

The impact of financial development on the effectiveness of monetary policy in South Africa

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Abstract

The study examines how financial development affects the effectiveness of monetary policy in influencing output and inflation in South Africa, through its interaction with the repo rate. Monetary policy effectiveness in this relationship is measured by the responsiveness of output and inflation to an interaction-term between a financial development indicator and the repo rate. This is carried out by estimating an output and inflation equations incorporating the interaction-term as an explanatory variable in each of the output and inflation equations. If the coefficient of the interaction-terms is negative and significant it implies that the effectiveness of monetary policy in influencing output and inflation is enhanced. On the other hand, a positive and significant coefficient of the interaction-terms means that the interaction of the financial development with the repo rate dampens monetary policy effectiveness in influencing output and inflation. Considering the adoption of an Inflation Targeting Framework (ITF) monetary policy framework in 2000, the study further examines how the regime shift has affected the effectiveness of monetary policy in South Africa. The study employs an Autoregressive Distributed Lag (ARDL) model to analyse the data for long-run co-integration and an Error Correction Model (ECM) to test for a short-run relationship. Additionally, the study uses a structural VAR to assess how long it takes for the interaction-terms to have full impact on output and inflation. The study concludes that the effect of monetary policy on output and inflation is enhanced through the interaction of the bank-based financial development indicator with the repo rate in South Africa. It also concludes that it takes about three quarters and four quarters for the bank-based interaction-term to have full impact on output and inflation respectively, which is quicker than it takes for the repo rate individually to have full impact on these variables. The study also finds that after the adoption of the ITF, the repo rate managed to restrain inflation to be within the targeted band at the expense of output. The study recommends that the South African Reserve Bank (SARB) should consider the bank-based financial development indicator when formulating its monetary policy.

Key Words: Financial development, Bank-based interaction-term, Stock market-based interaction-term Monetary policy, Autoregressive Distributed Lag (ARDL)

1. Introduction

This paper investigates how financial development, through its interaction with the repo rate, affects the effectiveness of monetary policy in influencing output and inflation in South Africa. Angeloni et al. (2003) note that financial development affects the transmission of monetary policy to the entire economy by affecting the channels through which monetary policy is transmitted to inflation and output. As observed by Seth and Kalyanaraman (2017), the degree of monetary policy effectiveness varies with the levels of financial development. Loayza, and Schmidt-Hebbel (2002) indicate that each stage of the transmission of monetary policy is particularly affected by the level of financial development. Effiong et al. (2020) also argue that a well-developed financial sector is a precondition for an effective monetary policy transmission, but the relation differs depending on countries' financial structure. The dominant channel through which financial development affect monetary policy transmission is the credit channel as supported by the credit channel theory that consists of the bank lending channel and balance sheet channel as proposed by Bernanke and Gertler (1995). While Loayza and Schmidt-Hebbel (2002) also support the dominance of the credit channel, they further observed that as the financial system becomes more developed and diversified, the other channels such as the asset price, interest rate and exchange rate turn out to be more significant.

Hence, the study intends to examine whether the interaction between a financial development indicator and the repo rate in South Africa improves or worsens the effectiveness of monetary policy in influencing inflation and output. There is no precise measurement of monetary policy effectiveness in this relationship, but several studies use the responsiveness of output and inflation to an interaction-term. Numerous studies, including those by Ma and Lin (2016), Effiong et al. (2020) and Caglayan et al. (2016), have carried similar research by firstly expressing both the output and inflation as a function of a monetary policy rate and other control variables, which are considered as baseline equations. Secondly, in a separate output and inflation equations an interaction-term between a monetary policy rate and a financial development indicator is included as an explanatory variable. Notwithstanding that the studies mentioned above are based on panel data, this study which is on South Africa will follow the same approach in analysing the impact of financial development on the effectiveness of monetary policy in influencing output and inflation. Hence, the results of the study may differ from the panel data-based studies because of varying country specific effects.

The study uses two interaction-terms derived from two measures of financial development indicators which are the “Domestic credit to the private sector relative to GDP” and “Stock market capitalization relative to GDP” as products of the repo rate and each of the above-mentioned financial development indicators. Whilst the studies mentioned above uses money supply as a monetary policy instrument, this study uses the repo rate because monetary policy in South Africa is implemented by setting the repo rate. The sign and size of the coefficients of the interaction-term determine whether financial development improves or worsens the effectiveness of monetary policy in influencing output and inflation and by what magnitude. For example, if the central bank pursues a contractionary monetary policy to curb inflation and the sign of the interaction-term coefficient turns out positive, implies that financial development dampens the effect of monetary policy to control inflationary pressures. This may be possible if financial development tends to increase demand for credit, which is inflationary, by more than the contractionary monetary policy intends to reduce it. However, it is worth mentioning that the sign of the coefficient of the interaction-term derived from a money supply as a monetary policy instrument carries an opposite sign to that of the interest rate. Hence, in the case of a contractionary monetary policy where money supply/interest rate is used as a policy instrument and the sign of the coefficient of the interaction-term turns out to be negative/positive, both implies that financial development dampens the effect of monetary policy to control inflationary pressures. Therefore, the theoretically expected sign of the interaction-term should be either positive or negative, irrespective of the monetary policy instrument used.

Monetary policy in South Africa is implemented by the South African Reserve Bank (SARB), which sets the repo rate based on recommendations from a Taylor rule-type model, to influence inflation and output through various transmission channels. This implies that the repo rate responds instantaneously to inflation rate and output while inflation and output respond with time lags to the change in the repo rate. According to Smal and De Jager (2001), it takes about between 6 to 8 quarters for the repo rate to have full impact on inflation, while it takes about 5 quarters to have full impact on output in South Africa. This shows that while the repo rate responds instantaneously to inflation in line with the Taylor rule type model, inflation in turn responds slowly to the repo rate and with elongated time lags. Bonga-Bonga (2017), finds that while a contractionary monetary policy by the SARB reduces output, it is less effective to suppress inflation, whilst Bonga-Bonga and Kabundi (2011) find that inflation is not responding to the repo rate. Meanwhile, Chipeta et al. (2018) find a significant and negative long-run

relationship between the inflation rate and repo rate but not in the short-run. These studies indicate that South Africa is experiencing a unique monetary policy dilemma, where high inflation rates are accompanied by high interest rates and low economic growth.

The financial sector in South Africa had undergone financial reforms and realized improvement in financial development, which affected the monetary policy transmission mechanism and most likely through the credit channel. For example, the SARB (2020) indicates that due to the financial liberalization and the increasing openness of the capital account, the amount of funds available as credit increased significantly causing the demand for credit in South Africa to be less sensitive to interest rate changes. Consequently, the overall interest rate elasticity of expenditure fell quite dramatically, rendering monetary policy less effective to stabilize inflation and output. It is also indicated that financial market development has affected the transmission of monetary policy through changes in the regulatory environment. As a result of the global financial crisis, prudential regulations changed to allow banks to be adequately capitalized and liquid. Subsequently, bank funding costs increased, and lending spreads widened, such that credit conditions could be tightening irrespective of monetary policy. More specifically, the objective of the study is to assess how the interaction between the repo rate and a financial development indicator as measured by the interaction-term influences output and inflation respectively. This is in cognisance that a contractionary monetary policy meant to curb inflation, is less effective to suppress inflation but does reduce output as proven by the several studies.

On the other hand, the effectiveness of monetary policy in influencing output and inflation might have been improved or worsened by the adoption of the inflation targeting monetary policy framework by SARB in 2000. Under the ITF, the SARB uses the repo rate to keep inflation within the target range of 3–6 percent. Since the adoption of the ITF, inflation has been fluctuating in and outside the band, averaging 5.30 percent in the period 2000 to 2019, which is on the higher side of the mid-point of the band. However, inflation in South Africa has been also subjected to exogenous shocks such as oil prices, exchange rate and drought shocks, which are beyond the control of the SARB, causing inflation to deviate from the targeted range. For instance, inflation rose to average 10.06 percent in 2008 due to increases in food and energy prices against a backdrop of financial turmoil in global markets. This happened despite the SARB pursuing a contractionary monetary policy stance with the repo rate high at 11.50 percent in 2008. As noted by Stiglitz (2008), inflation targeting policy has failed in emerging markets and developing economies due to circumstances beyond the control of their central banks.

Bleaney et al. (2020) also find that the inflation rate has remained persistently high in Ghana during the inflation targeting period. On the other hand, Broto (2008) finds that inflation targeting is associated with relatively low inflation for Latin American countries, while Sarel (1996) argues that an inflation targeting monetary policy framework serves as a tool to promote economic growth. Hence, the study further examines whether the repo rate has improved or worsened in influencing inflation and output after the adoption of the inflation targeting regime.

It can be deduced from the above discussions that financial development and/or inflation targeting may improve or worsen the effectiveness of monetary policy in influencing output and inflation depending on the channel through which it affects the transmission mechanism. Consequently, the study intends to answer the following specific questions:

- 1) To what extent does the interaction-term influence inflation and output?
- 2) Does the interaction-term influence output and inflation both in the short-run and long-run?
- 3) How long does it take for the interaction-term to have full impact on output and inflation?
- 4) Does the repo rate become more or less effective in influencing output and inflation with the adoption of the inflation targeting monetary policy framework?

The contribution of this study to existing studies on the effectiveness of monetary policy in South Africa is that it also considers how financial development, using two measures of financial development indicators, interacts with monetary policy to influence output and inflation. Secondly, it contributes to few existing studies using single-country analysis, whilst several studies use the panel data analysis, whose results may be affected by varying country-specific effects. Another added value of the study relative to existing studies is that it extends its analysis to assess how long it takes for the interaction-term to have full impact on output and inflation. In answering Questions 1 and 2, the study analyses the estimated coefficients of the interaction-term from the output and inflation equations using an Autoregressive Distributed Lag (ARDL) cointegration technique and an Error Correction Mechanism (ECM). Question 3 is answered by analysing impulse responses of output and inflation to the interaction-term respectively, derived from a Vector Autoregressive (VAR) framework. To answer Question 4, the study uses the ARDL on two sample periods which are the period prior to inflation targeting and the period of inflation targeting. The findings of this study are anticipated to have significant implications for both price and

financial stability in the Common Monetary Area (CMA)¹ of Southern Africa, particularly in the economies of Lesotho, Namibia, and Eswatini (LNE). This is due to the South African monetary policy spill-over effects on these economies. This is more so because the LNE countries pegged their currencies on one-to-one basis to the South African Rand, which renders the LNE monetary policies more dependent on South Africa's monetary policy. Ikhide and Uanguta (2010) confirmed in their study that changes in the South African repo rate tends to instantaneously influence the lending rates, level of prices and money supply in the LNE countries.

The rest of the paper is structured as follows: Section 2, presents an analysis of financial development indicators and a review of monetary policy in terms of their relation to output and inflation in South Africa. Section 3 contains a review of previous related literature on the subject matter. Section 4 presents the methodology used and data analysis. In Section 5, empirical results are presented and analyzed. Section 6 concludes with some policy recommendations.

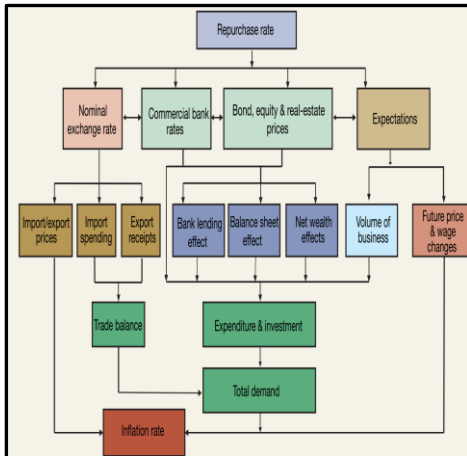
2. Review of Monetary Policy and Financial Development in South Africa

Monetary policy in South Africa is implemented by the SARB, which sets the repo rate to influence borrowing costs of the financial sector and subsequently affect the real economy. Prior to adopting the Inflation Targeting Framework (ITF) in 2000, the SARB used several monetary policy frameworks, including exchange rate targeting and money supply targeting. The basic aim of monetary policy under all these monetary policy regimes has been to achieve and maintain price stability in the interest of balanced and sustainable economic growth. Under the ITF, the SARB uses the repo rate to keep inflation within the target range of 3 to 6 percent. Consequently, inflation is considered the primary and sole mandate of the SARB and with market determined exchange rate movements. The repo rate is set based on recommendations from a Taylor rule-type model and influences inflation through different

¹ The countries in the Common Monetary Area (CMA) are South Africa, Lesotho, Namibia and Swaziland (Eswatini). Lesotho, Namibia and Eswatini (formally Swaziland) (LNE) have pegged their currencies to the South African Rand thus effectively surrendering monetary policy to the South African Reserve Bank (SARB).

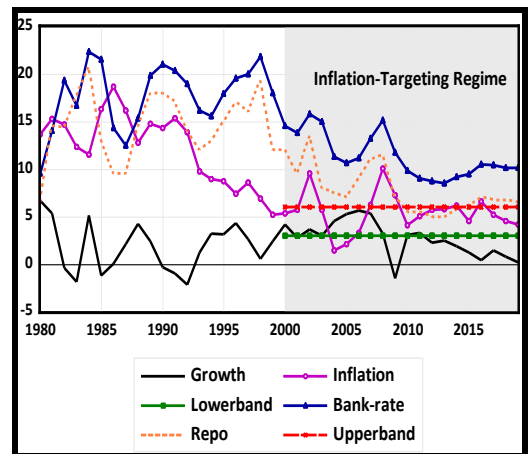
transmission channels. Figure 1.1 summarizes how changes in the repo rate by the SARB is transmitted to influence output and ultimately inflation to achieve price stability. The transmission mechanism is underpinned by the theory of money being neutral in the long-run thus changes in nominal money are reflected in nominal prices rather than in real output.

Figure 1.1: Monetary Policy Transmission Mechanism



Source: SARB Monetary Policy Review May 2004

Figure 1.2: Repo, Bank lending, Inflation, Growth Rates



Sources: Federal Reserve Economic Data (FRED) and IMF, *International Financial Statistics*

The immediate effect of a change in the repo rate is reflected on the other interest rates and asset prices. However, this is supported by a strong link between the repo rate and bank lending rates. Mahadeva and Sinclair (2001) confirmed the existence of a strong relation between the bank lending rates and the repo rate in South Africa, where bank lending rates are responding on a one-on-one basis to a change in the repo rate. This implies that a 100-basis-points increase in the repo rate will cause the bank lending rate to increase by the same margin, rendering the cost of borrowing expensive. In the money market, the rise in the repo rate is expected to cause short-term money market rates to go up and lower bond prices in the process. Subsequently, demand for non-interest-bearing assets such as real estate and equity falls causing their prices to decline. The second-round effects of the repo rate change owing to its first impact on the bank lending rates and asset prices would be reflected on changes in the components of aggregate expenditure. These second-round

effects are transmitted to aggregate expenditure through the bank lending effect, balance sheet effect, wealth effect channels and a direct effect from the interest rate to consumption expenditure. Ultimately, the affected aggregate expenditure components cause aggregate demand and real output to change and therefore exerting negative or positive pressures on domestic inflation.

Changes in the repo rate are also transmitted through the exchange rate channel by causing the South African Rand to appreciate or depreciate against other currencies. Subsequently to an increase in the bank lending rate in response to a contractionary monetary policy, the differential between domestic and foreign interest rates widens to encourage capital inflows leading to the Rand appreciation. This renders exports to be less competitive while improving imports, triggering the trade balance to worsen. The deteriorated trade balance in turn reduces aggregate demand and output, putting downward pressures on domestic inflation. Downward inflationary pressures may also emanate directly from the Rand appreciation through reduced import prices. The change in the repo rate also affects agents' expectations concerning inflation, employment, growth, future income and profits/losses. These expectations are transmitted to inflation through demand pressures by affecting business activities and through future price and wage changes. The direction in which such effects work is not certain and vary depending on the public's interpretation of such changes in monetary policy stance.

Therefore, the pass-through effect of the repo rate on the bank lending rate is an important ingredient for the effectiveness of monetary policy in influencing inflation and bringing stability in the economy (Matemilola et al.,2015). Becker et al. (2012) consider the speed of the pass-through rate to bank lending rate as an indication of the effectiveness of monetary policy. Similarly, Xu and Chen (2012) argue that monetary policy is considered effective if a change in the policy rate is transmitted to the bank lending rates, leading to changes in aggregate demand, investment, and ultimately output. Research on South Africa by Chipeta et al. (2018), Bonga-Bonga and Kabundi (2011), and Wyngaard et al. (2018) has assessed the effectiveness of monetary policy by analyzing the responsiveness of inflation and output to changes in the repo rate, using impulse response functions derived from Vector Autoregression (VAR) models. During the period of the study, the financial sector undergone financial reforms, which according to Matemilola et al. (2015) tend to affect the effectiveness of monetary policy through the transmission mechanism outlined above. As noted by Muyambiri and Odhiambo (2014), the financial liberalization coupled with the increasing openness of the capital account increased the interbank competition resulting in the amount of funds

available as credit increasing significantly despite the prevailing higher interest rates at that time in South Africa. Stals (1997f:8) in a speech also claim that the demand for credit in South Africa seems to have been relatively less sensitive to interest rate changes. This was consistent with the McKinnon-Shaw hypothesis² (McKinnon (1973) and Shaw (1973)) although the increased interbank competition never led to higher saving rates irrespective of the higher interest rates after the financial liberation.

As observed by Mollentze (2000), the interest rate elasticity of expenditure fell in tandem with the weakening relation between changes in the money supply and ultimate price changes due to the large volume of transactions in the financial markets. Consequently, the transmission of monetary policy weakened. To address the shortcomings of targeting money supply, the SARB started to conduct monetary policy using the repo rate and adopted formal inflation rate targeting in 2000. Figure 1.2 depicts the relationship between the repo rate, bank lending rate, inflation and real GDP growth rate during the period ranging from 1980 to 2019, which encompasses both the money supply and inflation targeting regimes. It is evident from the graph that there is a strong link between the repo rate and bank lending rates, implying a high repo rate pass-through to the bank lending rates. However, this relationship is very weak in the early 1980s, which may be because of the effects of the financial reforms. The relationship between the repo rate and inflation has improved since the adoption of the ITF in 2000. High inflation rates are associated with increases in the repo rate, indicating a strong positive correlation between these variables due to the SARB's conduct of monetary policy where the repo rate responds instantaneously to inflation in line with the Taylor rule type model. Inflation in turn responds slowly to the repo rate and with elongated time lags, which lead to South Africa experiencing a unique monetary policy dilemma, where high inflation rates are met with high interest rates and low economic growth. Smal and De Jager (2001), note that it takes about between 6 to 8 quarters for the repo rate to have full impact on inflation, while it takes about 5 quarters to have full impact on output in South Africa.

Since the adoption of the ITF, inflation has been fluctuating in and outside the band, averaging 5.30 percent, which is on the high side of the band. It is worth noting that inflation in South Africa has been also subjected to exogenous shocks such as oil prices, exchange rate and drought shocks, which are beyond the control of the SARB and consequently, inflation deviated from the targeted

² The McKinnon-Shaw hypothesis advocate for the removal of the financial repressive policies to foster increased financial development, which would lead to increased economic growth

range. For instance, inflation rose to an average of 10.06 percent in 2008 due to increases in food and energy prices against a backdrop of financial turmoil in global markets. This happened despite the SARB pursuing a contractionary monetary policy stance with the repo rate high at 11.50 percent in 2008. This implies that monetary policy becomes less effective to control inflation when it is largely driven by exogenous factors. In line with the findings of Bonga-Bonga (2017), contractionary monetary policy stances are associated with reductions in output. Similarly, Bonga-Bonga and Kabundi. (2015) also observed that increases in the repo rate tend to reduce output.

Review of Financial Development

The level of financial development in the financial sector has been improving since the early 1990s in line with financial liberation. According to Muyambiri and Odhiambo (2014), financial liberation which began in the 1980's started with the abolishment of repressive policies and procedures, such as interest and credit controls in 1980. These reforms focused on increasing interbank competition leading to increased product range offered by the financial sector and increased participation in the financial sector of the previously unbanked population. The resultant financial development manifested in increased personal credit, relatively decreasing share of sight deposits and increased financial depth in South Africa. However, the authors further argue that the increased competition in the financial sector due to financial liberation has not led to higher savings irrespective of the resultant high interest rates in South Africa. The increase in credit extension, particularly to the private sector, indicates an increase in the efficiency of financial intermediaries and provides evidence of financial development in South Africa, especially after 1990. Hence, the evolution of financial development has high implications for the effectiveness of monetary policy in South Africa.

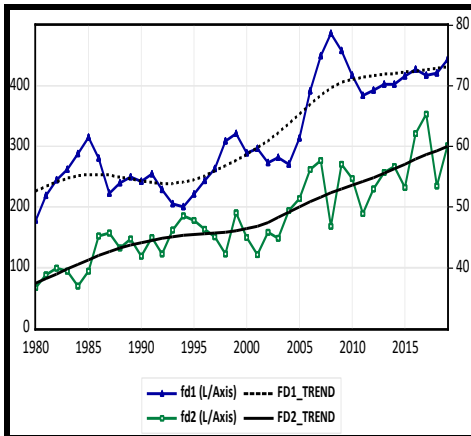
A strand of literature uses different measures of financial development but the most commonly used are the domestic credit to the private sector relative to GDP and the stock market capitalization relative to GDP. However, other studies such as by Mahmood -ur- Rahman (2018) and Ma and Lin (2016), have combined the two measures to arrive at a ratio of domestic credit to the private sector plus stock market capitalization to GDP. The domestic credit to the private sector to GDP ratio measures the level of financial intermediary depth and development, while the ratio of the stock market capitalization to GDP measures the level of financial (stock) market development. Consequently, the combined indicator of financial development measures the overall development of the financial sector including banks, nonbanks and

financial (stock) markets. In the case of South Africa, both measures of financial development are relevant considering that the stock market in South Africa is well developed.

Figure 2.1 depicts the trends in domestic credit to the private sector to GDP ratio (*fd1*) and stock market capitalization to GDP ratio (*fd2*) in South Africa. The dynamics of the financial system in South Africa, as measured by the financial development indicators, shows an upward trend and had survived series of financial crises. It is also evident that in South Africa the stock market, as measured by the *fd2* financial development indicator is developing faster than the banking sector as captured by the *fd1* financial development indicator. However, the financial sector in South Africa experienced a slump during the period 1985 to 1994 as indicated mostly by the banking sector financial development indicator. The slump in the financial sector development was due to trade and financial sanctions imposed on South Africa, political unrest, and the debt crisis, which hindered capital inflows. However, the level of financial development recovered from the recession and has been improving since the early 1990s.

Indeed, after the country gained political independence in 1994, domestic credit to the private sector as a percent of GDP rose from 50 percent in 1994 to 79 percent in 2008 before settling at 74 percent in 2019. This reflects an increasing efficiency in financial intermediation supported by, among other financial technologies, mobile financial services. As noted by Nguena (2019), mobile financial services lead to improvement in inclusiveness and depth of the financial sector in African countries. Smit et al. (2016) showed the importance of three pillars of financial innovation in the banking sector in South Africa as perceived by the eight of the largest banks surveyed in their study. These pillars are products and services development, organizational development, and distribution channel development.

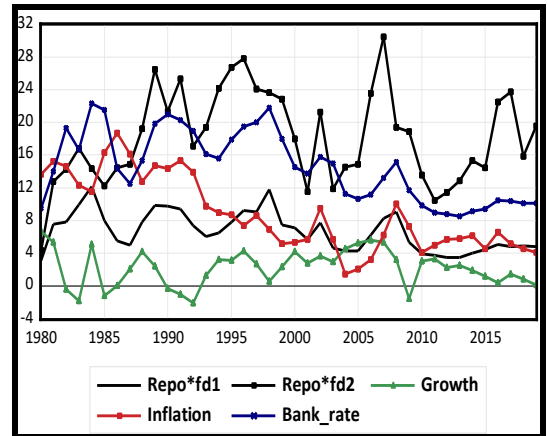
Figure 2.1: Trends in Financial Development Indicators



Sources: Federal Reserve Economic Data (FRED); IMF, *International Financial Statistics*; and author's calculations.

Figure 2.2 FD Indicators and Repo Rate interaction-terms,

Inflation, Bank lending rate and Growth



Sources: Federal Reserve Economic Data (FRED); IMF, *International Financial Statistics*; and author's calculations.

It is generally held that a well-developed financial sector is a precondition for an effective monetary policy transmission, but the relation differs depending on countries' financial structure (Effiong et al. (2020)). Seth and Kalyanaraman (2017) argue that the degree of monetary policy effectiveness varies with the levels of financial development. Mishra and Pradhan (2008) state that financial development influences monetary aggregates via changes in existing financial instruments and availability of new financial instruments and services as well as changes in the terms and conditions of credit provisions. According to the SARB (2020), financial market development has affected the transmission of monetary policy in South Africa through changes in the regulatory environment. In reaction to the global financial crisis, prudential regulations were altered to allow banks to be adequately capitalized and liquid. Consequently, bank funding costs increased, and lending spreads widened, such that credit conditions could be tightening irrespective of monetary policy. In line with Effiong et al. (2020) and Ma and Lin (2016), the study uses the responsiveness of inflation and output to the interaction-term between the repo rate and financial development as a measure of the impact of financial development on the effectiveness of monetary policy.

For South Africa, the interaction-terms as depicted in Figure 2.2 are the *Repo*fd1* and *Repo*fd2* representing interactions between the repo rate and

the *fd1* and *fd2* financial development indicators, respectively. There is a positive correlation between the *Repo*fd1* and bank lending rate while the relationship between the *Repo*fd2* and bank lending rate is not clear. This implies that there is a strong and a weak pass-through effect of the *Repo*fd1* and *Repo*fd2* on the bank lending rate, respectively. The responsiveness of inflation to the interaction-terms is mixed with inflation responding positively and negatively to increases in the interaction-terms during the period under review. Hence, a contractionary monetary policy interacts with financial development to increase and reduce inflation in South Africa. Seemingly there is a negative relation between growth and the interactions terms, implying that an expansionary monetary policy interacts with financial development to increase output. This confirms that the interaction between monetary policy and financial development amplifies the effectiveness of monetary policy on output.

3. Related Literature Review

Existing literature present several monetary policy channels through which financial development affects the real economy. Several studies find supporting evidence that an additional channel through which financial development affects growth is by reducing volatility. These studies emphasise the role of financial development in mitigating macroeconomic shocks by reducing the degree of credit market imperfections in an economy. Hence, this supports the effect of financial development on monetary policy transmission through the credit channel theory that consists of the bank lending channel and balance sheet channel as proposed by Bernanke and Gertler (1995). Research by Kashyap and Stein (2000), Loutskina and Strahan (2009), Gomez et al. (2005), and Mishra et al. (2010) provides evidence in support of the bank lending channel, which suggests that financial development influences the effectiveness of monetary policy through its impact on bank lending behaviour. Kashyap and Stein (2000) argue that the impact of monetary policy on credit extension is amplified for banks with less liquid balance sheets. Loutskina and Strahan (2009), and Gomez et al. (2005) show that financial securitization weakens the bank lending channel and consequently its effectiveness in influencing real variables at least in the short run. Meanwhile, Mishra et al. (2010) argue that the bank lending channel dominates monetary policy transmission at lower levels of financial development. Basa et al. (2019) note that financial market development can affect monetary policy transmission through changes in asset prices which in turn influence

economic activity through the stock market and household balance sheet channel.

Empirical studies find ambiguous results on the mediatory role of financial development on the impact of monetary policy on inflation and output. Ma and Lin (2016), using panel data from 41 countries, find a strong negative relation between financial development and the effects of monetary policy in influencing output and inflation. Specifically, the study finds that the effects of monetary policy in influencing output and inflation decrease more with financial development in developing and advanced economies, respectively. Similarly, Effiong et al. (2020) applied a standard panel data technique to 39 African countries and find a weak relationship between financial development and monetary policy effectiveness in Africa. Basa et al. (2019) also using an ARDL model find that financial development has a significant negative effect on monetary policy effectiveness in influencing output and inflation in Malaysia. A study by Laha (2018) finds that the development of the financial sector does not lead to improvement in the effectiveness of monetary policy in India. However, Apanisile and Osinubi (2019), using a Dynamic Stochastic General Equilibrium (DSGE) model, find that financial development has a positive effect on monetary policy transmission channel in Nigeria. Nyamongo and Ndirangu (2019) using a standard VAR also find that financial innovations improve the effectiveness of monetary policy in Kenya as evidenced by the reduction in the proportion of the unbanked population and a gradual reduction in currency outside banks.

While studies on the effectiveness of monetary policy in influencing inflation and output in South Africa have different results, there is evidence that a contractionary monetary policy is less effective to reduce inflation. Chipeta et al. (2018) investigated the effectiveness of using the repo rate as an instrument to facilitate price stability and GDP in South Africa. Employing a Vector Error Correction Model (VECM), they find a significant and negative long-run relationship between the inflation rate and repo rate. The study further finds a short-run relationship between GDP and repo rate but not for inflation and the repo rate. Wyngaard et al. (2018) analyzed the effectiveness of using the interest rate and money supply by the SARB to control inflation to support economic growth. The study employed an Autoregressive Distributed Lag (ARDL) model to analyze the data for long-run co-integration and an Error Correction Model (ECM) to test for a short-run relationship. The results confirm the existence of both long- and short-run relationships between the variables. The study further indicates that structural and cost-push inflation which exists in South Africa makes monetary policy less effective to control inflation and to impact on economic growth.

Bonga-Bonga (2017), assessed the effectiveness of the monetary policy instrument during the inflation targeting period in South Africa. Using a Structural Vector Error Correction Model (SVECM) shows that a contractionary monetary policy is less effective to suppress inflationary pressures while it manages to reduce growth in South Africa. Bonga-Bonga and Kabundi (2011) applied a simple structural vector autoregressive (SVAR) framework to evaluate the responsiveness of the output gap and inflation rate to monetary policy shocks using the impulse response functions (IRFs) over the period spanning 1998 to 2008. The study reveals that inflation in South Africa is not responsive to the repo rate during the period covered. Adelakun and Yousfi (2020) use a linear and non-linear ARDL framework to study the impact of monetary policy shocks on macroeconomic fundamentals, particularly in influencing output and inflation, in South Africa. They conclude that inflation responds significantly to both the short- and long-run asymmetric monetary policy shocks while output responds significantly only to the short-run asymmetric monetary policy shocks.

4. Methodology and Data Analysis

Model Specification and Estimation Techniques

One of the measures of the monetary policy effectiveness is its impact on output and inflation in the economy. Hence, in examining whether monetary policy is transmitted more effectively with better financial development, the study separately expresses output and inflation as a function of a measure of monetary policy (repo rate), a measure of the interaction between financial development and monetary policy (interaction-term) and other control variables. This approach has been used in several studies including Seth and Kalyanaraman (2017), Effiong et al. (2020), and Caglayan et al. (2016). Empirical studies have shown that financial development enhances or dampens the effectiveness of monetary policy in influencing output and inflation. Carranza et al. (2010), argue that a financial development that results in the creation of new instruments helps banks to insure themselves against unexpected changes in monetary policy and consequently financial development dampens the effectiveness of monetary policy. On the other hand, they argue that financially less developed countries turn to experience cash leakages from the financial system, which weaken the multiplier effect, and therefore rendering monetary policy ineffective in influencing output and inflation. Hence, the sign of the interaction-term is expected to be either negative or positive implying that financial development enhances or

dampens the effectiveness of monetary policy in influencing output and inflation.

The output equation is derived from the standard Mundell-Fleming-Dornbusch model known as the IS-LM-BOP model. This model extends the Keynesian IS-LM model to include external variables to influence the domestic economy. According to Rafiq and Mallick (2008), this model assumes that changes in monetary policy by adjusting the interest rates will cause changes to the real exchange rate and prices, money supply and the level of real output. Hence, Eq. (2) below show how the repo rate (*repo*), real exchange rate (*lrer*) and European Union (EU) real GDP (*lrgdp_eu*) variables affect output as measured by the real GDP growth rate (y_t) in South Africa. Theoretically, the expected sign of the coefficient of the repo rate is negative, while those of the exchange rate and EU real GDP are expected to be positive. A one-period lagged (y_{t-1}) variable is included in the output equation as an explanatory variable. The EU real GDP, which represents foreign demand for South African goods and services, was selected from the top five South Africa’s major trading partners because the EU appears first in the list followed by China, US, Japan and India. The inclusion of the exchange rate is supported by Kandil and Mirzaie (2003) who argue that an exchange rate depreciation may increase output by increasing exports competitiveness in international markets leading to an increase in aggregate demand, hence a rise in economic growth. This depends on whether the Marshall-Lerner condition holds and on the capacity of the domestic economy to meet the additional demand created by the depreciation. The Svensson (2000) model also supports the expansionary effect of a depreciation on output. The relation between the foreign real GDP and domestic output is expected to be positive since an increase in foreign GDP causes demand for home country exports to increase leading to an increase in aggregate demand, hence output. Rasaki and Malikane (2015) also argue that domestic output responds positively to the real exchange rate and foreign output.

$$y_t = \alpha_0 + \alpha_y y_{t-1} + \sum_{i=1}^S \alpha_i repo_{t-i} + \alpha_q lrer_t + \alpha_f lrgdp_eu_t + \alpha_d dum2000_t + \varepsilon_t \dots \dots \dots Eq. (2)$$

The inflation equation (Eq. (4)) is based on the inflation targeting monetary policy framework adopted by the SARB in 2000, which is forward looking. The forward-looking inflation targeting monetary policy framework implies that the current repo rate is determined by future inflation and in turn current

inflation is determined by the past repo rate. This is defined by the following traditional Taylor rule:

$$repo_t = \delta_0 + \sum_{i=1}^S \delta_p p_{t+i} + \delta_y y_t + \epsilon_t \dots \dots \dots Eq. (3),$$

with $repo_t$ representing the repo rate, δ_0 , δ_p and δ_y are parameters, p and y are measures of inflation and output growth, respectively. Hence, inflation is expressed as follows:

$$p_t = \beta_0 + \beta_p p_{t-1} + \sum_{i=1}^S \beta_i repo_{t-i} + \beta_q lner_t + \beta_m lms_t + \beta_{ol} loil_t + \beta_d dum2000_t + \mu_t \dots \dots \dots Eq. (4),$$

where South Africa's inflation (p_t) is a function of its one-period lag variable (p_{t-1}), past repo rate ($repo$) and other control variables such as the log nominal exchange rate ($lner$) with a theoretical expected negative sign, log world crude oil prices ($loil$) with an expected positive sign and log money supply (lms), which is expected to have a positive sign. A contractionary monetary policy (an increase in the repo rate) is expected to reduce inflation and output, hence the coefficients α_i and β_i are expected to be negative. If that is the case, monetary policy is considered effective to reduce both output and inflation in a contractionary monetary policy and to increase both output and inflation in an expansionary monetary policy. On the other hand, the size of those coefficients indicates the magnitude of the impact of monetary policy in influencing output and inflation respectively. If the signs of those coefficients are positive, monetary policy is not effective to reduce both inflation and output during a contractionary monetary policy or to increase them during an expansionary monetary policy. Hence, the sign and size of those coefficients measures the effectiveness and magnitude of the impact of monetary policy in influencing output and inflation respectively.

The one-period lagged of the dependent variables measure the degree of persistence of output and inflation in South Africa, respectively. On the relation between the exchange rate and inflation, Tejvan (2019) states that a depreciation can be inflationary by causing cost-push and demand-pull inflationary pressures through increases in the cost of imports and domestic aggregate demand, respectively. Hence, we expect a positive relation between

the nominal exchange rate and inflation. Oil prices constitute a cost-push inflation in an economy because oil is a major input in the economy. Choi et al (2017), find a significant positive relation between world oil prices and inflation in 72 advanced and developing economies. According to the quantity theory of money the general price level changes proportional to the change in money supply in an economy. Hence, there is a positive relation between money supply (lms) and inflation (p_t). To account for the change in monetary policy regime in 2000 to ITF, a dummy variable ($dum2000$) is included as an explanatory variable in both equations. The dummy variable equals 1 during the ITF period and zero otherwise. The coefficient of the dummy variable is expected to be either negative or positive. A negative coefficient implies that ITF reduces inflation, while a positive coefficient indicates that ITF causes inflation to increase.

To establish the interaction between the repo rate and the financial development indicator, we express the parameters of the repo rate variable in both equations as a function of a financial development indicator (lfd) in line with Ma and Lin (2016) as follows.

$$\alpha_i = \delta_i^r + \delta_i^{fd} lfd_{t-i} \dots \dots \dots Eq. (2a)$$

$$\beta_i = \varphi_i^r + \varphi_i^{fd} lfd_{t-i} \dots \dots \dots Eq. (4a)$$

Where; lfd is the measurement indicator for financial development. α_i and β_i are the parameters of the repo rate in the output and inflation equations above, which measure the impact of the repo rate on output and inflation, respectively. Hence, *Eqs. (2a) and (4a)* show that the impact of the repo rate is also influenced by financial development. Substituting *Eqs. (2a) and (4a)* into *Eqs. (2) and (4)*, respectively yields the following equations:

$$y_t = \alpha_0 + \alpha_y y_{t-1} + \sum_{i=1}^S \delta_i^r repo_{t-i} + \sum_{i=1}^S \delta_i^{fd} (lfd_{t-i} * repo_{t-i}) + \alpha_q lrer_t + \alpha_{fd} lfd_{t-i} + \alpha_f lrgdp_eu_t + \alpha_d dum2000_t + \varepsilon_t \dots \dots \dots Eq. (5)$$

$$p_t = \beta_0 + \beta_p p_{t-1} + \sum_{i=1}^S \varphi_i^r repo_{t-i} + \sum_{i=1}^S \varphi_i^{fd} (lfd_{t-i} * repo_{t-i}) + \beta_q lner_t + \beta_{ol} loil_t + \varphi_{fd} lfd_{t-i} + \beta_m lms_t + \beta_d dum2000_t + \varepsilon_t \dots \dots \dots Eq. (6)$$

Where $(lfd_{t-i} * repo_{t-i})$ measures the interaction between the financial development indicator and the repo rate. The coefficient of the interaction-term can either be positive or negative for contractionary monetary policy. In *Eqs.* (5) and (6) the financial indicator (lfd) has been added as an explanatory variable to capture its direct impact on output and inflation. About the relationship between output and financial development, the traditional supply-leading hypothesis indicates a positive relationship. Hence, a positive coefficient of lfd is expected in the output equation. Jun et al (2022), found that financial development is positively related with inflation, hence a positive parameter of lfd is expected in the inflation equation. However, Fu-Sheng H. (2003) argues that as inflation becomes relatively high, the relationship between financial development and economic growth changes to negative. This implies that there is a threshold level of inflation below which financial development increases growth and above which it reduces growth. New parameters in *Eq.* (5) are δ_i^r and δ_i^{fd} and in *Eq.* (6) are φ_i^{fd} and φ_i^r . The coefficients of interest to answer the research questions one and two are δ_i^{fd} and φ_i^{fd} , which are coefficients of the interaction-term in both equations. If the sign of these coefficients of the interaction between the financial indicators and the repo rate is negative it implies that a contractionary monetary policy improves monetary policy effectiveness. However, if these coefficients are positive, monetary policy effectiveness is reduced when the repo rate is increased.

In line with the objective and the research questions of the study, the study employs an ARDL bound cointegration testing technique as proposed by Pesaran and Shin (1999) to estimate the coefficients of Equations (2), (4), (5) and (6) to produce both their long-run and short-run results. Given also that the variables of the study are $I(1)$ and some $I(0)$, the ARDL is preferred because of its applicability for variables that are $I(0)$, $I(1)$ or a combination of both (Nkoro and Uko, 2016). Its major advantages are the identification of the cointegrating vector(s) and bound cointegration testing of the long-run relationship. Since in the Taylor rule specification in *Eq.* (3) the repo rate is a function of inflation and output growth, the inclusion of the repo rate and the interaction-terms in the output and inflation equations as regressors causes the problem of endogeneity because these variables are correlated with the error terms. One way to overcome the problem of endogeneity is to lag the potential endogenous variables in the equations, which can be handled by the ARDL. Mandeya and Ho (2021), also argue that the ARDL ensures that unbiased estimates of the long-run and valid t-statistics are obtained. On the research question relating to how long it takes for the interaction-term to have full impact on output and inflation, the study adopts a Structural VAR (SVAR) on

output, inflation, repo rate and the interaction-terms variables to obtain their impulse responses. The questions of whether the adoption of the ITF improves or worsens the effectiveness of monetary policy in influencing output and inflation is answered by comparing the results of Eqs. (2) and (4) for two sample periods; 1995q1 to 2019q4 (whole sample period) and 2000q1 to 2019q4 (ITF sample period) without a dummy variable.

Data Analysis

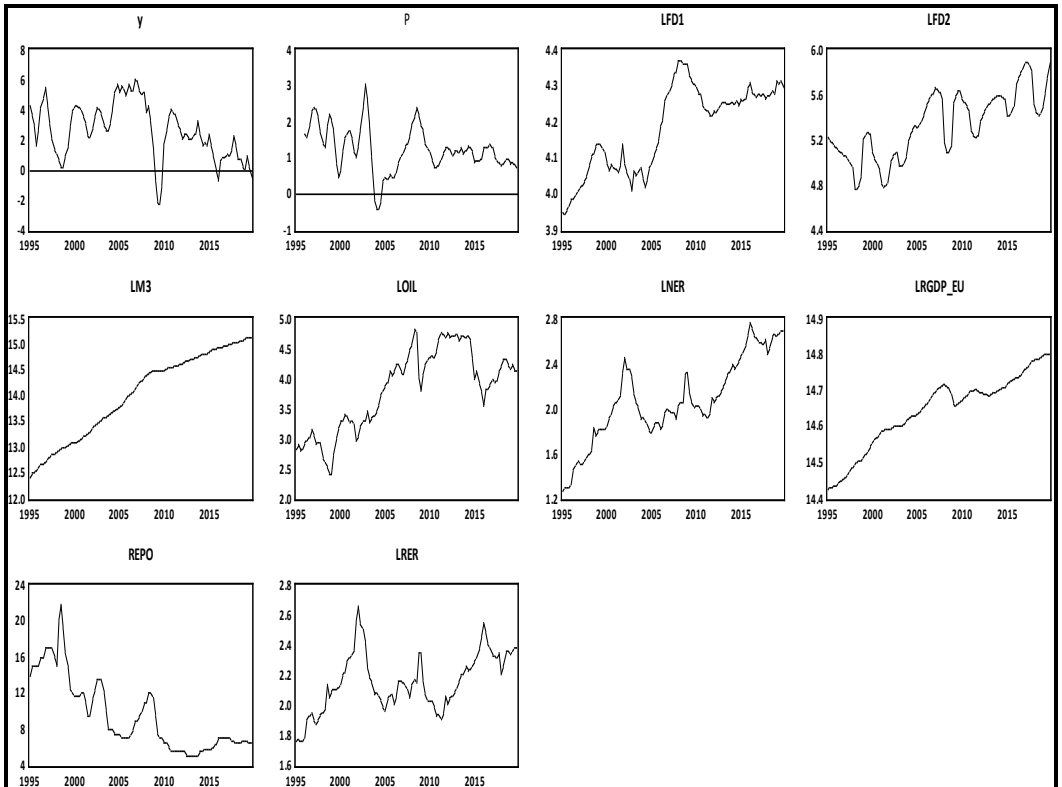
The study uses quarterly data spanning from the year 1995 to 2019. The unavailability of the EU real GDP data in the period before 1995 limited the starting date of the study to 1995. The data sets used in the study in natural logarithm forms are listed in Table 1, which also contains the variables descriptions and sources while Figure 3 depicts the variables trends. The exchange rate, which is the South African rand against the US dollar, is defined such that an increase is a depreciation, and a decline is an appreciation. The data were obtained from the IMF International Financial Statistics (IFS), and the Federal Reserve Economic Data (FRED).

Table 1: Variables, Definitions and Sources

Variables	Definitions	Sources
y	South African real Gross Domestic Product (GDP) growth rate	IMF IFS
p	Inflation rate	IMF IFS
lfd1	Log Domestic credit to the private sector relative to GDP	FRED
lfd2	Log Domestic credit to the private sector relative to GDP	FRED
lm3	Log Stock market capitalization relative to GDP	FRED
loil	Log Broad money supply	FRED
lner	Log World crude oil prices	IMF IFS
lrgdp_eu	Log Nominal Exchange rate between the SA rand and US Dollar	FRED
repo	Repo rate, the SARB monetary policy rate	FRED
lrer	Log European Union real Gross Domestic Product	FRED
dum2000	Repo rate, the SARB monetary policy rate	_____

	<p>Log Real exchange rate of the SA rand to the US dollar</p> <p>A dummy variable representing a shift to inflation targeting framework, which equals 1 during the ITF period and zero otherwise</p>	
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Figure 3: Variables Trends



Sources: Federal Reserve Economic Data (FRED); IMF, International Financial Statistics; and author's calculations.

The repo rate (repo) is characterized by ups and downs movements during the reviewed period, indicating both contractionary and expansionary monetary policy stances. The financial development indicators (lfd1 and lfd2) are showing upward trends indicating improvements in the financial sector in South Africa during the period under review. The nominal exchange rate (lner) has been on an upward trajectory implying that the rand exchange rate against the US dollar has been depreciating. Whilst the real exchange rate (lrer) depicts almost similar movements to the nominal exchange rate, its trend remains uncertain. The South African inflation rate (p) and real GDP growth rate (y) have been fluctuating over the reviewed period. The EU real GDP (lrgdp_eu), world oil prices (loil), and money supply (lm3) are all showing upward trends. Hence, given the trends displayed by the variables it is imperative to test for stationarity of the variables. The Augmented Dickey-Fuller (ADF) test is used to test for stationarity and their results are tabulated

in Table 2. However, the PP unit root test was also used to confirm the results from ADF test and where they agree the study reports the ADF test results but where they differ the PP test results are reported.

Table 2: ADF Test Results

Variable	Levels	1 st Difference	Decision
y	-2.45**	-----	I(0)
p	-3.03**	-----	I(0)
lfd ₁	-1.73	-8.11***	I(1)
lfd₂	-3.51**	-----	I(0)
lm3	-1.63	-7.19***	I(1)
loil	-1.70	-7.74***	I(1)
lner	-1.45	-7.73***	I(1)
lrgdp_eu	-1.55	-4.02***	I(1)
repo	-3.19*	-----	I(0)
lrer	-2.58*	-----	I(0)

Source: Author's calculations. *, ** and *** represent stationarity at 10%, 5% and 1%, respectively and otherwise non-stationary

The above results show that the variables are integrated of order 1, implying that they are non-stationary except for five variables which are integrated of order 0 and therefore stationary. These variables are the real GDP growth rate (y), inflation rate (p), stock market capitalization relative to GDP financial indicator (lfd₂), repo rate (repo) and the real exchange rate (lrer). The stationarity test results for the bold variables (lfd₂) and (lrer) in Table 2 are derived from the PP test after both tests show different results.

5. Empirical Results

The Relation Between Monetary Policy Effectiveness and Financial Development Analysis of the Long-run Relationship

The study estimates three equations for each of the output and inflation consisting of the baseline equation and two more equations that consider the financial development indicators lfd1 and lfd2 respectively. The rationale is to compare the results of the interaction-terms generated from the two financial indicators in influencing both output and inflation respectively. The variables **y** and **p** with superscript 'base' represents the output and inflation baseline equations results, while those with superscripts lfd1 and lfd2 denote output and inflation equations incorporating the interaction-terms obtained from the lfd1 and lfd2 financial development indicators respectively. As prior indicated, the study estimates the equations using the ARDL estimation technique. The most popular criteria for determining the appropriate lag structure for the equations is the Akaike criterion. The bounds testing approach was employed to investigate the presence of cointegration, or long-run relationships, between variables in two sets of equations: the baseline output and inflation equations, and the extended equations incorporating financial development indicators as follows:

$$\begin{aligned}
 & \Delta y_t \\
 = & \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 repo_{t-1} + \alpha_3 lrer_{t-1} + \alpha_4 lrgdp_eu_{t-1} \\
 & + \alpha_5 dum2000_{t-1} + \sum_{i=1}^p \rho_1 \Delta y_{t-i} + \sum_{i=1}^q \rho_2 \Delta repo_{t-i} + \sum_{i=0}^r \rho_3 \Delta lrer_{t-1} \\
 & + \sum_{i=0}^s \rho_4 \Delta lrgdp_eu_{t-1} \\
 & + \varepsilon_t \dots \dots \dots Eq. (7)
 \end{aligned}$$

$$\begin{aligned}
 \Delta p_t = & \beta_0 + \beta_1 p_{t-1} + \beta_2 repo_{t-1} + \beta_3 lner_{t-1} + \beta_4 lms_{t-1} + \beta_5 loil_{t-1} \\
 & + \beta_6 dum2000_{t-1} + \sum_{i=1}^p \gamma_1 \Delta p_{t-i} + \sum_{i=1}^q \gamma_2 \Delta repo_{t-i} \\
 & + \sum_{i=0}^r \gamma_3 \Delta lner_{t-i} + \sum_{i=0}^s \gamma_4 \Delta lms_{t-i} + \sum_{i=0}^u \gamma_5 \Delta loil_{t-i} \\
 & + \varepsilon_t \dots \dots \dots Eq. (8)
 \end{aligned}$$

$$\begin{aligned}
\Delta y_t = & \delta_0 + \delta_1 y_{t-1} + \delta_2 repo_{t-1} + \delta_3 lrer_{t-1} + \delta_4 lrgdp_eu_{t-1} \\
& + \delta_5 dum2000_{t-1} + \delta_6 (lfd_{t-1} * repo_{t-1}) + \delta_7 lfd_{t-1} \\
& + \sum_{i=1}^p \sigma_1 \Delta y_{t-i} + \sum_{i=1}^q \sigma_2 \Delta repo_{t-i} + \sum_{i=0}^r \sigma_3 \Delta lrer_{t-i} \\
& + \sum_{i=0}^s \sigma_4 \Delta lrgdp_eu_{t-1} + \sum_{i=1}^u \sigma_5 (\Delta lfd_{t-i} * \Delta repo_{t-i}) \\
& + \sum_{i=0}^v \sigma_6 \Delta lfd_{t-i} \\
& + \mu_t \dots \dots \dots Eq. (9)
\end{aligned}$$

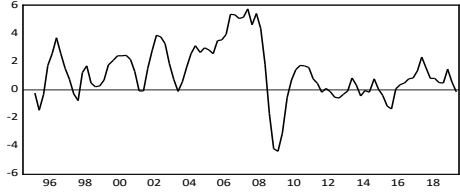
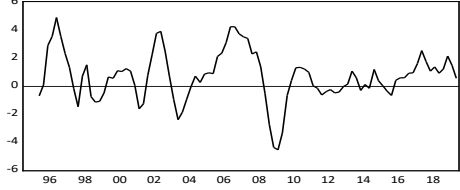
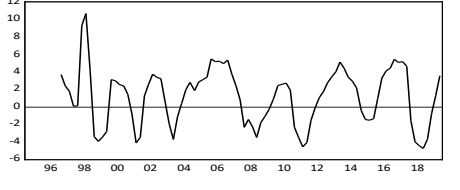
$$\begin{aligned}
\Delta p_t = & \theta_0 + \theta_1 p_{t-1} + \theta_2 repo_{t-1} + \theta_3 lner_{t-1} + \theta_4 lms_{t-1} + \theta_5 loil_{t-1} \\
& + \theta_6 dum2000_{t-1} + \theta_7 lfd_{t-1} + \theta_8 (lfd_{t-1} * repo_{t-1}) \\
& + \sum_{i=1}^p \varphi_1 \Delta p_{t-i} + \sum_{i=1}^q \varphi_2 \Delta repo_{t-i} + \sum_{i=0}^r \varphi_3 \Delta lner_{t-i} \\
& + \sum_{i=0}^s \varphi_4 \Delta lms_{t-i} + \sum_{i=0}^u \varphi_5 \Delta loil_{t-i} + \sum_{i=0}^v \varphi_6 \Delta lfd_{t-i} \\
& + \sum_{i=1}^w \varphi_7 (\Delta lfd_{t-i} * \Delta repo_{t-i}) \\
& + \vartheta_t \dots \dots \dots Eq. (10)
\end{aligned}$$

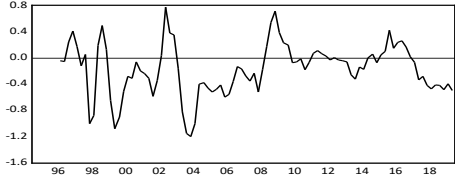
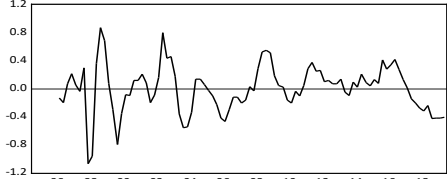
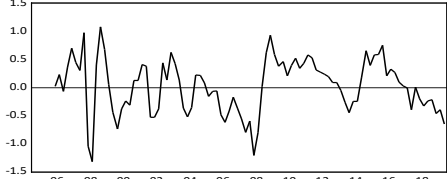
where Δ is the first difference notation and (p,q,r,s,u,v,w) are the optimum lag length using the Akaike Information Criterion (AIC).

ARDL Bounds tests for cointegration

Table 3 below presents the results of the bounds tests for cointegration. The F-statistic is carried out on the joint null hypothesis that the coefficients of the one-period lagged variables, which correspond to the long-run relationship, in Eqs. 7 to 10 are all equal to zero. If the null is true, then there is no cointegration among the variables, hence a long-run relation does not exist. If the estimated F-statistic falls above the upper bound of the critical values, then the null hypothesis of no-cointegration is rejected. Likewise, if the estimated F-statistic falls below the lower bound, then the null hypothesis cannot be rejected. If the estimated value falls inside the critical value band, the result is inconclusive. Since the F-statistics for all the equations are above the upper bound values at one percent, it means the long-run equations are cointegrated and thus the null hypothesis of no cointegration is rejected. This therefore implies the existence of a meaningful long-run relationship amongst the variables. Table 3 also shows the cointegration graphs which confirms the long-run cointegration among the variables.

Table 3: bounds cointegration test results

Equations	Lower (0) and upper bounds (1)	F-Statistics	Cointegration Graphs																				
y^{base}	<table border="1"> <tr> <td>I(0)</td> <td></td> </tr> <tr> <td>10%</td> <td>2.37</td> </tr> <tr> <td>5%</td> <td>2.79</td> </tr> <tr> <td>2.5%</td> <td>3.15</td> </tr> <tr> <td>1%</td> <td>3.65</td> </tr> <tr> <td>I(1)</td> <td></td> </tr> <tr> <td>10%</td> <td>3.20</td> </tr> <tr> <td>5%</td> <td>3.67</td> </tr> <tr> <td>2.5%</td> <td>4.08</td> </tr> <tr> <td>1%</td> <td>4.66</td> </tr> </table>	I(0)		10%	2.37	5%	2.79	2.5%	3.15	1%	3.65	I(1)		10%	3.20	5%	3.67	2.5%	4.08	1%	4.66	5.64	
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$I(0)$ and $I(1)$ represent the values for the lower and higher bounds respectively

Long-run Output and Inflation Results

Once cointegration is established in Eqs. (7), (8), (9) and (10), conditional ARDL long-run equations for the output and inflation equations are estimated in the following forms.

$$y_t = \rho_0 + \sum_{i=1}^p \rho_1 y_{t-i} + \sum_{i=1}^q \rho_2 repo_{t-i} + \sum_{i=0}^r \rho_3 lrer_{t-i} + \sum_{i=0}^s \rho_4 lrgdp_eu_{t-1} + \sum_{i=1}^u \rho_5 dum2000_{t-1} + \varepsilon_t \dots \dots \dots Eq. (11)$$

$$p_t = \gamma_0 + \sum_{i=1}^p \gamma_1 p_{t-i} + \sum_{i=1}^q \gamma_2 repo_{t-i} + \sum_{i=0}^r \gamma_3 lner_{t-i} + \sum_{i=0}^s \gamma_4 lms_{t-i} + \sum_{i=0}^u \gamma_5 loil_{t-i} + \sum_{i=1}^v \gamma_6 dum2000_{t-1} + \varepsilon_t \dots \dots \dots Eq. (12)$$

$$y_t = \sigma_0 + \sum_{i=1}^p \sigma_1 y_{t-i} + \sum_{i=1}^q \sigma_2 repo_{t-i} + \sum_{i=0}^r \sigma_3 lrer_{t-i} + \sum_{i=0}^s \sigma_4 lrgdp_eu_{t-1} + \sum_{i=1}^u \sigma_5 (lfd_{t-i} * repo_{t-i}) + \sum_{i=0}^v \sigma_6 lfd_{t-i} + \sum_{i=0}^w \sigma_7 dum2000_{t-1} + \mu_t \dots \dots \dots Eq. (13)$$

$$p_t = \varphi_0 + \sum_{i=1}^p \varphi_1 p_{t-i} + \sum_{i=1}^q \varphi_2 repo_{t-i} + \sum_{i=0}^r \varphi_3 lner_{t-i} + \sum_{i=0}^s \varphi_4 lms_{t-i} + \sum_{i=0}^u \varphi_5 loil_{t-i} + \sum_{i=0}^v \varphi_6 lfd_{t-i} + \sum_{i=1}^w \varphi_7 (lfd_{t-i} * repo_{t-i}) + \sum_{i=1}^z \varphi_8 dum2000_{t-1} + \vartheta_t \dots \dots \dots Eq. (14)$$

Where, all variables are as previously defined. The selection of the maximum lag lengths p, q, r, s, u, v, w, z is based on the Akaike Information Criterion (AIC).

The results of the estimated long-run equations are presented in Table 4. From all the three output equations, the results show a negative and significant relationship between the repo rate and output in line with theoretical expectations. A one percent increase in the repo rate reduces output by 0.02 percent in the output(baseline) equation, 0.14 percent in the output(lfd1) equation and by 0.18 percent for the output(lfd2) equation. The results of the output equations also reveal that financial development, as measured by lfd1 and lfd2, has a negative and significant relationship with output in South

Africa. The results indicate that a one percent increase in lfd1 and lfd2 reduces output by 0.31 percent and 0.42 percent respectively. For South Africa, Muyambiri and Odhiambo (2018) found a negative but insignificant relationship between lfd1 and investment, while they found lfd2 to have a positive and significant relationship with investment. The negative coefficients of lfd1 and lfd2 could be implying that South Africa's inflation is relatively high and above the threshold level of inflation that is no longer conducive for financial development to promote growth as indicated by Fu-Sheng (2003). The results of interest to the study, which pertains to the interaction-terms $repo * lfd1$ and $repo * lfd2$, indicate a negative and significant relationship between output and the interaction-term $repo * lfd1$ while $repo * lfd2$ has a positive and significant impact on output. In the output equation, the results indicate that the interaction-term $repo * lfd1$ has a coefficient of -0.317 while the $repo * lfd2$ has a parameter of 0.334. The result on the $repo * lfd1$ is contrary to the finding by Effiong et al. (2020) for 39 African countries including South Africa. They found a positive and insignificant relationship between output and an interaction-term computed similar to our measure of financial development lfd1. The results of the other variables of the output equations are in line with theoretical expectations except for the real exchange rate which shows a negative relationship with output in the output(baseline) and output(lfd2) equations. The results also show positive coefficients for the ITF dummy variable (dum2000) although only significant in the output(lfd2) equation.

The results of the inflation equations show a negative but insignificant relationship between the repo rate and inflation. The result confirms the findings of Wyngaard et al. (2018) and Bonga-Bonga and Kabundi (2011) which propose that inflation is not responsive to the repo rate in South Africa. The empirical studies attribute that to the existence of structural and cost-push inflation which causes monetary policy to be less effective in influencing inflation in South Africa. The dominance of the cost-push inflation factors such as the market determined nominal exchange rate and oil prices is confirmed in our study judging from their relatively large, positive and significant coefficients. The results show that a one percent increase in the nominal exchange rate and oil prices cause inflation to increase by 1.57 percent and

1.21 percent respectively. The relationship between inflation and the financial development indicators shows a positive and significant coefficient of 0.993 for lfd1, and positive and insignificant coefficient of 0.213 for lfd2. This finding is line with those of Jun et al. (2022), where financial development is found to be positively associated with inflation. The results further show that the interaction-term (repo*lfd1) carries a negative and significant coefficient of 0.855 while the repo*lfd2 has a positive and significant coefficient of 0.2281. Money supply also exerts inflationary pressures in South Africa although not significant in the p^{lfd2} equation. The ITF dummy variable has negative coefficients and significant except in the p^{lfd2} equation.

Table 4. Long-run Output and Inflation Results

Output Equations			Inflation Equations			
Variables	y^{base}	y^{lfd1}	Variables	p^{base}	p^{lfd1}	
y^{lfd2}			p^{lfd2}			
C	-3.619	4.619	C	3.528	-3.930***	2.04
2.234**				(3.550)		(0.851)
	(6.381)	(1.308)				(0.913)
$y_{(-1)}$	0.955***	0.606***	$p_{(-1)}$	0.932***	0.816***	
0.425***			0.611***			
	(0.111)	(0.141)		(0.114)		(0.105)
	(0.143)		repo	-0.190	-0.378	-
repo	-0.023***	-0.136***	0.125			
-0.178**				(0.436)		(0.770)
	(0.008)	(0.045)		(0.079)		
	(0.028)		lnr	1.566***	0.934***	
lnrer	-0.198*	0.179	1.186*			
0.187*				(0.501)		(0.370)
	(0.113)	(0.175)		(0.610)		
	(0.105)		loil	1.211***	0.931***	
lrgdp-eu	0.911**	0.220**	1.240***			
0.314***				(0.310)		(0.213)
	(0.431)	(0.090)		(0.392)		
	(0.096)					

dum2000	0.056	0.692	lms	0.835**	0.652**
0.660***			1.177**		
	(0.101)	(1.620)		(0.339)	(0.295)
(0.212)			(0.478)		
lfd1	_____	-0.313***	dum2000	-0.120*	-0.631**
_____			0.266		-
		(0.115)		(0.336)	(0.276)
repo*lfd1	_____	-0.317**	(0.443)		
_____			lfd1	_____	0.993***
		(0.105)	_____		
lfd2	_____	_____			(0.229)
0.419***			repo*lfd1	_____	-0.855***

(0.066)					(0.185)
repo*lfd2	_____	_____	lfd2	_____	_____
0.334***			0.213		
			(0.142)		
(0.005)			repo*lfd2	_____	_____
F-stat.	5.64	4.98	7.19	0.281*	
				(0.149)	
			F-stat.	6.84	8.88
					5.31

Notes: The asterisks (*), (**), and (***) denote the statistically significant at 10%, 5% and 1% levels; the standard errors are in parentheses.

Residual Diagnostic and Stability Test Results

To confirm the robustness of the results, the estimated equations are subjected to diagnostic tests including stability test to verify if the relationship is stable. The residuals of the equations were tested against null hypotheses of normality, no heteroscedasticity and no serial correlation of the error terms. If the p-values are greater than 5 percent do not reject the null hypotheses. The analysis of the residuals plays an important role in validating the results of the regression. Hence, if the

residuals of the equations satisfy the assumptions of normal distribution, homoscedasticity and no serial correlation then the results of the equations are considered valid. Since the p-values as indicated in Table 5 are greater than 5 percent, the null hypotheses are not rejected and conclude that the residuals are homoscedastic, normally distributed and not serial correlated.

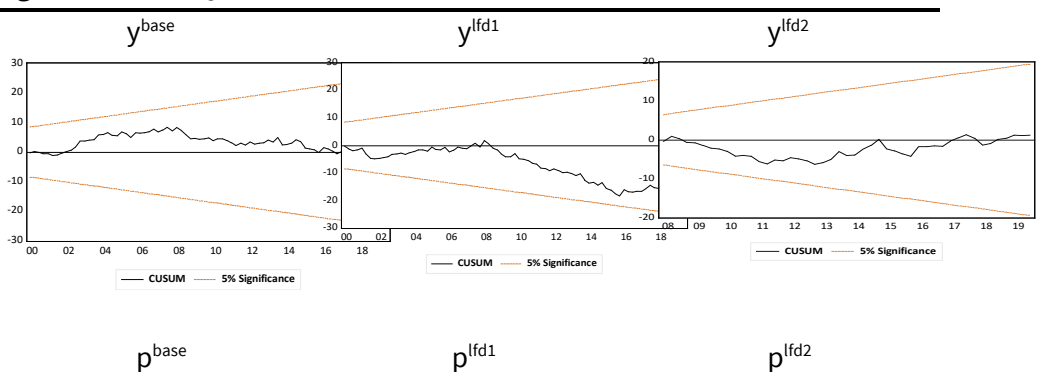
Table 5: Residual Diagnostic Tests Results

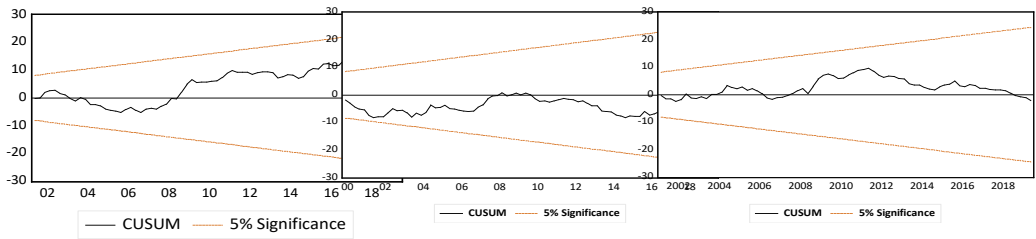
Tests	y^{base}	y^{rfd1}	y^{rfd2}	p^{base}	p^{rfd1}	p^{rfd2}
Normality (Jarque-Bera)	0.965	0.260	0.674	0.360	0.471	0.539
Heteroscedasticity (Breusch-Pagan-Godfrey)	0.272	0.154	0.321	0.117	0.251	0.141
Serial Correlation (Breusch-Godfrey)	0.661	0.546	0.319	0.461	0.280	0.582

The figures in this table represent P-Values

The equations were also tested for stability using the CUSUM test and the result are shown in Figure 4 indicating that the equations fall within the red boundaries confirming stability of the equations. Hence, overall, the equations are considered stable, reliable and that their results are robust.

Figure 4: Stability Test Results





Analysis of the short-run relationship and error-correction results

The study proceeds to estimate the short run equations of the output and inflation. The short run gives us information on how long it takes for the variations of output and inflation from their steady states or long run equilibrium to revert to equilibrium. This information is derived from the Error Correction Term (ECT). The results of the short run are presented in Table 6. As in the long-run, the three equations of the output and inflation are estimated for short-run. In the short-run a negative relationship exists between output and the repo rate although not significant in the baseline output equation. However, there is a positive and strong relationship between the repo rate and inflation in the short-run. The coefficients of the financial development indicators lfd1 and lfd2 in the output equations are negative but not significant for lfd2. In the inflation equations, the lfd1 has a negative coefficient while the coefficient of the lfd2 is positive but all are insignificant. The parameters of the interaction-terms are all negative and significant in the output equations. The coefficient of the interaction-term (repo*lfd1) is -0.341 while that of the repo*lfd2 is -0.525 in the output equations. In the inflation equations, the repo*lfd1 has a negative and significant coefficient of 0.559 while the repo*lfd2 has a positive and significant parameter of 0.052. The error correction terms (ECT) have negative and significant coefficients of -0.345 in the output(baseline), -0.269 in the output(lfd1), -0.479 in the output(lfd2), -0.280 in the inflation(baseline), -0.411 in the inflation(lfd1) and -0.255 for the inflation(lfd2). This implies that positive and negative shocks are corrected so that output and inflation revert to its equilibrium path. The lagged output and

inflation variables have positive coefficients and significant in all the equations implying persistence in output and inflation in South Africa.

Table 6. Short-run Output and Inflation Results

Output Equations			Inflation Equations		
Variables	y^{base}	y^{lfd1}	Variables	p^{base}	p^{lfd1}
y^{lfd2}			p^{lfd2}		
d(y(-1))	0.204**	0.406***	d(p(-1))	0.429***	0.494***
0.223***	(0.088)	(0.079)	0.129*	(0.066)	(0.051)
(0.085)			(0.075)		
d(repo)	-0.036	-0.351***	d(repo)	0.072***	0.240***
-0.524***	(0.047)	(0.054)	0.111***	(0.022)	(0.030)
(0.078)			(0.025)		
d(lrer)	-0.007	-0.166	d(lrer)	0.490**	0.216*
0.005	(0.010)	(0.133)	0.100***	(0.247)	(0.122)
(0.009)			(0.030)		
d(lrgdp-eu)	0.285*	0.368***	d(loil)	0.558***	0.021***
0.473	(0.081)	(0.123)	0.557***	(0.129)	(0.003)
(0.133)			(0.131)		
d(lfd1)	_____	-0.122*	d(lms)	-0.277	-0.004
_____		(0.070)	0.193**	(0.087)	(0.031)
d(repo*lfd1)	_____	-0.341**	(0.093)		
_____		(0.179)	d(lfd1)	_____	-0.033
d(lfd2)	_____	_____	_____		(0.065)
0.103			d(repo*lfd1)	_____	-0.559***
(0.018)			_____		(0.073)
d(repo*lfd2)	_____	_____	d(lfd2)	_____	_____
0.525**			0.014		

(0.230)				(0.017)		
ECT	-0.345***	-0.269***	-	d(repo*lfd2)	_____	_____
0.479***				0.052***		
	(0.055)	(0.041)				
(0.059)				(0.019)		
				ECT	-0.28***	-0.411***
				0.255***		-
					(0.037)	(0.044)
				(0.035)		

Notes: The asterisks (*), (**), and (***) denote the statistically significant at 10%, 5% and 1% levels; the standard errors are in parentheses.

The Estimation of the Structural VAR

The next question the study intends to answer is how long it takes for the interaction-terms $repo * lfd1$ and $repo * lfd2$ to have full impact on output and inflation. To answer this question the study estimates a structural VAR of output, repo rate, inflation, $repo * lfd1$ and $repo * lfd2$ variables to derive their impulse responses. The impulse responses show how output and inflation respond to the interaction-terms and further show the maximum point when there is full impact of the interaction-terms on output and inflation. The study estimates the following reduced form VAR.

$$Y_t = B_0 + B_1 Y_{t-1} + B_2 Y_{t-2} + \dots + B_p Y_{t-p} + \varepsilon_t \dots \dots \dots Eq. 15$$

Where Y_t is a $(k \times 1)$ vector of variables ($y, p, repo * lfd2, repo * lfd1$ and $repo$); B_0 is a $(k \times 1)$ vector of constants; B_i are $(k \times k)$ matrices of coefficients; ε_t is a $(k \times 1)$ vector of errors. The ordering of the variables above is informed by that the SARB under the inflation targeting monetary framework responds to current and past values of output and inflation, while output and inflation react to changes in the repo rate with lags. The real GDP growth is the first in the ordering since it adjusts slowly to the repo rate and

followed by the inflation rate. The bank-based interaction-term ($repo * lfd1$) is expected to react faster than the stock market-based interaction-term ($repo * lfd2$) to changes in the repo rate which leads to an immediate change in the lending rate and consequently to credit extension to the private sector. Hence, the $repo * lfd2$ is ordered third and $repo * lfd1$ fourth. The lag length selection is 4 based on the AIC criteria as shown in Table 7. below.

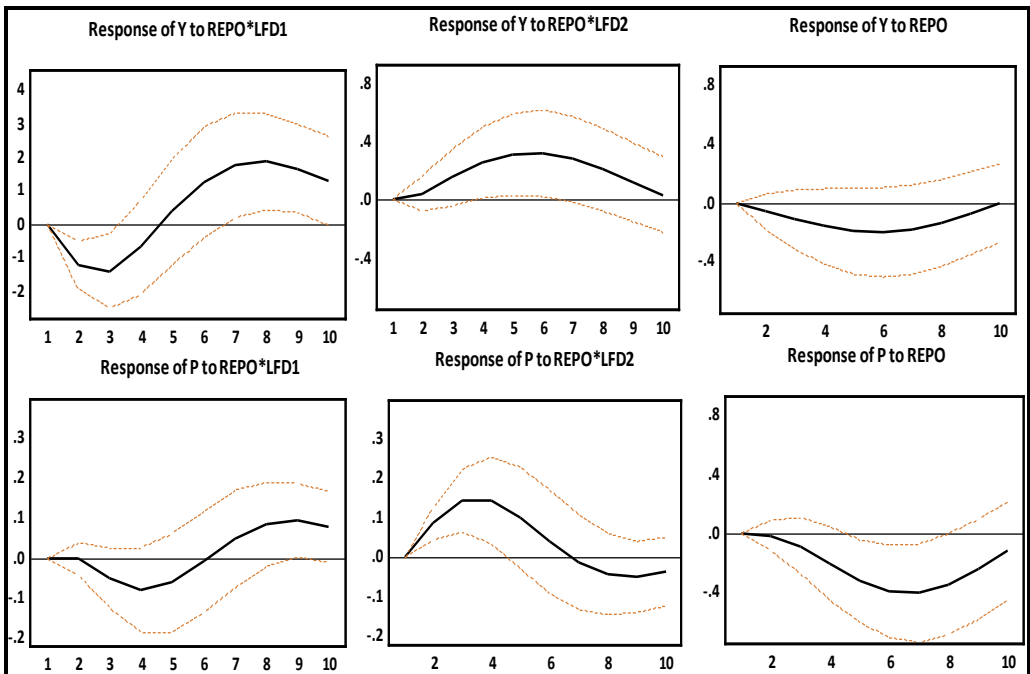
Table 7: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-806.9661	NA	31.88243	17.65144	17.78849	17.70675
1	-333.7672	884.6762	0.001873	7.907982	8.730304	8.239878
2	-245.7653	154.9597	0.000478	6.538377	8.045968	7.146853
3	-203.9921	69.01669	0.000336	6.173741	*	7.058798
4	-168.2118	55.22601*	0.000272	5.939388	8.366600	*
			*	*	8.817516	7.101025

The results of the impulse responses are shown in Figure 5. The solid lines depict the estimated effects, while the dotted lines show the boundaries of a 95% confidence interval. The results from the impulse responses are more or less the same as those of the ARDL in terms of the signs of the coefficients of the interaction-terms and those of the repo rate indicating their influences on output and inflation. For instance, the graph depicting the response of y to the $repo * lfd1$ indicates a negative relationship between the two variables in line with the results of the ARDL long-run. From the impulse response it takes about three quarters for the interaction-term ($repo * lfd1$) to have full impact on output in South Africa. On the response of inflation to the $repo * lfd1$, the ARDL results found a negative relationship between these variables, which is also confirmed by the impulse response. The impulse response shows that it takes about four quarters for inflation to realize the full impact of the $repo * lfd1$. The responses of output and inflation to $repo * lfd2$ are positive in

line with the ARDL results and significant. Notwithstanding the positive signs, the impulse responses indicate that the $\text{repo}^* \text{lfd2}$ has full impact on output and inflation at about six and four quarters, respectively. The impulse responses of output and inflation to the repo rate show a negative relationship in line with the findings of the ARDL but the coefficient of the repo rate is insignificant in the ARDL inflation equation. Based on the impulse responses, it takes about five quarters for the repo rate to have full impact on output and 7 quarters on inflation. These findings are in line with those of Smal and De Jager (2001), who found that it takes about between six to eight quarters for the repo rate to have full impact on inflation, while it takes about five quarters to have full impact on output in South Africa.

Figure 5: Impulse responses results

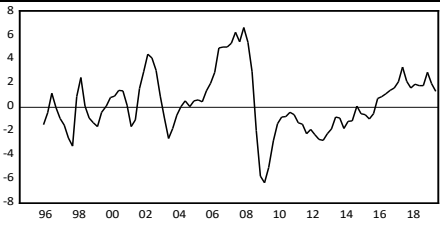


The Relation Between Monetary Policy Effectiveness and Inflation Targeting

The study further investigates whether the adoption of the ITF in 2000 by SARB improved or worsened the effectiveness of monetary policy in influencing output and inflation. This is carried out by estimating the baseline output and

inflation equations without the dummy variable on two sample periods and compares the coefficients of the repo rate obtained from the two sample periods. The two sample periods include 1995q1 to 2019q4 (whole sample of the study) and 2000q1 to 2019q4 (Sample corresponding to the period of ITF). If the coefficients of the repo rate in the output and inflation equations for the sample 2000q1 to 2019q4 are greater or less than those of the whole sample 1995q1 to 2019q4 and significant, we can conclude that the adoption of the ITF improved or worsened monetary policy effectiveness. The output and inflation equations for the whole sample are indicated with a superscript “w” as follows y^w and p^w and for the ITF period are indicated with a superscript “IT” as follows y^{IT} and p^{IT} . The baseline output and inflation equations are estimated using the ARDL and tested for cointegration using the bounds cointegration test. The bounds cointegration test results are presented in Table 8. Since the F-statistics values of all the equations are above the upper bound critical values at 1 percent they confirm the existence of cointegration among the variables included in each equation. This is also confirmed by the cointegration graphs.

Table 8: bounds cointegration test results

Equations	Lower (0) and upper bounds (1)	F-Statistics	Cointegration Graphs
y^w	<p>I(0)</p> <p>I(1)</p> <p>10% 2.37</p> <p>3.20</p> <p>5% 2.79</p> <p>3.67</p> <p>2.5% 3.15</p> <p>4.08</p> <p>1% 3.65</p> <p>4.66</p>	7.38	

y^{IT}	I(1)	I(0)	9.17	
	10%	2.37		
	3.20			
	5%	2.79		
	3.67			
	2.5%	3.15		
	4.08			
	1%	3.65		
4.66				
p^w	I(1)	I(0)	7.81	
	10%	2.20		
	3.09			
	5%	2.56		
	3.49			
	2.5%	2.88		
	3.87			
	1%	3.29		
4.37				
p^{IT}	I(1)	I(0)	5.05	
	10%	2.20		
	3.09			
	5%	2.56		
	3.49			
	2.5%	2.88		
	3.87			
	1%	3.29		
4.37				

The study proceeds to estimate the ARDL long-run for each of the equations and their results are presented in Table 9. The results indicate that in the whole sample period a one percent increase in the repo rate significantly reduces output by 0.025 percent. In the ITF sample period, a one percent rise in the

repo rate insignificantly reduces output by 0.034 percent. This implies that output responded effectively to the repo rate prior to the adoption of the ITF monetary policy framework than it is during the ITF period. Possibly, this is because monetary policy turns out to be more focused on inflation and less on output during the ITF period. About the inflation equations, the results indicate that in the whole sample period the coefficient of the repo rate is -0.138 and insignificant, however in the ITF sample period it is -0.292 and significant and higher than the coefficient of the whole sample in absolute terms. Again, this implies that as the SARB pursues an inflation targeting monetary policy framework, inflation started to respond effectively to monetary policy than it used to be before the adoption of the ITF monetary policy framework. In a nutshell, the results indicate that output responded effectively than inflation to monetary policy in South Africa prior to the adoption of the ITF monetary policy framework. However, during the ITF period the opposite becomes evident where inflation responds effectively than output to monetary policy.

Table 9. Long-run Output and Inflation Results of two Sample Periods

Output Equations			Inflation Equations		
Variables	y^w	y^{IT}	Variables	p^w	p^{IT}
C	-5.501 (4.571)	2.808*** (0.754)	C	4.824 (3.367)	3.973 (4.973)
$y_{(-1)}$	1.176*** (0.096)	0.903*** (0.112)	$p_{(-1)}$	0.619*** (0.051)	0.988*** (0.089)
repo	-0.025*** (0.007)	-0.034 (0.138)	repo	-0.138 0.292*** (0.436)	- (0.056)
lrer	-0.160** 0.605*** (0.079)	- (0.148)	lner	0.960** (0.450)	2.125*** (0.762)
lrgdp-eu	1.037** (0.311)	1.806*** (0.514)	loil	0.983*** (0.289)	1.855*** (0.473)
F-stat.	7.38	9.17	lms	0.745** (0.306)	1.190** (0.535)
			F-stat.	7.81	5.05

Notes: The asterisks (*), (**), and (***) denote the statistically significant at 10%, 5% and 1% levels; the standard errors are in parentheses.

6. Conclusions and Recommendations

The main purpose of this study is to investigate how financial development interacts with the repo rate to affect the effectiveness of monetary policy in influencing output and inflation in South Africa. The effectiveness of monetary policy is measured by the responsiveness of the output and inflation to an interaction-term between the repo rate and a financial development indicator. Specifically, the study examines the coefficients of the interaction-terms in an output and inflation equations respectively, where a statistically significant positive or negative coefficient indicates that financial development dampens or enhances the effectiveness of monetary policy. The study further investigates whether the relationships exist in the long-run, short-run or both and how long it takes for the interaction-terms to have full impact on output and inflation respectively. Two measures of financial development are used in the study namely, domestic credit to the private sector to GDP ratio (bank-based financial development indicator) and stock market capitalization to GDP ratio (stock market-based financial development indicator). While other studies have used money supply as a monetary policy instrument, this study uses the interest rate (repo rate) because South Africa implements its monetary policy by adjusting the repo rate.

The study uses an ARDL framework to investigate the long-run and short-run relationships and a structural VAR to derive the impulse responses to answer the question on how long it takes for the interaction-terms to have full impact on output and inflation. Given that South Africa adopted an ITF monetary policy framework in 2000, the study also investigates whether this monetary policy framework has improved or worsened the effectiveness of monetary policy in influencing output and inflation. Hence, the contributions of the study relative to existing literature on the effectiveness of monetary policy in South Africa are that two measures of financial development indicator have been used instead of one to assess how they interact with monetary policy to influence output and inflation. Whilst many studies on this topical issue have

used panel data analysis, whose results may be influenced by varying country-specific effects, the study adds to few existing literatures on a single-country analysis. The study has further provided insights on how long it takes for the interaction-terms, derived from the two financial development indicators, to have full impact on output and inflation respectively, which existing studies have not explored. Moreover, the study contributes to existing literature by investigating whether the introduction of the ITF has improved or worsened the effectiveness of the repo rate in influencing inflation and output in South Africa.

The results show that the coefficients of the bank-based interaction-term in the long-run and short-run of the output and inflation equations respectively are negative and significant. On the other hand, the results indicate that the coefficient of the stock market-based interaction-term is positive and significant in the long-run but negative and significant in the short-run for the output equation. However, in the inflation equation the coefficients of the stock market-based are positive and significant both in the long-run and short-run. The negative and significant coefficients of the bank-based interaction-term imply that the bank-based financial development indicator interacts with the repo rate to improve/increase the effectiveness of monetary policy in influencing output and inflation both in the long-run and short-run in South Africa. On the other hand, the results of the coefficients of the market-based financial indicator mean that this indicator interacts with the repo rate to weaken/reduce the effectiveness of monetary policy on inflation both in the long-run and short-run, and on output in the long-run. In terms of the magnitude of the coefficients, the bank-based interaction-terms' parameters are larger than those of the corresponding repo rate coefficients. For example, a one percent change in the repo rate individually causes output to increase or reduce by 0.136 percent while the bank-based interaction-term increases or reduces output by 0.317. With respect to inflation, the repo rate has a negative and insignificant coefficient of 0.378 while the bank-based interaction-term has a negative and significant coefficient of 0.855. The results indicate that although the stock market is well developed in South Africa the financial system relies more on financial intermediaries. This also confirms the dominance of the credit channel through which financial development affects

monetary policy transmission as supported by the credit channel theory that consists of the bank lending channel and balance sheet channel as proposed by Bernanke and Gertler (1995).

The results further reveal that the bank-based interaction-term takes less time to have full impact on output and inflation compares with the repo rate and the stock market-based interaction-term. The bank-based interaction-term takes about three quarters and four quarters to have full impact on output and inflation respectively, which is quicker than the five quarters and seven quarters it takes for the repo rate individually to have full impact on output and inflation respectively. The latter results are consistent with the findings of Smal and De Jager (2001), which indicate that it takes about between six to eight quarters for the repo rate to have full impact on inflation, while it takes about five quarters to have full impact on output in South Africa. Lastly, the study indicates that the adoption of the ITF monetary policy framework has improved the effectiveness of monetary policy in influencing inflation while worsening its effectiveness in influencing output. The negative and significant coefficient of the ITF dummy variable in the inflation equation; and its positive and insignificant parameter in the output equation, imply that the introduction of the ITF contributed significantly to the reduction in inflation with no significant effect on output. Hence, it is concluded that inflation is responding accordingly to the repo rate since the adoption of the ITF, and it has been fluctuating within the targeted band of 3 to 6 percent for the better part of the ITF period, averaging 5.30 percent.

Based on the results it is concluded that monetary policy effectiveness is enhanced when the repo rate interacts with the bank-based financial development indicator and is reduced when it interacts with the stock market-based financial development indicator in South Africa. The result showing that the bank-based financial development enhances monetary policy effectiveness in South Africa is aligned with the findings of the study by Apanisile and Osinubi (2019) in Nigeria, indicating that the credit channel is the most active channel in stimulating output and the expectation channel being the most active in stabilizing prices. On the other hand, the result indicating that the improvement in the stock market-based financial development

indicator in South Africa reduces monetary policy effectiveness is consistent with the findings by Basa et al. (2019) who used an almost similar financial development indicator (liquid liabilities and stock market capitalisation) in Malaysia. The study further concludes that due to the repo rate interacting with the bank-based financial development indicator, the period it takes for this interaction-term to have full impact on output and inflation is relatively shortened in South Africa. It is therefore recommended that the SARB should consider the bank-based financial development indicator when formulating its monetary policy. For instance, the bank-based financial development indicator can be included in their model for determining the repo rate. Given that during the ITF period the repo rate managed to restrain inflation to be within the targeted band at the expense of output, it is recommended that fiscal policy should be crafted such that it addresses the deficiency of the monetary policy to influence output.

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