that lead to false conclusions about the variables being studied. Spurious regressions are one common error resulting from variables showing a relationship or association either due to coincidence or the presence of a third unforeseen factor when they are not causally related. This section will first conduct pre-estimation tests to ensure that variables are fit for use in the model followed by model estimation, post-estimation tests and interpretation of results.

Descriptive Statistics

Table 1 depicts a snapshot of the quarterly descriptive statistics for the different variables during the period under review. The price of copper recorded lows of $4,674.74, averaged $7,071.14/ton, and reached highs of $9,985.47/ton. Inflation hit a maximum of 23.7 percent as a quarter average but the single highest monthly rate of inflation stood at 24.6 percent in June, 2021. The highest monetary policy rate stood at 15.5 percent signifying tightened monetary policy from the average of around 9 percent.

Table 1: Descriptive Statistics

	Copper Price	GDP	Inflation	Money Supply	Policy Rate	Revenue	Expenditure
Mean	7,071.14	31,474.72	10.48	49,106.62	9.72	10,501.35	13,054.00
Median	7,010.32	32,668.21	7.87	41,184.00	9.80	9,190.76	11,672.00
Maximum	9,985.47	37,522.00	23.70	117,691.50	15.50	29,137.11	32,553.12
Minimum	4,674.74	22,555.45	6.24	12,841.30	1.58	2,448.36	3,187.95
Std. Dev.	1,434.31	3,946.71	5.35	30,254.24	3.50	5,719.33	7,172.12
Skewness	0.34	- 0.53	1.33	0.91	- 0.61	1.12	0.76
Kurtosis	2.31	2.28	3.33	2.65	3.30	4.28	2.83
Jarque-Bera	2.00	3.57	15.60	7.46	3.43	14.37	5.01
Probability	0.36785	0.16787	0.00041	0.02400	0.18036	0.00076	0.08178
Observations	52	52	52	52	52	52	52

Unit root tests

The Augmented Dickey-Fuller (ADF) test is the most commonly used method for testing stationarity of time series variables in the literature. According to Studenmund (2011), stationarity in a time series implies that the mean and variance of the data are not dependent on time. According to the ADF test's null hypothesis, the variable has a unit. Differencing can be used to make non-stationary data stationary. Additionally, I(k), which represents the integration order of K for the data, indicates how many times the series must be differenced in order to achieve stationarity. Should a time series be stationary without any differencing, then it has an

integration order of zero (0) and is denoted by I(*0*). Table 2 gives a summary of the unit root tests that were carried out on different variables.

Variable Name	At Level	At 1st Difference	Order of Integration
Copper Price	0.6385	0.0000	I(1)
GDP	0.9862	0.0496	I(1)
Policy Rate	0.7022	0.0000	I(1)
Money Supply	1.0000	0.0002	I(1)
Inflation	0.1884	0.0001	I(1)
Expenditure	0.9836	0.0000	I(1)
Revenue	1.0000	0.0000	I(1)

Table 2: Unit root results

Cointegration tests

The foundation of cointegration is the theory that, even when trending, the difference between two or more series that move closely together over time will remain constant (Chimobi, 2010). It is therefore assumed that the variables have no long-term link if cointegration is absent. Furthermore, a misleading regression problem is created when variables lack cointegration, rendering economic results worthless.

Trend assumption: Linear deterministic trend
Series: COPPER GDP INF M2 MPR EXP01 REV
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.766512	185.3670	125.6154	0.0000
At most 1 *	0.499593	112.6356	95.75366	0.0021
At most 2 *	0.443897	78.01892	69.81889	0.0096
At most 3 *	0.383746	48.67886	47.85613	0.0417
At most 4	0.196360	24.47404	29.79707	0.1811
At most 5	0.163565	13.54382	15.49471	0.0963
At most 6 *	0.088141	4.613518	3.841466	0.0317

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* Denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.766512	72.73133	46.23142	0.0000
At most 1	0.499593	34.61672	40.07757	0.1814
At most 2	0.443897	29.34007	33.87687	0.1583
At most 3	0.383746	24.20482	27.58434	0.1277
At most 4	0.196360	10.93022	21.13162	0.6543

At most 5	0.163565	8.930304	14.26460	0.2920
At most 6 *	0.088141	4.613518	3.841466	0.0317

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 3: Cointegration results

The results in table 3 indicate that there is at least four cointegrating equations at 5 percent level of significance using the trace method and at least one based on the maximum eigen value test. This means there is at least one long run relationship among the variables.

Lag selection

In modelling time series data, the effect of the interaction between variables is rarely immediate. The delay in response is what is referred to as a "lag". It is important to pick an optimal number of lags in order circumvent errors that arise from picking too many lags such as model misspecification, multicollinearity, or loss of degrees of freedom.

The rule of thumb is that the optimal lag will be picked from the model with the lowest value corresponding to a particular information criterion. Based on the output in table 4, the optimal lag of 1 corresponding to the Schwarz information criterion (SC) will be used.

LAG	LOGL	LR	FPE	AIC	SC	HQ
0	-1967.457	NA	3.39E+29	82.18571	82.38063	82.25937
1	-1764.874	354.5208	2.09E+26	74.78641	75.95591*	75.22837
2	-1740.057	38.2594	2.18E+26	74.79404	76.93812	75.60429
3	-1704.203	47.80528	1.52E+26	74.34179	77.46046	75.52034
4	-1638.131	74.33059*	3.30e+25*	72.63047*	76.72372	74.17732*

** Indicates lag order selected by the criterion*
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 4: Lag selection

Impulse Response

As earlier stated, impulse response functions describe the evolution of variables of interest along a specified time horizon in response to a structural shock associated with another variable in the system. This is a pure shock or innovation that is unrelated to any other shock and thus allows us to establish the impact of one variable on another variable with the knowledge that this shock is completely unrelated to any other shock, Stock and Watson (2001). This

subsection provides outcomes of various exogenous shocks to monetary and fiscal instruments on other variables. The impulse response functions are modelled over a period of 20 quarters to reflect the evolution of each variable in both the short and long run. The short run falls below period 12 and the long run is described as periods between 12 and 20.

Figure 5 shows that an exogenous shock to a monetary policy instrument such as money supply causes a steady positive rise in economic growth, a result consistent with what Musa (2022) found in Nigeria. This positive relationship between a money supply shock and growth in GDP can be supported by the monetarists who split the transmission mechanism into two. Firstly, Dornbusch (2010) argues that an increase in real money balances throws the money market into a state of disequilibrium. To get out of this scenario, consumers will need to purchase alternative financial assets, such as bonds, which drives the bond price up. Bond prices and interest rates are inversely related, meaning that as bond prices rise, interest rates decline. The connection between interest rates and aggregate demand initiates the second phase of the transmission mechanism. A declining interest rate induced by an increase in bond prices will boost output and aggregate demand because interest rates and demand are inversely related. Consequently, monetary policy, which adjusts the money supply, affects economic growth by boosting the aggregate demand's interest-related components. To achieve all this, the paper assumes that interest rates are sensitive to changes in money supply and that they also cause aggregate demand to shift.

This money supply shock also leads to a steady increase in inflation. Theoretically, the quantity theory of money links money supply and inflation directly. It postulates that the general level of prices for goods and services in an economy is directly proportional to the money supply. The effect of the shock on itself is a steady increasing trend in money supply. This is also consistent with Schmitt-Grohé (2022) who pointed out that monetarism suggests that inflation will occur when the money supply rises faster than the rate of growth of national income.

A robust test was conducted by inducing a shock in an alternative monetary policy instrument such as the policy rate (*Figure 7*). The result show that the effect of an exogenous shock in the policy rate on GDP is a quite small and insignificant. However, though statistically insignificant, a shock in the policy rate shows a decline in inflation over the 20-period horizon. This is consistent with the objective of introducing policy rates. *Figure 7* also shows that the increase in the policy rate is not persistent as it starts declining in period 2 and dissipates by

period 10. This can be attributed to the fact that the policy rate is usually adjusted downwards once inflation has been contained.

Figure 5 shows that an exogenous shock to a fiscal instrument such as government revenue shows a small but insignificant positive movement in GDP and a steady increase in money supply. However, when modeled with the policy rate (*figure 7*), the effect of a shock in government revenue on GDP is an initial increase from period 2 followed by a slower increase and is statistically significant. Revenue shocks also seem to positively influence inflation. In this context, government revenue is used as a policy outcome of fiscal policy because it rules out the possibility of having to pinpoint the accurate form of tax tool or instrument such as the income tax rate, value-added tax rates, or rates associated with customs duty. This is further supported by Vegh and Vuletin (2015) who assert that data for these tax instruments remains difficult to access for both advanced and developing economies.

A robust check was done by inducing a shock in an alternative fiscal policy instrument such as government expenditure (*figure 6*). The impact of an exogenous shock to government expenditure on GDP is an initial drop followed by an increase from period 2 and a steady growth over the horizon. The delayed response of GDP to expenditure shocks can be explained by the Ricardian theory discussed earlier, where consumers change their behavior in such a way that renders government intervention ineffective in a specific time period. The impact of the shock on money supply is a steady increase over the 20-period horizon. inflation reacted to the shock with a strong increase up to period 4, beyond that, it starts falling but never touches the zero line in the long run.

When modelled with the policy rate, *figure 8* shows that with an exogenous shock to government expenditure, GDP increases significantly from period 2 to period 4 and continues to grow steadily over the rest of the horizon, a result consistent with the findings of Blanchard and Perotti (2002) for a similar empirical assessment in the U.S. From the aggregated demand equation, an increase in government expenditure is directly linked to an increase in output and subsequently economic growth. Spending by government creates demand for various goods and services, this increased demand can be met by an increase in employment and disposable income of the general population, this boosts GDP. Furthermore, an increase in government expenditure has a multiplier effect on the economy because it unlocks more than one sector in order for demand to be met.

The expenditure shock has an almost neutral effect on the policy rate but positively influences inflation. In practice, the policy rate is only adjusted to keep inflation under control, as such, expenditure shocks will only trigger a policy rate response when inflation exceeds a given target range, 6 to 8 percent for the Zambian case. However, the effects of the shock show positive co-movement with inflation because an increase in aggregate demand resulting from and increase in government spending induces demand-pull inflation. Expectations of future inflation based on government spending behavior can also contribute to inflationary pressures. Households and firms may change their behavior to reflect their expectations of higher prices in future, such as demanding higher wages or increasing prices for goods and services, if they believe that increased government spending will result in higher prices in future.

Government expenditure shocks on expenditure show a steady decrease over time. Figure 8 shows that expenditure will move from a one-time increase and slowly decline to almost normal levels of growth after approximately one fiscal year.

Figure 3: Response to Money supply and Revenue shocks

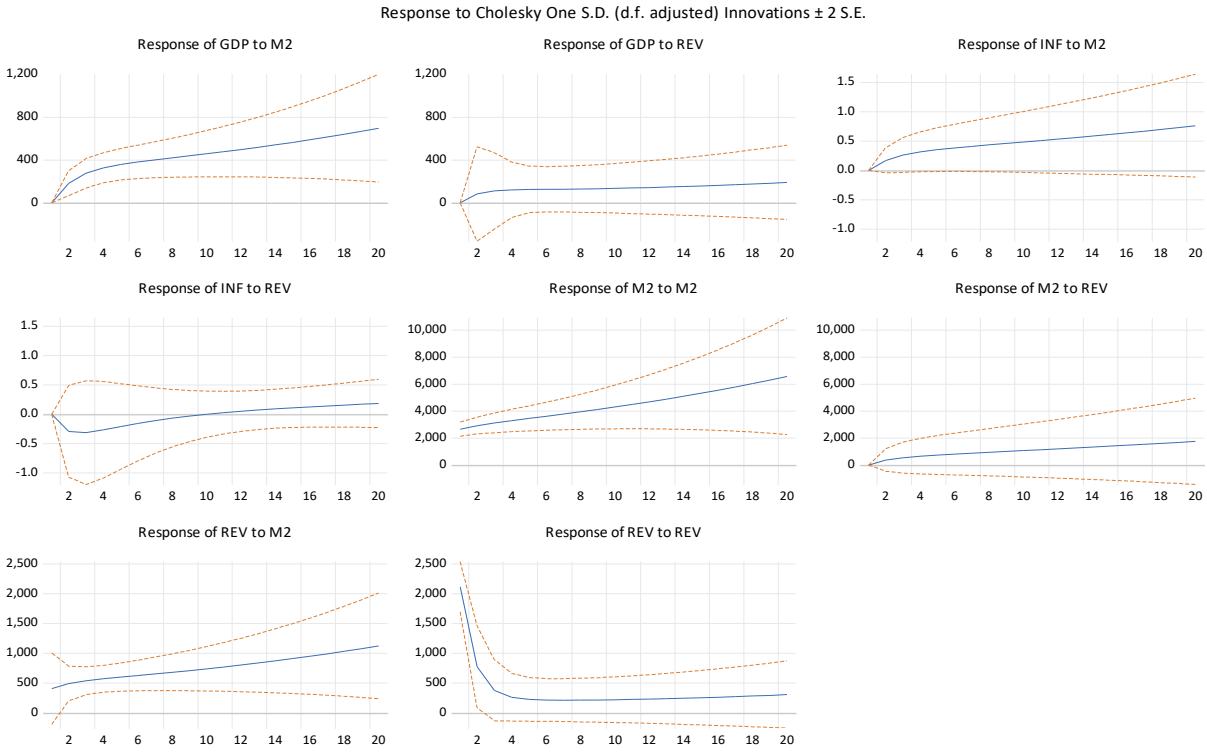


Figure 4: Response to Money supply and Expenditure shocks

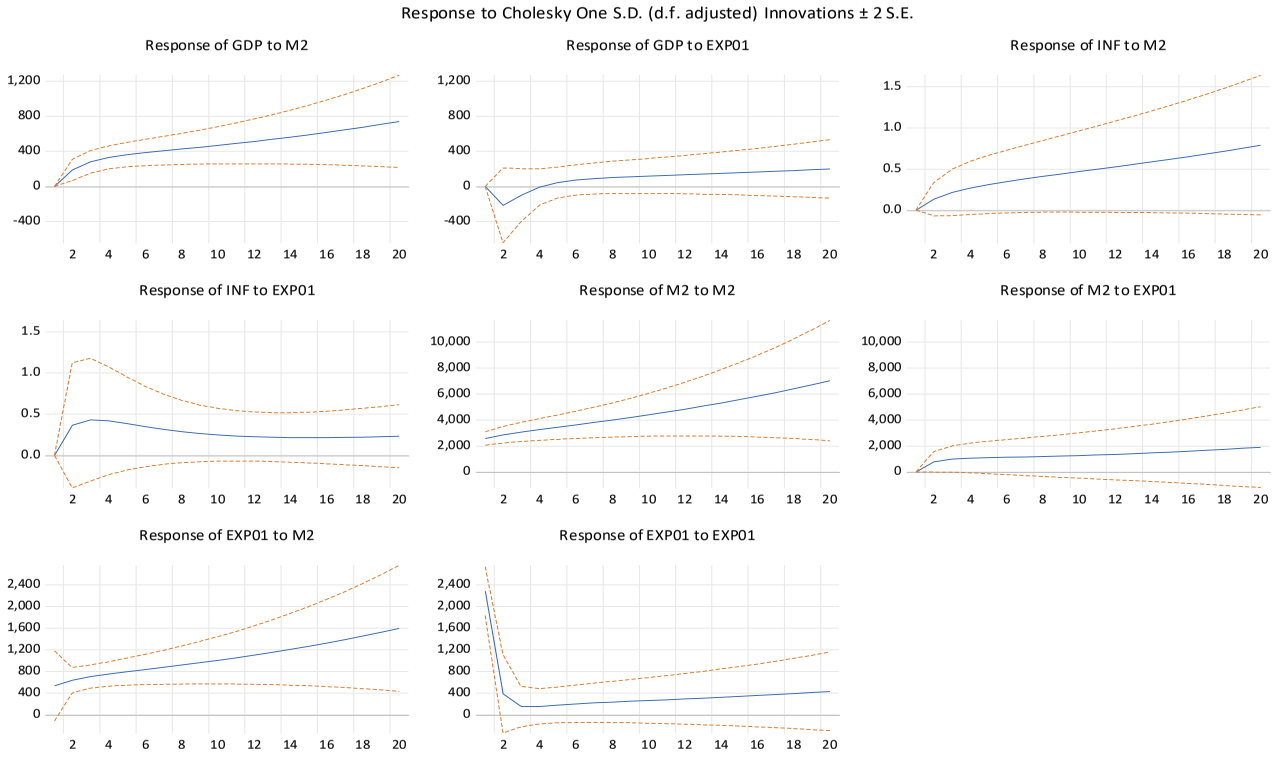


Figure 5: Response to Policy rate and Revenue shocks

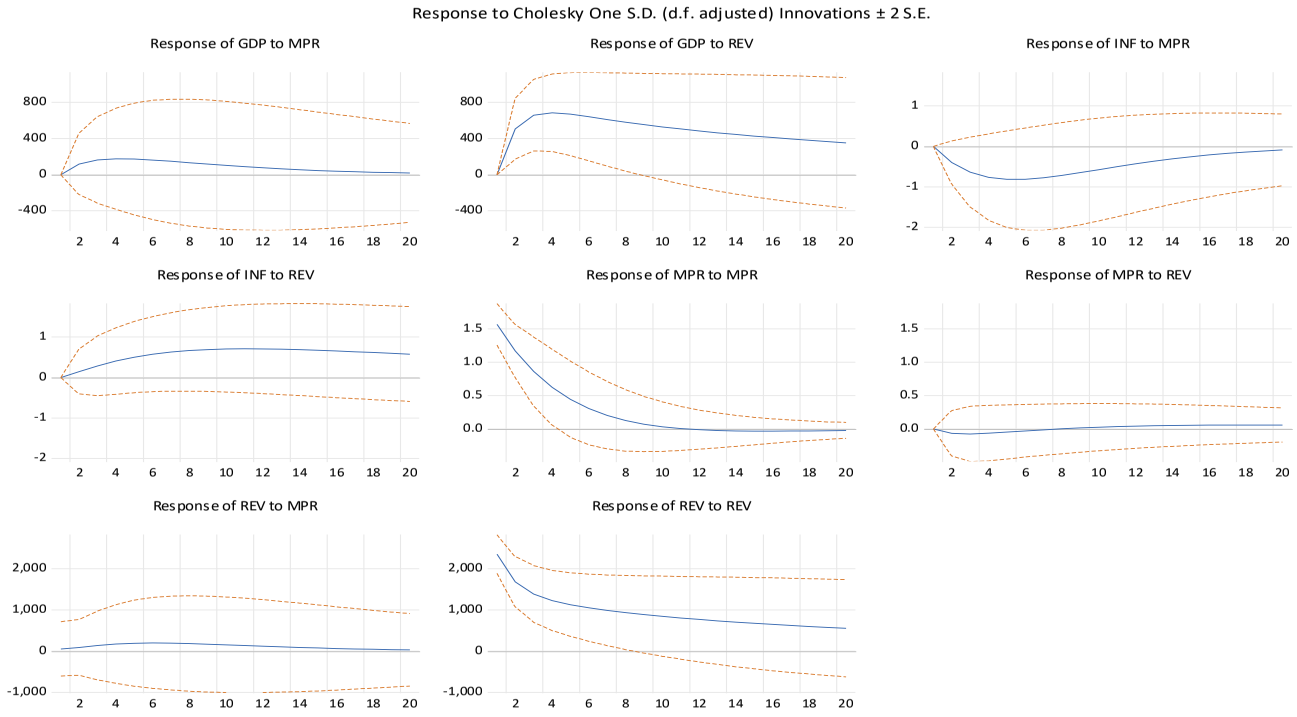
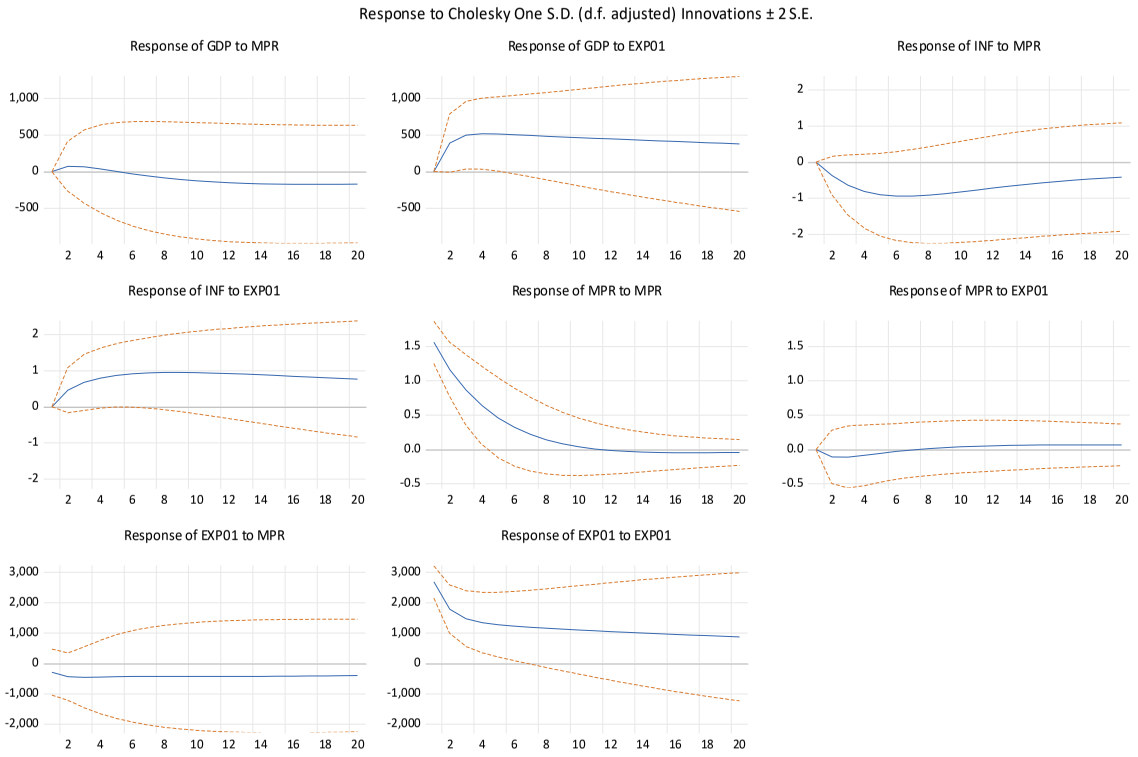


Figure 6: Response to policy rate and Expenditure shocks



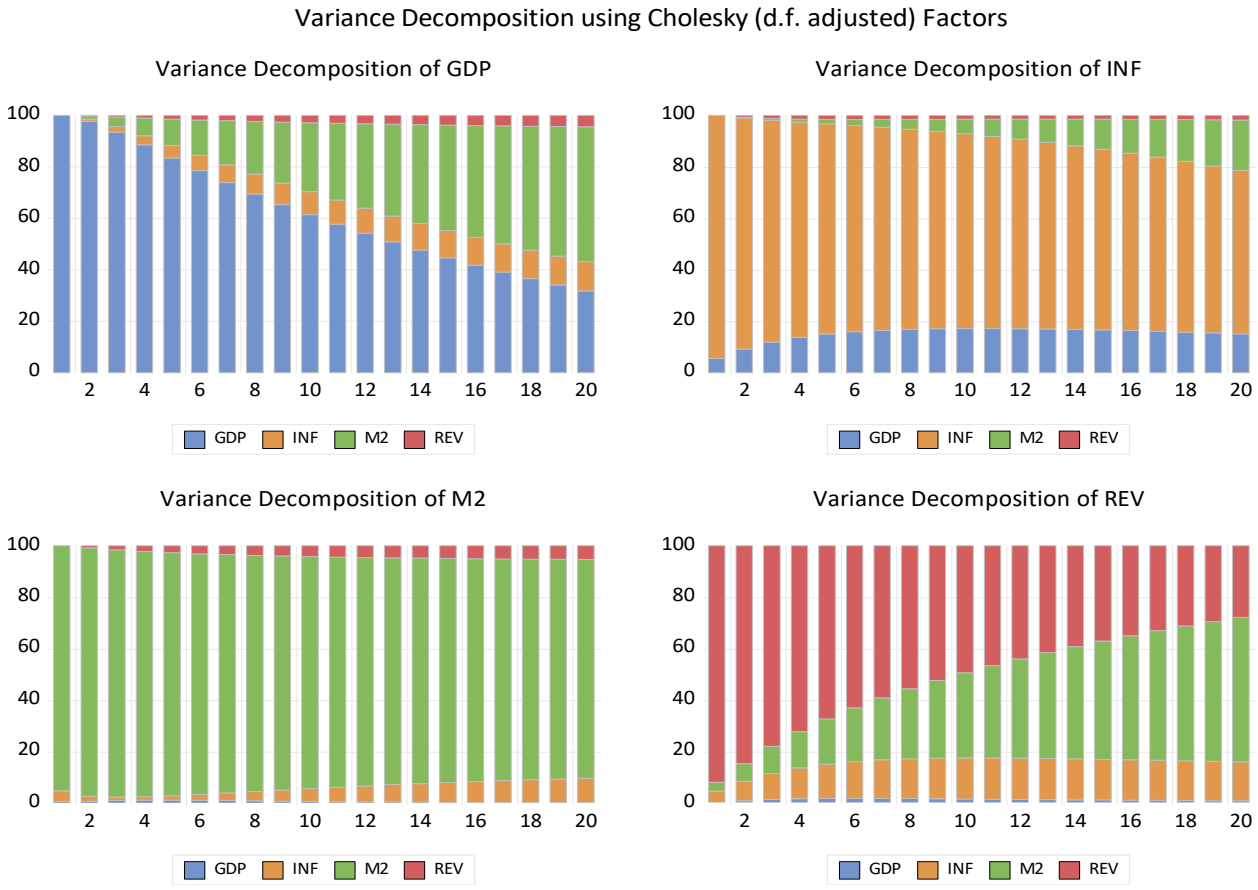
Variance Decomposition

Variance decomposition as described by Zaefarian et al. (2022) is a statistical technique that allows partitioning the total variance in an outcome variable. The aim is to show how much variation in one variable is as a result of other variables in the model. Figure 9 shows that most of the variation in GDP in the first two periods is as a result of changes in itself. However, from period 3 onwards, changes in GDP are increasingly influenced by changes in money supply and a small portion of changes in inflation and revenue.

Inflation variations were mostly driven by itself in the initial two periods and are later influenced by changes in GDP and money supply over the rest of the period. Money supply on the other hand is generally driven by variations in itself with small traces of inflation and revenue in the long run. However, it presents increasing influence in the variation of government revenue both in the short and long term. GDP remained neutral in the variation of money supply and government revenue.

Government expenditure variations follow a similar pattern as that of revenues (see appendix). The policy rate remained flat across all variables except in explaining variations in itself.

Figure 7: Variance Decomposition



6. CONCLUSION

This study assessed the impact of fiscal and monetary policy on economic growth in Zambia using money supply and monetary policy rate as monetary policy instruments and fiscal policy instruments such as government expenditure and government revenue. Government expenditures excluded interest payments from total expenditure as the data did not explicitly provide lines for government expenditure in the domestic economy. Government revenues were modelled as policy outcomes of fiscal policy in order to rule out the possibility of having to pinpoint the accurate form of tax tool or instrument such as the income tax rate, value-added tax rates, or rates associated with customs duty.

The study used vector autoregression (VAR) model to conduct the empirical analysis of the impact of monetary and fiscal policy on economic growth. Within the VAR framework, the Structural VAR (SVAR) was used to model the dynamic relationship among the different variables and trace out the impact of shocks from monetary and fiscal instruments using impulse response functions. The SVAR used a recursive identification strategy and ordered the exogenous copper price first, followed by GDP, inflation, a monetary instrument and a fiscal instrument. The results of the impulse response functions show that money supply positively affects GDP but also drives inflation up. The bank policy rate did not have a significant effect on GDP on its own but it seemed to slow down inflation. In the same vein, both government revenue and expenditure serving as fiscal instruments did positively affect GDP but also edged inflation upwards across the 20-period horizon.

The Bank of Zambia's mission is to promote sustainable economic development by achieving and maintaining price and financial system stability. Based on the findings of this paper and in line with the stance taken by Onderi (2015), the recommendation is that monetary authorities should steer more effort towards quantity based nominal anchors such as money supply since it seems to have a huge effect on driving economic growth. As was earlier stated, most central banks are implicit or explicit inflation targeters and thus adjust short-term rates to achieve price stability, see also Brando-Marques et al. (2020) who provides a detailed analysis concerning monetary policy conduct, its evolution, and transmission in emerging markets and developing economies. To keep price and financial system stability in check, the monetary authority can adjust the policy rate accordingly to keep inflation within the target range, manage the monetary base, particularly currency in circulation and the level of required reserves by commercial banks to be held with the central bank and allow for sustainable growth.

The role of fiscal authorities in an economy is backed by the Keynesian model which places a strong emphasis on the role that taxation and spending by the government play in keeping the economy stable. The model asserts that fiscal policy is necessary to stabilize the economy (Barro, 1999). Therefore, fiscal authorities must observe the real business cycle and know when to act accordingly. For example, during economic booms, they can lower spending or increase taxes to prevent the economy from overheating. During recessions, undertaking larger government spending or tax cuts can boost demand.

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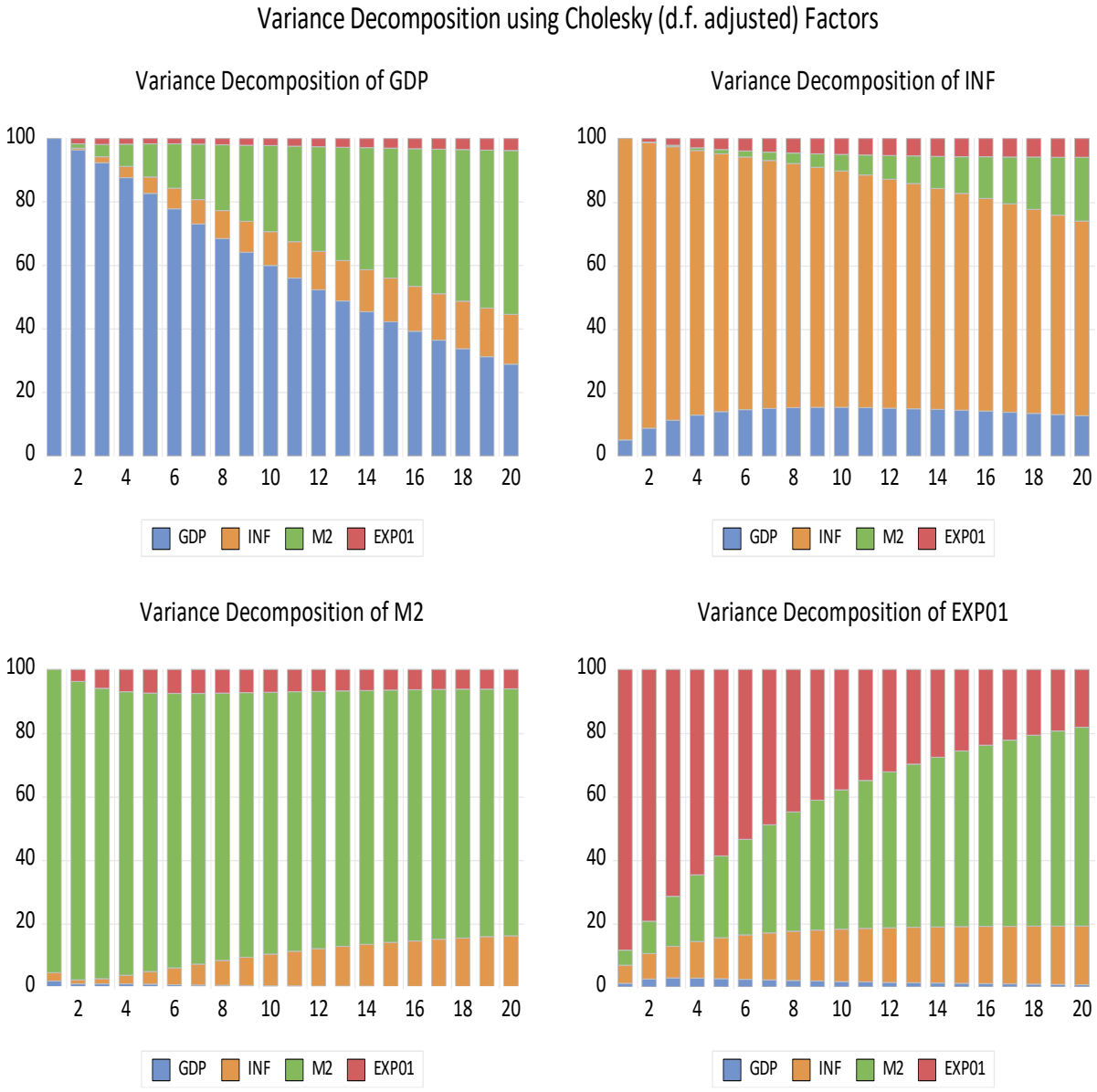
APPENDIX


Variance Decomposition using Cholesky (d.f. adjusted) Factors
Variance Decomposition of GDP
Variance Decomposition of INF
Variance Decomposition of M2
Variance Decomposition of EXP01
100
80
60
40
20
0
2
4
6
8
10
12
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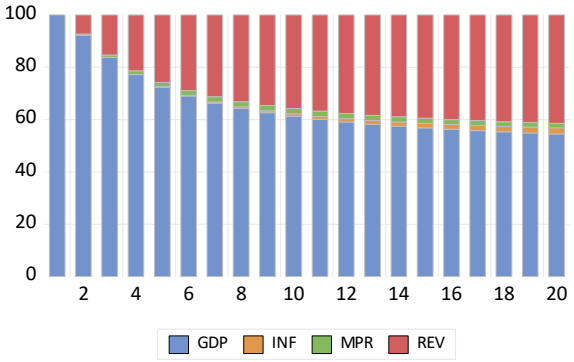
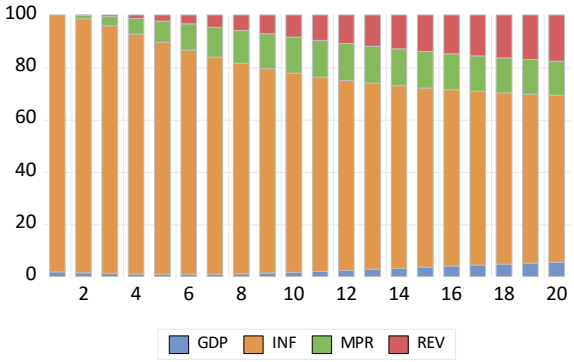
GDP
INF
M2
EXP01

Variance Decomposition using Cholesky (d.f. adjusted) Factors

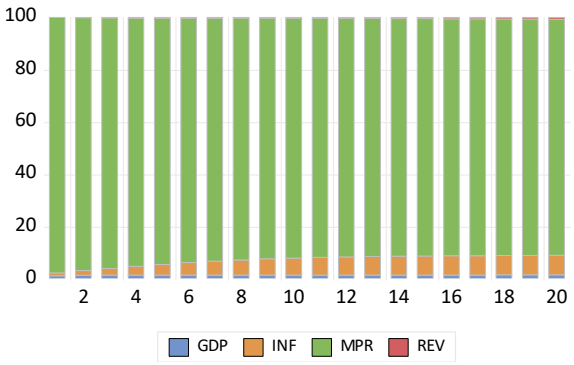
Variance Decomposition of GDP



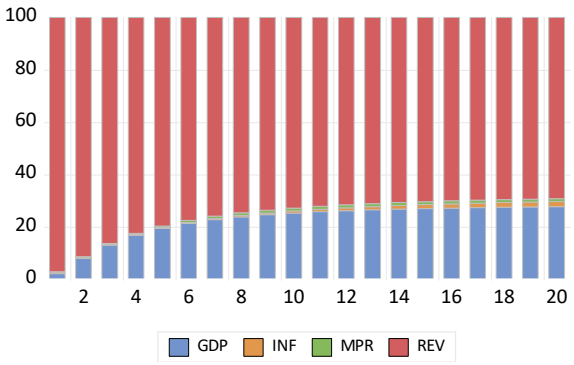
Variance Decomposition of INF



Variance Decomposition of MPR

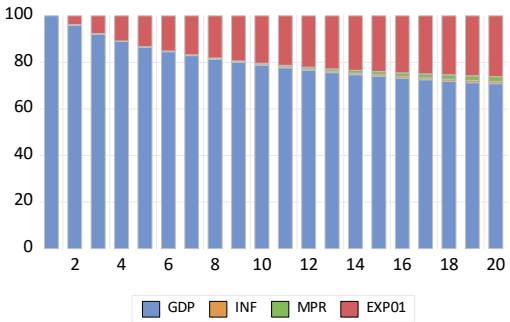


Variance Decomposition of REV

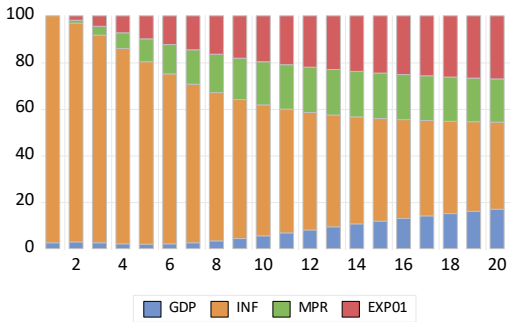


Variance Decomposition using Cholesky (d.f. adjusted) Factors

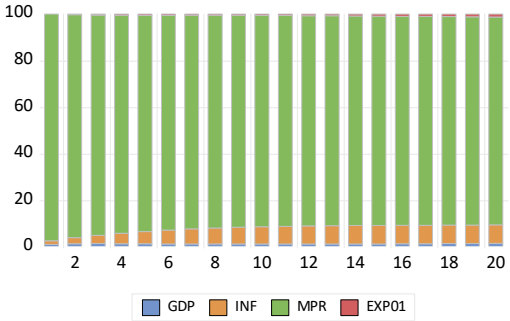
Variance Decomposition of GDP



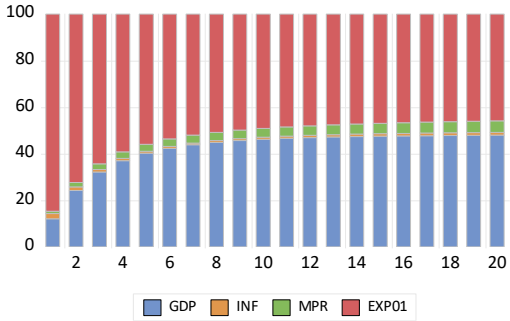
Variance Decomposition of INF



Variance Decomposition of MPR



Variance Decomposition of EXP01



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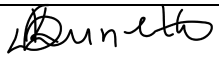
Signature of Student	
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