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-RESEARCH ARTICLE-

MONETARY POLICY IN SOUTH AFRICA: A VECM APPROACH

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─Abstract─

This study aims to analyse monetary policy's influence in South Africa by examining the effects of repo rates and inflation on economic development. The study makes use of annual time series data from 1966 to 2020. The study uses a VECM model and Granger causality tests to analyse the variables' short, long run, and causal relationships. The study revealed that actual interest rates had a modest positive correlation with economic growth in the short term but a significant negative correlation in the long run. M2 was found to negatively correlate with money supply, whereas M3 had a positive correlation in the short and long run. M1 has an inverse association with economic growth in South Africa in the short run but a positive link in the long run. As a result, the study suggests that the SARB must implement expansionary and contractionary monetary policies in the short and long run, respectively, to enhance South Africa's economic growth.

Keywords: Monetary Policy, Inflation, Economic growth, VECM, South Africa

JEL Specification: *CO1, C32, E12, E52, E58.*

1. INTRODUCTION

Due to its influence on economic fundamentals, monetary policy is a critical driver of economic growth. Economic growth is crucial for the health of an economy since it reduces poverty and raises living standards. Due to the increasing importance of monetary policy, most governments have prioritised its efficiency in supporting

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economic growth. Despite widespread disagreement among economists and politicians about how financial policy works and how much it influences the economy, there is surprising agreement that it does have an effect. Monetary policy is subject to classical, Keynesian, and monetarist ideas. These theories differ in their interpretations of how a country's monetary policy operates during periods of full employment, money supply expansion, and price stability.

The money supply is the sum of its currency and other liquid assets on the measurement date, including cash and deposits that can be utilised just as quickly as cash. In a liquidity crisis, the repo rate is the interest rate when a central bank lends money to commercial banks. The repo rate or money supply can be used by monetary authorities to impose macroeconomic control. South Africa's Reserve Bank (SARB) is responsible for safeguarding the currency's value in the interest of balanced and sustainable economic growth (SARB, 2022). The SARB's functions must be conducted independently without fear of retaliation, favour, or bias. The Federal Reserve implements monetary policy by setting a short-term policy rate called the repo rate. This affects the borrowing costs of the banking sector, which in turn affects the more excellent economy. The repo rate derives from banks exchanging cash for a SARB asset such as a government bond. They can then repurchase (repo) the asset at a lesser price to recover the interest they paid, i.e., the repo rate.

The study's executive summary: Monetary policy is defined as a collection of policies aimed at managing the value, supply, and price of money in any economy in a way that is consistent with the projected level of economic activity or with the overall macroeconomic objectives (Precious, 2014; SARB, 2022). The South African Reserve Bank administers South Africa's monetary policy. Monetary policy affects economic growth through collective spending. The financial objectives of the majority of economies include price stability, the balance of payments stability, job creation and output growth, and long-term development (Precious, 2014). Price stability is frequently related to the indirect pursuit of other objectives, such as economic growth, which can occur only when financial markets are stable and allocatively efficient.

According to the SARB governor, economic growth in the next two years would follow the low potential development rate; GDP growth is expected to be 1.7% in 2022 and 1.8% in 2023. The SARB anticipates headline inflation of 5.3% in the fourth quarter of 2022, CPI headline inflation of 4.5% in 2024, core inflation of 3.8%, and a 25 basis point annual increase in the repo rate to 3.75%. South Africa's repo rate has been reduced drastically in reaction to the damage caused by the Covid-19 epidemic to stimulate economic growth and job creation. Following the SARB's most recent interest rate hike, economists anticipate an interest rate of 5.75% in 2023 and 6.75% in 2024 (Briard et al., 2020).

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The monetary policy maintains a money supply proportional to real income growth while preventing inflation. Because inflation is typically a purely economic phenomenon, monetary policy is utilised to combat it. Variations in the money supply and interest rates affect consumer spending and investment decisions (Precious, 2014). As a result, aggregate demand swings due to monetary policy changes. South Africa follows an inflation-targeting system, with the repo rate fixed at between 3% and 6% annually to protect the rand's value and provide price stability. Numerous countries have performed extensive economic research on the monetary policy transmission mechanism. A significant modern trend in this subject has been the empirical analysis of the effects of monetary policy shocks, commonly characterised as a transient and exogenous increase in a short-term interest rate, on production, prices, exchange rates, and other key economic variables (K. C. Cheng, 2007).

The Federal Reserve implements monetary policy by setting a short-term policy rate called the repo rate. This affects the cost of borrowing for the financial sector, affecting the general economy. South Africa started inflation targeting in February 2000. (SARB, 2022). This is a framework in which the central bank uses monetary policy tools, notably interest rate control, to keep inflation within a predetermined target range. The SARB experimented with various other methodologies before adopting the inflation-targeting framework, including exchange rate and money supply targeting. Inflation targeting has been effective because it has resulted in the SARB's instruments and objectives being more realistically aligned (SARB, 2022). Inflation targeting is predicated on the premise that monetary policy has a momentary effect on growth but a lasting effect on prices. Inflation targeting emerged as a result of two theoretical inconsistencies. Several central banks welcomed inflation in the 1970s to stimulate economic growth, but the consequence was stagnant growth and rising inflation, a scenario known as stagflation (SARB, 2022).

Although monetarist policies gained popularity in the 1980s, they failed when central banks recognised that changes in the money supply had only a tangential relationship to outcomes important to people, such as inflation. As a result of the failure of a third strategy, currency rate regulation, several nations, most notably Brazil and the United Kingdom, and to a lesser extent South Africa, embraced inflation targeting (Duke et al., 2020). These policy lessons demonstrated that inflation is more manageable and consequential than the other variables targeted by central banks. In South Africa, the Minister of Finance initiated the goal with the South African Reserve Bank Governor. Since 2017, the monetary policy committee has expressed a preference for inflation near the 4.5%, a midpoint of the target range of 3 to 6%. The monetary policy committee (MPC) meets to establish the repo six times a year. The MPC comprises the SARB's governor, three deputy governors, and senior officials selected by the governor. A typical meeting begins with senior officials' overview of the world and domestic economies, financial markets, and the economy's future (SARB, 2022). The staff economists then depart, allowing the MPC members to determine a repo position and draught a statement.

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Finally, the governor gives this statement live on national television during a news conference that includes a question-and-answer session with reporters.

2. LITERATURE REVIEW

2.1 Theoretical Literature

The concept of monetary policy used by classical economics is based on the quantity theory of money (Hazell, 1898; Walker, 1895). According to this theory, a change in money results in a corresponding increase or decrease in price (Hansen, 1951). The quantity theory of money is frequently described in terms of the exchange equation, denoted by the expression:

$$MV = PY \quad \ldots\ldots (1)$$

P is the current price level, and Y is the actual GDP level. Thus, PY signifies current nominal GDP, M the money supply over which the central bank has some control, and V the velocity of circulation, which is the average number of times the currency is spent on final goods and services over 12 months. According to this equation, the present market worth of all final goods and services—nominal GDP—must equal the quantity of money multiplied by the average annual number of times the currency is used in transactions. The quantity theory of money requires two assumptions to convert the equation of exchange from an identity to a theory of money and monetary policy (Gudalov et al., 2020).

Due to the belief that the economy is always at or near its natural level of real GDP, classical economics assumes that Y in the exchange equation is constant, at least in the short run. Additionally, classical economics believes that V is fixed due to the generally continuous velocity of money in circulation. Assuming that Y and V remain constant, the expansionary or contractionary monetary policy of the central bank has no effect on M except that the price level, P, increases or decreases in direct proportion to the change in M. In other words, an extremely loose monetary policy will always result in inflation. Price deflation is always the effect of a contractionary monetary policy (Habanabakize, 2020).

Monetary policy from a Keynesian perspective: John Maynard. Keynes (1936) refutes the classic quantity theory of money's inextricable relationship between the money supply and the price level. J. M. Keynes (1937) argues against the concept that the economy is perpetually at or near its natural level of real GDP, meaning that Y in the exchange equation is constant. Additionally, they refute the concept that money circulation is constant and provide evidence to support this argument. Keynesians maintain that the money supply and real GDP are inextricably linked. They believe that interest rates will drop by expanding the supply of loanable money available through the banking industry. Interest rate reductions often result in a rise in aggregate spending on

investment and interest-sensitive consumer goods, resulting in a significant gain in GDP. As a result, monetary policy can indirectly affect real GDP.

On the other hand, Keynesians continue to doubt the effectiveness of the monetary policy. They argue that expansionary economic policies that increase banking system reserves do not always result in a multiple expansion of the money supply because banks can refuse to lend their excess funds (Hansen, 1951). Additionally, lower interest rates associated with expansionary monetary policy do not always increase aggregate investment and consumption expenditures, as businesses and consumers' demand for investment and consumption items may be insensitive to interest rate decreases (Kikulwe et al., 2020). Keynesians, for these reasons, tend to place a smaller premium on the efficiency of monetary policy and a higher premium on the success of the fiscal policy, which they believe has a more direct effect on real GDP.

Monetarism is a new school of thought regarding monetary policy that emerged in the 1950s due to Keynes' belief that monetary policy is ineffectual. Monetarists maintain that money demand is constant and unaffected by interest rate fluctuations (Ryan-Collins, 1935). As a result, expansionary economic policies create a money surplus that households quickly spend, increasing aggregate demand. In contrast to classical economists, monetarists recognise that the economy does not always operate at full employment in terms of real GDP. Monetarists believe that expansionary monetary policy can enhance real GDP in the short run through increasing aggregate demand. Monetarists, on the other hand, argue that in the long run, when the economy is at full employment, classical quantity theory provides a reasonable approximation to the relationship between the money supply, price level, and real GDP; in the long run, expansionary monetary policies cause inflation but have no effect on real GDP (Wallenius et al., 2020).

Monetarists are mainly concerned with the dangers of mishandling of monetary policy and price level instability. They frequently attribute the severe deflation of the Great Depression to the central bank's contractionary monetary policy. Prolonged inflations or deflations, according to monetarists, are economic occurrences caused by sustained expansionary or contractionary monetary policy (Matthews et al., 2020). Monetarists advocate for tightening monetary policy to avoid extended periods of inflation or deflation (Hansen, 1951). They believe the central bank should conduct monetary policy to expand the money supply at a rate proportional to the economy's actual growth rate over time. Thus, monetarists maintain that monetary policy should accommodate natural GDP expansion while preventing deflation (Valencia, 2020).

This section comprises empirical research conducted in developed, developing, and South Africa on the relationship between repo rates (monetary policy) and economic growth. The study will be organised around the variables identified positive, negative, no, and nonlinear relationships (Yoon et al., 2020).

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Khabo et al. (2005) investigate the effect of monetary policy on the economic growth of South Africa's small open economy. When the ADT statistic is compared to the McKinnon critical values, it is discovered that changes in the money supply and inflation are strongly related to changes in economic growth; however, monetary authorities can control M3 via the repo rate they are unable to keep it within predetermined targets. Fadiran et al. (2013) compare repo rates in South Africa from 1990 to 2010 using a Structural Vector Autoregressive (SVAR) econometric model. The findings suggested that monetary policy was more efficient during the repo period, which the use of an inflation-targeting framework could explain. K. C. Cheng (2007) conducted a VAR analysis of Kenya's monetary policy's transmission mechanism to ascertain the economic impact of the central bank's repo rate. The study analysed annual time series data from 1997 to 2005. The study used a VAR model to examine the relationships between the variables. The study's core findings illustrate that, while exogenous short-term interest rates often result in price declines and nominal exchange rate increases, they have little effect on production and output.

Precious (2014) examined the economic growth impact of South Africa's monetary policy. The study analysed time-series data from 2000 to 2010 using a VECM. The study determined that the money supply, the repo rate, and the exchange rate are insignificant predictors of economic growth in South Africa and proposes that monetary policy be utilised to encourage an investment climate favourable to sustained economic growth. Gerlach (2011) investigated the ECB's repo rate decisions during the financial crisis. The study employed an ordered logit model from 1999 to 2009. The study found a rapid shift in the middle of 2008 by allowing for a smooth transition from one set of characteristics to the next. Thomas et al. (2018) explore the dynamic influence of foreign direct investment and interest rates on South Africa's GDP. The study used ARDL and ECM models to analyse time-series data from 2000 to 2016. The data reveal a statistically significant positive correlation between the gross domestic product and repo rate in South Africa.

Ichwani (2021) evaluated the BI-7-Days repo rate, GDP, and exchange rate concerning the money supply of Indonesia. From 2016 to 2019, the study used linear regression to determine that the repo rate has a considerable effect on the money supply in Indonesia . Temitope (2014) investigates the impact of the repo rate on inflation in South Africa from 1980 Q2 to 2013 Q3. The study employed a VAR model and Granger causality testing. The study revealed that the repo rate correlates with GDP and inflation growth. According to Higgins et al. (2016), the repo rate's impact on China's GDP and CPI is restricted between 2017 and 2020, when the repo rate was increased. Obeid (2017) used the VECM model and quarterly data to analyse the impact of monetary policy instruments on economic development in Jordan from 2005 to 2015. The data reveal that Jordan's monetary policy and economic growth are positively correlated. Due to the bigger pool of repo market players, Klee (2011) argue that target repo may be a more effective policy instrument than target federal funds rate.

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Twinoburyo (2018) examined the relationship between monetary policy and economic growth from a qualitative perspective. They discovered that most literature established a positive association between monetary policy and economic progress, primarily in financially developed economies with independent central banks, but not in underdeveloped countries. From 1981 to 2008, Onyeiwu (2012) investigated Nigeria's monetary policies and economic growth. The researcher discovered that money supply-based monetary policy was favourable to economic growth but detrimental to inflation using an OLS model. The researcher argues for a more accommodative monetary policy through interest rates, currency exchange rates, and liquidity management tools. From 1975 to 2010, Fasanya et al. (2013) examine the relationship between monetary policy and economic growth in Nigeria. The researchers discovered that the inflation rate, exchange rate, and foreign reserves are the three most important monetary policy tools driving Nigeria's economic growth. They advocated using primary and secondary bond markets to increase monetary policy efficacy.

Adefeso (2010) examine the effect of fiscal and monetary policies on the growth of the Nigerian economy from 1970 to 2007. They employ an ECM model. The findings suggest that monetary policy has a more significant impact on economic growth than previously considered, and Nigeria should place a premium on monetary policy. From 1974 to 2008, Nouri (2011) examine the relationship between Iran's money supply and economic growth. The OLS, Levine, and Renelt models all reveal a positive statistically significant relationship between money supply and economic development in Iran. Bhattacharya et al. (2009) research optimal monetary policy and economic growth and show that the Friedman rule is unsatisfactory independent of risk aversion.Akalpler et al. (2018) investigated the effect of monetary policy on economic growth in Malaysia using an OLS model and discovered a positive correlation between money supply and economic growth. Ufoeze (2018) evaluated the impact of monetary policy on economic development in Nigeria between 1986 and 2016 and discovered that both the monetary policy rate and the money supply had a statistically significant positive effect on economic growth.

Anowor (2016) argue for monetary policy measures to stimulate economic growth in Nigeria, based on an ECM simulation ran using 1982–2013 data. Mugableh (2019) evaluated the monetary policy of Jordan from 1990 to 2017. Using the ARDL and VECM models, the researcher discovered that monetary policy benefits economic growth in Jordan and bidirectional causality between money supply and economic development. Olamide et al. (2019) did a dynamic regression and SVAR study in the SADC region and advocated monetary targeting. S. Cheng et al. (2019) discovered that China's economic development benefits from monetary policy shocks. Kuvalin et al. (2020) examined Russia's monetary policy and found that the central bank uses an inflation targeting mechanism.

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Ndou (2017) investigated the asymmetric effect of repo and inflation rate shocks on South Africa's economic development. The study examined quarterly data from 1995 Q1 to 2014 Q4 using a threshold VAR technique and discovered that rising inflation and repo rates have a detrimental effect on economic growth. Munyeka (2014) found a negative correlation between inflation and economic development in South Africa from 1993 to 2011 using quarterly data and an OLS model. Kamaan (2014) evaluated the quantitative influence of monetary policy on economic development in Kenya and discovered that initial monetary policy shocks were negative and inconsequential before turning positive and insignificant over the next four months. The experts argue that interest rates should be decreased to a level that promotes economic growth while maintaining moderate inflation. Abata (2012) support fiscal prudence as a means of resolving Nigeria's budgetary indiscipline.

Amarasekara (2008) examined the impact of monetary policy on economic growth in Sri Lanka from 1978 to 2005. The study employs a VAR model and discovers that a decline in economic growth has a relatively short lag in the anticipated policy. From 1973 to 2014, Ahmad (2016) evaluated the effect of monetary policy on economic growth in Pakistan. According to an ARDL model, interest rates and inflation are detrimental to economic growth, whereas the money supply and exchange rates are beneficial. Tan et al. (2020) discovered that interest rates were detrimental to economic growth in Malaysia, Singapore, and Thailand between 1980 and 2017. They used the ARDL, FMOLS, CCR, and DOLS models.

The subsequent studies showed no correlations, nonlinear relationships, or causative relationships: Fry (2019) conducted a survey of the financial structure, monetary policy, and economic growth in Hong Kong, Singapore, Taiwan, and South Korea between 1960 and 1983. The findings indicated that the four countries' monetary policies had stifled neither economic growth nor exports. Meyer (2017) examined the short- and long-run effects of economic growth on employment in South Africa using a VAR and Granger causality model. The study analysed data from 2002 to 2016 and discovered that economic growth and the volatility of repo rates affect careers. Phiri (2018) examined quarterly data from 2001 Q1 to 2016 Q2 in South Africa using a smooth transition regression (STR) and established a threshold of 5.30% over which inflation benefits economic development and below which it damages economic growth. N. E. Monamodi, & Choga, I (2022) study the impact of fiscal and monetary policies on economic growth in SACU from 1980 to 2017. They utilised panel ARDL and pooled mean group estimator models. The researchers discovered that causality in SACU runs in the opposite direction from government expenditure to actual interest rates, inflation, and the official currency rate.

The significance of this study is that it evaluates the relationship between monetary policy, economic growth, inflation, and unemployment in South Africa between 1966 and 2020. Recently, in response to the Coronavirus epidemic, the SARB adopted an

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expansionary monetary policy, lowering the repo rate by 275 basis points, from 6.25 to 3.50%, to encourage economic activity. The purpose of this study is to explore the relationship between monetary policy and economic growth in South Africa to gain a better understanding of the role of monetary policy in the country's economy. This study will demonstrate the effect of accurate interest rates, money supply (M1, M2, and M2), lending rates, consumer price inflation, and unemployment on economic growth in South Africa.

3. METHODOLOGY

Table 1: Variable and Description

Variable	Description	Unit	Source
M1	Monetary Aggregates/ Money Supply:M1	Percentage	SARB
M2	Monetary Aggregates/ Money Supply:M2	Percentage	SARB
M3	Monetary Aggregates/ Money Supply:M3	Percentage	SARB
CPI	Inflation consumer prices annual percentage	Percentage	World Bank
GDP	GDP per capita annual growth rate	Percentage	World Bank
UNE	Unemployment	Percentage	World Bank
LIR	Lending interest rate	Percentage	World Bank
RIR	Real interest rate	Percentage	World Bank

Source: Author's compilation

The study makes use of annual time series data from 1966 to 2020. Secondary sources, including the South African Reserve Bank and the World Bank, were consulted for the data. The variables are represented using natural logarithms. Precious (2014) and Ichwani (2021), respectively, derived the money supply (M1,2, and 3), repo, CPI, and GDP (2021). It was decided to use Meyer's definition of unemployed (2017).

Empirical model estimation: The study's primary objective is to assess the effect of monetary policy on the South African economy's growth by examining the real interest rate, the money supply (M1, 2, and 3), lending rates, consumer price inflation, and unemployment. As indicated in the following equation, these variables are utilised to generate a multivariate regression equation:

$$GDP_t = \alpha_1 + \alpha_{RIR} RIR_t + \alpha_{M1} M1_t + \alpha_{M2} M2_t + \alpha_{M3} M3_t + \alpha_{LIR} LIR_t + \alpha_{CPI} CPI_t + \alpha_{UNE} UNE_t + \varepsilon_t \quad \ldots\ldots(2)$$

Where, GDP_t represents economic growth, RIR_t is actual interest rates, $M1_t$ is money supply 1, $M2_t$ is money supply 2, $M3_t$ is money supply 3, LIR_t is the lending rates, CPI_t is the inflation consumer prices, UNE_t is the unemployment rate, α_1 is the constant and ε_t is the error term.

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Data analysis: The study determined the stationarity levels of the data using the enhanced Dickey-Fuller and Phillips-Perron unit root tests. This will aid in the model selection process and help avoid producing false regressions. The model's ideal amount of lags to include is determined using the lag length criteria, and the long-term relationship between the variables is determined using the Johansen cointegration test. The VECM model created by Precious (2014), Obeid (2017), and Mugableh (2019) is used in this Olamide et al. (2019). This model will allow for estimating both short- and long-term relationships between the model's variables. The VECM employed in this study acts to no more than n-1 cointegrating vectors.

$$\Delta Y_t = \theta_0 + \sum_{i=1}^{k-1} \theta_i \, \Delta Y_{t-1} + \propto \beta'^{Y_{t-k}} + \varepsilon_t \quad \text{.....(3)}$$

Where Δ is a differencing operator, Y is the variables (GDP, RIR, M1, M2, M3, LIR, CPI and UNE), θ represents the constant and ε represents the vector of white noise process.

VECM Granger-causality: The empirical estimation of the VECM is specified as given below to show short-run and long-run causal relationships:

$$\Delta GDP_t = \alpha_{10} + \sum_{i=1}^{p} \alpha_{11} \, \Delta RIR_{t-i} + \sum_{i=1}^{q} \alpha_{12} \, \Delta M1_{t-i} + \sum_{i=1}^{r} \alpha_{13} \, \Delta M2_{t-i} + \sum_{i=1}^{s} \alpha_{14} \, \Delta M3_{t-i} + \sum_{i=1}^{t} \alpha_{15} \, \Delta LIR_{t-i} + \sum_{i=1}^{u} \alpha_{16} \, \Delta CPI_{t-i} + \sum_{i=1}^{V} \alpha_{17} \, \Delta UNE_{t-i} + \psi_1 ECT_{t-1} + \varepsilon_{t-i} \quad \text{.....(4)}$$

$$\Delta RIR_t = \alpha_{20} + \sum_{i=1}^{p} \alpha_{21} \, \Delta GDP_{t-i} + \sum_{i=1}^{q} \alpha_{22} \, \Delta M1_{t-i} + \sum_{i=1}^{r} \alpha_{23} \, \Delta M2_{t-i} + \sum_{i=1}^{s} \alpha_{24} \, \Delta M3_{t-i} + \sum_{i=1}^{t} \alpha_{25} \, \Delta LIR_{t-i} + \sum_{i=1}^{u} \alpha_{26} \, \Delta CPI_{t-i} + \sum_{i=1}^{V} \alpha_{27} \, \Delta UNE_{t-i} + \psi_2 ECT_{t-1} + \varepsilon_{2t} \quad \text{.....(5)}$$

$$\Delta M1_t = \alpha_{30} + \sum_{i=1}^{p} \alpha_{31} \, \Delta RIR_{t-i} + \sum_{i=1}^{q} \alpha_{32} \, \Delta GDP_{t-i} + \sum_{i=1}^{r} \alpha_{33} \, \Delta M2_{t-i} + \sum_{i=1}^{s} \alpha_{34} \, \Delta M3_{t-i} + \sum_{i=1}^{t} \alpha_{35} \, \Delta LIR_{t-i} + \sum_{i=1}^{u} \alpha_{36} \, \Delta CPI_{t-i} + \sum_{i=1}^{V} \alpha_{37} \, \Delta UNE_{t-i} + \psi_3 ECT_{t-1} + \varepsilon_{3t} \quad \text{.....(6)}$$

$$\Delta M2_t = \alpha_{40} + \sum_{i=1}^{p} \alpha_{41} \, \Delta M1_{t-i} + \sum_{i=1}^{q} \alpha_{42} \, \Delta RIR_{t-i} + \sum_{i=1}^{r} \alpha_{43} \, \Delta GDP_{t-i} + \sum_{i=1}^{s} \alpha_{44} \, \Delta M3_{t-i} + \sum_{i=1}^{t} \alpha_{45} \, \Delta LIR_{t-i} + \sum_{i=1}^{u} \alpha_{46} \, \Delta CPI_{t-i} + \sum_{i=1}^{V} \alpha_{47} \, \Delta UNE_{t-i} + \psi_4 ECT_{t-1} + \varepsilon_{4t} \quad \text{.....(7)}$$

$$\Delta M3_t = \alpha_{50} + \sum_{i=1}^{p} \alpha_{51} \, \Delta M2_{t-i} + \sum_{i=1}^{q} \alpha_{52} \, \Delta M1_{t-i} + \sum_{i=1}^{r} \alpha_{53} \, \Delta RIR_{t-i} + \sum_{i=1}^{s} \alpha_{54} \, \Delta GDP_{t-i} + \sum_{i=1}^{t} \alpha_{55} \, \Delta LIR_{t-i} + \sum_{i=1}^{u} \alpha_{56} \, \Delta CPI_{t-i} + \sum_{i=1}^{V} \alpha_{57} \, \Delta UNE_{t-i} + \psi_5 ECT_{t-1} + \varepsilon_{5t} \quad \text{.....(8)}$$

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$$\Delta LIR_t = \alpha_{60} + \sum_{i=1}^{p} \alpha_{61}\, \Delta M3_{t-i} + \sum_{i=1}^{q} \alpha_{62}\, \Delta M2_{t-i} + \sum_{i=1}^{r} \alpha_{63}\, \Delta M1_{t-i} + \sum_{i=1}^{s} \alpha_{64}\, \Delta RIR_{t-i} + \sum_{i=1}^{t} \alpha_{65}\, \Delta GDP_{t-i} + \sum_{i=1}^{u} \alpha_{66}\, \Delta CPI_{t-i} + \sum_{i=1}^{V} \alpha_{67}\, \Delta UNE_{t-i} + \psi_6 ECT_{t-1} + \varepsilon_{6t} \quad \text{.....(9)}$$

$$\Delta CPI_t = \alpha_{70} + \sum_{i=1}^{p} \alpha_{71}\, \Delta LIR_{t-i} + \sum_{i=1}^{q} \alpha_{72}\, \Delta M3_{t-i} + \sum_{i=1}^{r} \alpha_{73}\, \Delta M2_{t-i} + \sum_{i=1}^{s} \alpha_{74}\, \Delta M1_{t-i} + \sum_{i=1}^{t} \alpha_{75}\, \Delta RIR_{t-i} + \sum_{i=1}^{u} \alpha_{76}\, \Delta GDP_{t-i} + \sum_{i=1}^{V} \alpha_{77}\, \Delta UNE_{t-i} + \psi_7 ECT_{t-1} + \varepsilon_{7t} \quad \text{.....(10)}$$

$$\Delta UNE_t = \alpha_{80} + \sum_{i=1}^{p} \alpha_{81}\, \Delta CPI_{t-i} + \sum_{i=1}^{q} \alpha_{82}\, \Delta LIR_{t-i} + \sum_{i=1}^{r} \alpha_{83}\, \Delta M3_{t-i} + \sum_{i=1}^{s} \alpha_{84}\, \Delta M2_{t-i} + \sum_{i=1}^{t} \alpha_{85}\, \Delta M1_{t-i} + \sum_{i=1}^{u} \alpha_{86}\, \Delta RIR_{t-i} + \sum_{i=1}^{V} \alpha_{87}\, \Delta GDP_{t-i} + \psi_8 ECT_{t-1} + \varepsilon_{8t} \quad \text{.....(11)}$$

GDP, RIR, M1, M2, M3, LIR, CPI and UNE represent economic growth, real interest rate, money supply (1, 2 and 3), lending rate, inflation, consumer prices, and unemployment. ε defines serially uncorrelated random error terms in periods 1 to 8. ECT represents cointegrating vectors. ψ represents the adjustment coefficient, showing the level of corrected disequilibrium as expressed by Khobai et al. (2017). The researchers further describe that the ECT (ψ) should be significant to find long term causality. The Granger causality tests were also conducted in the study conducted by N. E. Monamodi et al. (2022).

4. RESULTS AND INTERPRETATIONS

As noted in Table 2, the study used the Augmented Dickey-Fuller and Phillips-Perron unit root tests to determine the order of variable integration and to minimise spurious regression issues. According to the ADF and PP results, GDP, RIR, M1, M2, and M3 are all level stationary; they are integrated to order zero or I. (0). On the other hand, LIR, CPI, and UNE remain constant at the first difference, meaning that they are integrated on a scale of one or I. (1). As a result, the data comprises a mixture of I(0) and I(1), which qualifies the VECM model for use because it requires variables to be stationary at I(0), I(1), or a mixture of I(0) and I(1), but not at I(0) (2). As shown in Table 3, the study employs the VAR optimal leg length criteria to determine the optimal number of lags to apply.

The study calculated the maximum number of optimal lags employed in the investigation using the VAR ideal leg length criterion, as evidenced by the results in Table 3. The study will utilise four delays according to the LR, FPE, and AIC criteria, although the SC and HQ criteria recommend zero and one lag, respectively.

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Table 2: Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Unit Root Test

Variables	**ADF unit root test**				**PP unit root test**			
	Constant		Trend & Intercept		Constant		Trend & Intercept	
	Level		Level		Level		Level	
GDP	-3.6128 ***	-8.3730 ***	-3.6284 **	-8.3082 ***	-3.5318 **	-9.6445 ***	-3.6587 **	-9.5402 ***
RIR	-4.0109 ***	-8.9622 ***	-4.4430 ***	-5.4192 ***	-4.0188 ***	-14.320 ***	-4.4693 ***	-14.066 ***
M1	-7.2816 ***	-8.5222 ***	-7.3408 ***	-8.4360 ***	-7.2816 ***	-51.668 ***	-7.3419 ***	-52.040 ***
M2	-4.2605 ***	-7.3942 ***	-4.8317 ***	-7.2868 ***	-4.1513 ***	-17.326 ***	-4.3313 ***	-19.820 ***
M3	-4.0784 ***	-7.8864 ***	-4.8321 ***	-7.8268 ***	-4.0068 ***	-16.138 ***	-4.1703 ***	-22.106 ***
LIR	-1.9976	-6.4881 ***	-2.3774	-6.0946 ***	-1.8137	-5.8156 ***	-1.7025	-9.4546 ***
CPI	-1.8046	-6.7532 ***	-2.3775	-7.0685 ***	-1.8530	-6.5930 ***	-2.0568	-10.2129 ***
UNE	-1.4946	-6.2773 ***	-2.5220	-6.2133 ***	-1.4946	-6.2655 ***	-2.7239	-6.2008 ***

Source: Author's own computation (*),(**),(***) significance at 10%, 5% and 1% respectively

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Table 3: Optimal Leg Length Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1214.303	NA	2.36e+11	48.89212	49.19805*	49.00862
1	-1108.883	172.8888	4.66e+10	47.23532	49.98863	48.28380*
2	-1057.451	67.89074	9.34e+10	47.73803	52.93873	49.71848
3	-980.5455	76.90519	9.79e+10	47.22182	54.86991	50.13426
4	-852.5731	87.02125*	2.88e+10*	44.66292*	54.75840	48.50734

Source: Author's computation

As a result, the study will employ four delays, as most standards require. As a result, the analysis proceeds to estimate cointegration checks using the Johansen technique to ascertain long-run correlations between the variables, as illustrated in Table 4 below.

Table 4: Johansen Cointegration Test

Hypothesised No. of CE(s)	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
None	338.0379*	159.5297	130.1168*	52.36261
At most 1	207.9211*	125.6154	71.19042*	46.23142
At most 2	136.7307*	95.75366	61.63368*	40.07757
At most 3	75.09705*	69.81889	30.76359	33.87687
At most 4	44.33345	47.85613	25.00435	27.58434
At most 5	19.32911	29.79707	13.31594	21.13162
At most 6	6.013166	15.49471	4.881555	14.26460
At most 7	1.131612	3.841465	1.131612	3.841465

Source: Author's computation

As evidenced by the results in Table 4, the Johansen cointegration test was applied in this inquiry. The Trace statistic indicates the existence of four cointegration equations, whereas the Maximum-Eigen statistic indicates the presence of three. According to researchers, the Maximum-Eigen value is more potent than the Trace statistic; consequently, this investigation concludes that the variables in the study exhibit a long-run relationship. As a result, as seen in Tables 5 and 6, the study estimates both short- and long-run linkages.

The short-run relationships analysed using the VECM model are summarised in Table 5. In South Africa, a statistically negligible positive correlation exists between actual interest rates and economic progress over the near term, as indicated by a t-statistic of 1.18, less than the crucial value of 2. In the short run, a 1% increase in South Africa's actual interest rates will result in a minuscule 0.17% gain in economic growth, ceteris paribus. These findings corroborate Fadiran et al. (2013), Precious (2014),Kosi's Cheng's (2007), and Thomas et al. (2018) (Akalpler et al., 2018). These data suggest that actual interest rates contribute positively to the South African economy's growth. As a result,

policies favouring a short-term increase in actual interest rates must be preferred to spur South Africa's economic growth.

Table 5: VECM and Short-run Relationships

Variable	Coefficient	Standard Error	t-Statistic
C	-0.278182	0.27248	-1.02094
D(GDP(-3))	-0.302919	0.22050	-1.37375
D(RIR(-3))	0.179403	0.15162	1.18323
D(M1(-3))	-0.001873	0.00143	-1.30589
D(M2(-3))	-0.074276	0.12660	-0.58670
D(M3(-3))	0.116945	0.13616	0.85886
D(LIR(-3))	-0.418754	0.23571	-1.77655
D(CPI(-3))	0.348236	0.20494	1.69925
D(UNE(-3))	0.122052	0.22385	0.54523
ECT(-1)	0.213103	0.06499	3.27882
R-squared	0.739617		
Adjusted R-squared	0.468384		

Source: Author's computation

Additionally, the data reveal a negative statistically insignificant short-term relationship between money supply 1 and economic development in South Africa, as indicated by a t-statistic less than -2 and a coefficient of -1.31. In the short run, a 1% rise in M1 in South Africa results in a minuscule 0.002% loss in economic growth, ceteris paribus. This shows that in the short run, money supply (M1) is detrimental to economic growth in South Africa, and policies aimed at reducing available M1 must be pursued. These findings contradict those of Akalpler et al. (2018), Ufoeze (2018), Nouri (2011), and Ichwani (2021), which all established a positive relationship between money supply and economic growth.

M2 and economic growth in South Africa have a statistically negligible negative relationship in the near run, as the t-statistic is more diminutive than -2, with a coefficient of -0.59. In the short run, a 1% increase in M2 will result in a modest 0.07% loss in economic growth, assuming all other variables remain constant. These findings are in direct conflict with those of Akalpler et al. (2018), Ufoeze (2018), Nouri (2011), and Ichwani (2021). These findings show that M2 is detrimental to economic growth in the short run. As a result, policies that restrict the supply of M2 in South Africa must be encouraged in the short run to stimulate economic growth.

Additionally, the short-run relationship between M3 and economic growth in South Africa is statistically insignificantly positive since the t-statistic is less than 2 with a coefficient of 0.86. In the short run, a 1% increase in M3 will result in a 0.12% increase in economic growth, assuming all other variables remain constant. These findings

corroborate Akalpler et al. (2018), Ufoeze (2018), .'s Nouri (2011), and Ichwani (2021) findings (2021). These findings show that, in the near run, M3 is crucial for economic growth due to its favourable influence. As a result, activities that enhance M3 in the short term must be promoted to boost South Africa's economic growth.

There is a short-term negative statistically insignificant association between lending interest rates and economic development in South Africa, as the t-statistic is more diminutive than -2 with a coefficient of -1.78. In the short run, a 1% increase in LIR results in a minimal 0.42 % loss in economic growth in South Africa, conditional on other factors remaining constant. These findings show that loan interest rates damage South Africa's economic growth. As a result, economic growth in South Africa requires support for efforts that cut lending interest rates in the short run.

There is a positive statistically insignificant short-term correlation between inflation consumer prices and economic growth in South Africa, as the t-statistic is less than two with a coefficient of 1.69925. In the short run, a 1% increase in the CPI will result in a tiny 0.35% increase in economic growth in South Africa, ceteris paribus. These findings provide credence to Phiri's Akalpler et al. (2018). These findings show that the CPI is crucial for the South African economy's short-term progress. Thus, in the short run, initiatives that result in a CPI increase of between 3 and 6% must be encouraged in South Africa to stimulate economic growth.

In South Africa, there is a statistically negligible positive short-run correlation between unemployment and economic growth, as the t-statistic is less than twice the critical threshold, with a coefficient of 0.55. Ceteris paribus, a 1% increase in unemployment results in a minuscule 0.12% increase in economic growth. This means that unemployment in South Africa does not have to be a short-term impediment to financial success. This reflects the reality that unemployment has a detrimental effect on the South African economy's growth in the near run. As a result, job development efforts must be bolstered if unemployment accounts for a sizable share of South Africa's economic growth.

The R-squared coefficient is 0.739617, suggesting a solid fit and that the model explains for 73.96% of economic growth variation. The adjusted R-squared is 0.468384, implying that 46.84% of the degree of freedom is accounted for. The error correction coefficient is 0.213103, which is positive and statistically significant because the t-statistic is greater than 2 with a coefficient of 3.27882, meaning that 21.31% of economic growth divergence is adjusted towards long-run equilibrium. As a result, as indicated in Table 6 below, the study predicts long-run relationships.

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Table 6: VECM and Long-run Relationships

Variable	Coefficient	Standard Error	t-Statistic
GDP(-1)	1.000000	-	-
RIR(-1)	-1.454215	0.11548	-12.5925
M1(-1)	0.004526	0.00259	1.75017
M2(-1)	-0.179623	0.20540	-0.87449
M3(-1)	0.193721	0.22327	0.86765
LIR(-1)	-3.866342	0.69568	-5.55768
CPI(-1)	-6.136558	0.55337	-11.0894
UNE(-1)	-0.100950	0.29351	-0.34395

Source: Author's computation

The results of the long term association are shown in Table 6 above. Because the t-statistic is smaller than -2, the critical value with a coefficient of -12.59, the long-run relationship between actual interest rates and economic growth in South Africa is negative statistically significant. In the long run, a 1% increase in RIR results in a 1.45% loss in economic development, ceteris paribus. The findings of Fadiran et al. (2013), Precious (2014), K. C. Cheng (2007), and Thomas et al. (2018) are in opposition to those of Fadiran et al. (2013), Precious (2014), Thomas et al. (2018). This means that actual interest rates are long-term detrimental to South Africa's economic growth. As a result, policies that result in lower actual interest rates must be pursued in the long run to stimulate economic growth.

Additionally, a long term positive statistically insignificant correlation exists between money supply 1 and economic growth in South Africa since the t-statistic is less than the critical value of 2 with a coefficient of 1.75. In the long run, a 1% increase in M1 in South Africa results in a minuscule 0.004% increase in economic growth, ceteris paribus. These findings corroborate Akalpler et al. (2018), Ufoeze (2018),.'s Nouri (2011), and Ichwani (2021) findings (2021). These findings show that M1 is crucial for South Africa's long-run economic growth due to its beneficial effect. As a result, policies that gradually increase the quantity of M1 must be implemented to stimulate economic growth.

Because the t-statistic exceeds -2, the threshold value with a coefficient of -0.87, there is a long term negative statistically insignificant relationship between M2 and economic growth in South Africa. In the long run, a 1% increase in M2 in South Africa will result in a minimal 0.18 percentage point loss in economic growth, assuming all other variables remain constant. These findings are in direct conflict with those of Akalpler et al. (2018), Ufoeze (2018), Nouri (2011), and Ichwani (2021). These data show that M2 is long-term detrimental to the growth of the South African economy. As a result, policies that result in a gradual fall in the quantity of M2 must be implemented to maintain economic development.

M3 and economic growth in South Africa show a positive long-term correlation that is statistically insignificant, as the t-statistic is less than 2 with a coefficient of 0.87. In the long run, a 1% increase in M3 will result in a minuscule 0.19% increase in economic growth, assuming all other variables remain constant. These findings corroborate Akalpler et al. (2018), Ufoeze (2018), .'s Nouri (2011), and Ichwani (2021) findings (2021). These findings show that the quantity of M3 is crucial for the South African economy's long-run growth due to its beneficial effect. Thus, methods that result in a long-term increase in M3 in South Africa must be pursued to stimulate economic growth.

Because the t-statistic is more diminutive than -2, the essential value with a coefficient of -5.56, the long-run link between lending interest rates and economic growth in South Africa is negative statistically significant. In the long run, a 1% increase in LIR will significantly reduce economic growth in South Africa by 3.87%, ceteris paribus. This suggests that high loan interest rates are long-term detrimental to the development of the South African economy. As a result, policies resulting in long-run declines in lending interest rates must be implemented to enhance economic growth significantly.

Additionally, there is a negative statistically significant long-term correlation between consumer price inflation and economic growth in South Africa, as the t-statistic is less than the critical value of -2 with a coefficient of -11.09. In the long run, a 1% increase in South Africa's consumer price index will significantly lower economic growth by 6.14%, ceteris paribus. Munyeka's (2014) and Ahmad et al. findings .'s are corroborated by these studies (2016). These data show that the CPI is long-term detrimental to South Africa's economic growth. As a result, policies to lower the CPI must be promoted to enhance economic growth significantly.

In the long run, there is a statistically insignificant negative correlation between unemployment and economic growth in South Africa, as the t-statistic with a coefficient of -0.34 exceeds the critical threshold of -2. In the long run, a 1% increase in unemployment in South Africa will result in a minor 0.10% decrease in economic growth, conditional on other factors remaining constant. These findings show that unemployment has a long-term adverse effect on the development of the South African economy. This suggests that activities to reduce unemployment must be encouraged to boost South Africa's economic growth. As a result, the study continues to decompose the variation of South Africa's monetary economic development, as demonstrated in Tables 7 to 11 below.

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Table 7: Variance Decomposition Economic Growth

Period	S.E.	GDP	RIR	M1	M2	M3	LIR	CPI	UNE
1	1.9068	100.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	2.7273	63.895	5.4972	0.0953	4.6159	2.2331	17.941	5.7162	0.0068
3	3.2484	63.801	9.1117	1.7423	4.1376	1.6997	12.923	6.5768	0.0088
4	3.5337	62.264	7.9046	1.7841	4.8496	1.9529	14.484	6.0205	0.7405
5	3.9523	63.533	6.5277	5.6538	4.4919	1.5639	12.162	5.3350	0.7326
6	4.1337	64.531	6.0933	5.5624	4.2049	1.4469	11.477	5.4180	1.2669
7	4.3059	63.303	6.7559	5.1509	6.5313	1.3548	10.742	4.9941	1.1679
8	4.4189	61.570	7.0347	5.1133	6.2402	1.3550	11.578	5.9267	1.1818
9	4.7379	62.900	6.1864	4.6478	5.4832	2.5349	11.199	6.0061	1.0425
10	5.0105	64.027	5.5536	4.2427	4.9050	2.6035	11.624	6.0329	1.0113

Source: Author's computation

The variance decomposition results for economic growth using Cholesky (d.f.) factors are summarised in Table 7. The data indicate that a one standard deviation shock to actual interest rates, M1, M2, M3, loan interest rates, CPI, and unemployment in the tenth year will result in 5.55%, 4.24% 4.91%, 2.60%, 11.62%, 6.03%, and 1.01%, respectively. After ten periods, a greater percentage of 64.03% adequately accounts for economic development. The table below depicts how the variance of actual interest rates is decomposed.

The variance decomposition of actual interest rates using Cholesky (d.f.) factors is summarised in Table 8. The results indicate that in the tenth year, a one standard deviation shock to economic growth, M1, M2, M3, lending interest rates, CPI, and unemployment will result in 3.51%, 5.69%, 2.58%, 6.79%, 1.40%, 7.08%, and 1.43%, respectively. After ten periods, a more significant percentage of 71.53% becomes self-explanatory for actual interest rates. The table below depicts how the variance of the money supply number one is decomposed (M1).

The outcomes of the variance decomposition using Cholesky (d.f.) factors for money supply 1 are summarised in Table 9. (M1). The findings indicate that a one standard deviation shock to economic growth, actual interest rates, M2, M3, lending interest rates, the consumer price index, and unemployment in the tenth year will result in 22.67%, 4.71%, 2.30%, 1.87%, 3.92%, 0.72%, and 2.41%, respectively. After ten sessions, M1 becomes self-explanatory with a more substantial share of 61.40%. The table below depicts how the volatility of the money supply is subdivided (M2).

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Table 8: Variance Decomposition Real Interest Rate

Period	S.E.	GDP	RIR	M1	M2	M3	LIR	CPI	UNE
1	4.0241	0.9693	99.030	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	5.3390	1.0243	86.759	10.751	0.6996	0.2069	0.1245	0.2116	0.2239
3	6.1751	0.8396	81.460	8.0930	1.0575	4.9120	0.2766	2.5000	0.8616
4	6.5649	0.9181	77.524	8.1317	1.7359	5.8279	0.9274	4.1622	0.7723
5	6.9450	1.7593	72.637	7.2787	1.5906	5.4585	1.4873	8.1292	1.6592
6	7.2669	2.8065	69.387	6.7505	2.4891	5.9426	1.5194	9.5449	1.5597
7	7.5990	3.4965	70.262	6.5038	2.7229	5.4348	1.3895	8.7474	1.4428
8	7.8797	3.5533	71.124	6.3925	2.5344	5.1692	1.6025	8.1932	1.4308
9	8.2214	3.6778	71.333	6.1938	2.3295	5.9331	1.4883	7.5333	1.5116
10	8.5751	3.5094	71.528	5.6938	2.5849	6.7865	1.3988	7.0671	1.4310

Source: Author's computation

Table 9: Variance Decomposition M1

Period	S.E.	GDP	RIR	M1	M2	M3	LIR	CPI	UNE
1	334.57	17.998	5.5893	76.412	0.0000	0.0000	0.0000	0.0000	0.0000
2	390.81	16.394	6.5091	71.584	1.4996	0.5597	0.3970	0.0034	3.0532
3	419.07	16.907	5.7430	69.591	2.2706	1.2647	0.8980	0.0096	3.3155
4	470.61	28.263	4.6258	58.022	1.8375	1.9142	1.8979	0.0274	3.4120
5	503.92	24.760	4.3177	60.702	1.6274	2.1872	2.6200	0.5364	3.2494
6	537.02	24.716	5.4324	58.936	1.6812	1.9321	3.9399	0.4880	2.8746
7	568.35	22.449	5.1852	61.442	1.5538	1.7531	4.0933	0.7804	2.7426
8	594.47	22.109	5.1815	61.953	1.6075	1.6240	4.2870	0.7216	2.5170
9	618.12	22.059	4.9583	61.495	2.4207	1.7446	4.1038	0.6740	2.5452
10	634.59	22.665	4.7074	61.399	2.3022	1.8699	3.9220	0.7197	2.4149

Source: Author's computation

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Table 10 Variance Decomposition M2

Period	S.E.	GDP	RIR	M1	M2	M3	LIR	CPI	UNE
1	4.3030	1.9834	7.0593	0.7538	90.204	0.0000	0.0000	0.0000	0.0000
2	7.1676	2.2328	13.176	0.9398	70.404	0.1447	0.1268	12.970	0.0051
3	8.6878	1.5945	18.140	0.6827	58.863	1.9266	1.3803	17.170	0.2432
4	9.5770	10.265	16.687	1.0456	48.612	3.9772	1.4836	17.119	0.8107
5	10.573	19.274	13.720	2.8931	40.063	3.8223	2.1725	17.261	0.7930
6	11.109	17.755	12.759	2.6280	44.471	3.5037	1.9950	15.775	1.1126
7	11.659	17.273	12.515	2.4782	46.589	3.6339	2.1683	14.330	1.0125
8	12.280	15.897	11.539	4.2934	46.937	3.3070	2.0592	15.048	0.9186
9	12.763	15.467	10.691	4.2238	47.244	3.2444	2.5375	15.736	0.8559
10	13.500	18.406	10.612	3.8479	44.371	3.0300	2.4372	16.509	0.7867

Source: Author's computation

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Table 10 summarises the variance decomposition results for M2 using Cholesky (d.f.) Factors. The results indicate that a one-standard-deviation shock to economic growth, actual interest rates, M1, M3, loan interest rates, CPI, and unemployment in the tenth year will result in 18.41%, 10.61%, 3.851%, 3.031%, 2.441%, 16.511%, and 0.791%, respectively. After ten periods, real interest rates of 44.37% become self-explanatory. The table below depicts the variance decomposition for the third money supply (M3).

Table 11: Variance Decomposition M3

Period	S.E.	GDP	RIR	M1	M2	M3	LIR	CPI	UNE
1	4.4580	0.1333	0.9025	2.0754	64.257	32.632	0.0000	0.0000	0.0000
2	6.7269	5.5074	15.260	1.1420	52.144	16.199	6.9300	9.3312	0.1463
3	7.8597	7.1091	20.582	1.1613	44.768	12.254	3.5105	10.158	0.4567
4	8.6207	12.580	17.309	1.5656	37.867	13.434	4.2307	12.399	0.6145
5	9.5553	17.882	14.214	4.2055	31.768	14.261	4.3338	12.752	0.5846
6	9.9663	17.851	13.489	4.0375	33.981	13.898	4.2453	11.748	0.7505
7	10.397	16.566	13.805	3.7099	35.840	14.346	4.1282	10.896	0.7088
8	11.032	14.853	12.803	4.4083	38.271	13.031	4.5252	11.477	0.6309
9	11.592	16.022	12.374	4.5982	37.643	12.009	4.4776	12.301	0.5759
10	12.262	19.949	11.759	4.1382	34.282	11.399	4.8850	13.043	0.5450

Source: Author's computation

The results of the variance decomposition using Cholesky (d.f.) Factors for M3 are summarised in Table 11. According to the findings, a one standard deviation shock to economic growth, actual interest rates, M1, M2, lending interest rates, CPI, and unemployment in the tenth year will result in 19.95%, 11.76%, 4.14%, 34.28%, 4.89%, 13.04%, and 0.55%, respectively. After ten periods, a reduced actual interest rate proportion of 11.40% becomes self-explanatory. The following table summarises the Granger causality testing findings.

The Granger Causality test was used to examine the short and long run associations in Tables 5 and 6 and look for causal relationships, as shown in Table 12. The data suggest that actual interest rates and economic growth have a one-way causal relationship. These findings corroborate a previously published study (N. E. Monamodi, & Choga, I, 2022). This implies that actual interest rates contribute to and explain South Africa's economic growth. As a result, changes in real interest rates will affect economic growth.

Additionally, the statistics suggest that the relationship between M1 and economic development is unidirectional. This means that M1 contributes to the economic growth of South Africa. Though M1 contributed little to explaining economic growth in the short and long run, as indicated in Tables 5 and 6, it has a robust causal effect on economic growth, meaning that policies impacting M1 will have a causal impact on the South African economy's growth. In South Africa, a one-way causal relationship exists

between lending interest rates and economic progress. This demonstrates that lending interest rates have been a critical factor in explaining economic growth and that policies altering lending interest rates will have a robust causal effect on the expansion of the South African economy. The findings indicate no causal relationships between M2, M3, CPI, unemployment, and economic development in South Africa, meaning that policies impacting any of these variables will not affect economic growth.

Table 12: Granger Causality Test

Null Hypothesis	F-statistic	Prob.
RIR does not Granger Cause GDP	3.60460	0.0130
GDP does not Granger Cause RIR	1.51143	0.2162
M1 does not Granger Cause GDP	2.09491	0.0985
GDP does not Granger Cause M1	0.72254	0.5814
M2 does not Granger Cause GDP	0.82234	0.5183
GDP does not Granger Cause M2	1.22404	0.3151
M3 does not Granger Cause GDP	0.54257	0.7053
GDP does not Granger Cause M3	0.74203	0.5688
LIR does not Granger Cause GDP	7.61389	0.0001
GDP does not Granger Cause LIR	0.17661	0.9492
CPI does not Granger Cause GDP	0.96018	0.4396
GDP does not Granger Cause CPI	1.64771	0.1807
UNE does not Granger Cause GDP	0.52720	0.7163
GDP does not Granger Cause UNE	0.82562	0.6165

Source: Author's computation

5. RECOMMENDATIONS AND CONCLUSIONS

The study studied the effect of monetary policy on economic growth in South Africa. The study examined actual interest rates, money supply (M1, M2, and M3), lending rates, the consumer price index, and unemployment. Using annual time series data from 1966 to 2020 using a Vector Error Correction Model, the study examined the association between the variables. The study revealed that actual interest rates had a modest positive correlation with economic growth in the short term but a significant negative correlation in the long run. M2 was found to negatively correlate with money supply, whereas M3 had a positive correlation in the short and long run. M1 has an inverse association with economic growth in South Africa in the short run but a positive link in the long run.

The study's empirical findings have the following policy ramifications: To begin, the relationship between actual interest rates and economic growth needs governments to undertake expansionary or contractionary monetary policies in the short and long run, respectively. This means that the government should raise and cut actual interest rates in the short and long term, respectively, to boost South Africa's economic growth.

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Second, given the relationship between M1 and economic development, the monetary policy committee should pursue both expansionary and contractionary monetary policy in the short and long run, respectively, to stimulate economic growth in South Africa. To promote economic growth in South Africa, the government must adjust the money supply in the short and long run. In South Africa, the relationship between M2 and M3 necessitates the adoption of contractionary and expansionary monetary policies in the short and long run, respectively, to stimulate economic growth. To promote economic growth, the government must limit M2 supply while increasing M3 supply. This will enable individuals to obtain more long-term loans to fund their enterprises and reduce their dependency on short-term loans, boosting their economic growth.

The positive short-run and negative long-run correlations between lending rates and economic growth entail the SARB reducing rates in both the short- and long-run. This would enable individuals and firms to borrow more money, increasing aggregate spending and resulting in economic growth in South Africa. The positive short-run and negative long-run relationship between CPI and economic growth necessitate that the monetary authorities implement policies that stimulate inflation within the target range of 3 to 6% in the short run and procedures that maintain low inflation, in the long run, to avoid the economy overheating and thus generating economic growth. Given South Africa's exceptionally high unemployment rate, the relationship between unemployment and economic development is worrying. This requires collaboration between the government and monetary authorities on policy formulation to absorb the sizable unemployment pool. This can be accomplished by monetary authorities maintaining low prime rates, which enable businesses to borrow more money and grow their production scale, which requires more significant labour and reduces unemployment. Additionally, the government can subsidise the private sector to reduce production costs and provide employment opportunities.

The study's principal purpose was to ascertain the short- and long-run effects of monetary policy on economic growth in South Africa. This was accomplished by applying the VECM model to real GDP, actual interest rates, money supply, lending rates, consumer price index, and unemployment. As a result, the study suggests that the SARB must implement expansionary and contractionary monetary policies in the short and long run, respectively, to enhance South Africa's economic growth. In the future, researchers could examine the relationship between monetary policy and economic development using a different model and quarterly data to see if they can unearth new insights in the South African context with further observations.

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