ASSESSING THE IMPACT OF MONETARY POLICY SHOCKS ON FINANCIAL STABILITY IN SOUTH AFRICA

https://doi.org/10.47743/jopafl-2023-29-20

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Abstract: The study examined the monetary policy shocks on financial market stability. This was achieved by means of econometric analysis. The study made use of quarterly time series macroeconomic data spanning from 2003Q2 to 2020Q4. The study used various econometric techniques such as stationarity, determining optimal lag length, cointegration analysis, estimating a vector error correction model, impulse response functions, forecast error variance decomposition and granger causality. The study found that, credit to non-financial sector responds negatively to its own innovations in the short and positively to its own innovations in the medium to long term. Meanwhile, credit to non-financial sector responds negatively to shocks in interest rates and money supply during the entire period. Similarly, the findings reveal that credit to non-financial sector responds negatively to systematic risks, that is, shocks induced by poor financial conduct. Systematic risks create disturbances in the financial market, and this hampers financial market stability. The response of credit to non-financial sector to shocks in the consumer price index is found to be positive in the short run although this trend becomes negative overtime. A uni-directional causation can be observed between credit to non-financial sector and global economic activity at the 5% significance level. Similarly, uni-directional causation can be seen between the 2008 global financial crisis dummy and credit to non-financial sector at the 1% statistical significance level. Interestingly, a bi-directional causality was established between broad money supply and credit to non-financial sector at the 1% and 5% statistical significance levels, respectively.
Keywords: Financial stability, financial markets, Money supply, Consumer Price Index.
JEL Classifications: B22, G10, C10

Introduction

A crucial component of macroeconomic policy, monetary policy is seen as essential to the health and future of the economy. Therefore, it is generally acknowledged amongst academics that achieving and sustaining price stability is the core goal of monetary policy. There are various schools of thought regarding how to properly accomplish this goal, though. According to Dlamini (2020), several central banks have implemented various regimes, including exchange rate targeting, monetary targeting, eclectic monetary targeting, and inflation targeting, in order to achieve and maintain price stability. A rising number of nations have embraced inflation targeting as their monetary policy framework in recent years. The adoption of this framework has marked a positive change in how central banks from around the world conduct monetary policy. Other central banks in developed and emerging markets then adopted this new framework after New Zealand,

which had introduced it in 1990. Many more are currently considering doing so. Like other nations, South Africa implemented the IT monetary policy framework in February 2000 through its central bank, the South African Reserve Bank. The South African IT framework is forward-looking in that a specified inflation target must be fulfilled within a given time period because it is based on inflation forecasts (Dlamini).

Moreover, the financial system in the real economy plays a key role in sustaining a healthy economic growth through the provision of funds for investment opportunities, enhanced capital accumulation and improvements in the allocation of risks. Prior to the global economic crisis of 2007/2008, the global financial system witnessed very rapid, but unsustainable growth, which distortions were exacerbated by the crisis (Ioana, 2013). There is no consensus in the literature on whether Central Banks should extend monetary policy beyond price stability. However, periods of financial instability have shown that the direct effect of credit controls, financial regulation and the high cost of borrowing have intensified procyclicality in financial markets and business cycles (Angeloni and Faia, 2013; Liu and Seeiso, 2012). The 2007/2008 global financial crisis is an example of how financial instability can disrupt the functioning of the real economy. As a small, open economy, South Africa is susceptible to uncertainty and risk from the global financial environment (SARB, 2016). Subsequent to the 2007/2008 financial crisis, policy rate differentials between advanced economies and emerging markets led to capital inflows (in the latter) that created a risk for macroeconomic and financial stability (Unsal, 2013).

The primary aim of macro-prudential policy is financial stability, which calls for mechanisms to influence the economic outcomes of different countries. All over the world, the authorities are experiencing challenges in implementing macro-prudential policy. However, the objective of monetary policy and macro-prudential policy is clear in terms of how each affects credit growth. Credit growth can emanate from households' loans (house prices) and corporate loans.

Financial stability in South Africa has been subject to various challenges in recent years. The country's economy is one of the largest in Africa, but it has experienced slow growth, high unemployment, and economic inequality. These economic challenges have led to financial instability and affected the livelihoods of many South Africans. The banking sector is a critical part of the financial system in South Africa. The ongoing COVID-19 pandemic has led to an increase in non-performing loans, which has put pressure on the banking sector's stability. Furthermore, the South African Reserve Bank (SARB) has implemented various measures to mitigate financial risks, such as supervisory stress tests and macro-prudential policy tools. The government has also taken steps to improve financial stability. The Financial Sector Regulation Act (FSRA) was introduced in 2017 to improve regulation and create a more robust financial system.

The Act established the Prudential Authority and the Financial Sector Conduct Authority to regulate and supervise financial institutions (Nhalpo & Nyasha, 2021). However, South Africa faces additional financial stability challenges, including high levels of household debt, subdued economic growth, and political instability. Moreover, ongoing challenges related to corruption and weak governance, also undermine financial stability in the country (Makubalo, 2019).

Financial stability in South Africa faces both internal and external challenges. While the government has taken steps to improve regulation and the financial system, significant challenges remain. It is crucial for policymakers to continue to implement measures that

assist in mitigating these challenges and foster long-term financial stability in South Africa. It is against this backdrop that this study investigated the effect of monetary policy shocks in financial stability in South Africa. To the best of the researcher's knowledge, this is the first study in South Africa to assess monetary policy shocks on financial stability using quarterly data using the latest data spanning from 2003 to 2020.

Literature Review

Theoretical literature.

The theoretical framework for monetary policy is rooted in the monetary policy transmission mechanism. There are two such mechanisms, namely, non-neoclassical channels and neoclassical channels (Boivin et al, 2011). Neoclassical channels of monetary policy are founded on Friedman's (1956) monetarist characterization of the transmission mechanism. These channels mainly operate through the interest rate channel. Non-neoclassical channels, also known as credit channels, are founded on frictions in the credit market that are the result of asymmetric information between borrowers and lenders. According to Lacoiello and Minettiz (2008). The importance of these channels before the global financial crisis was mixed.

However, Cecchetti et al. (2009) and Mishkin (2009) showed thatfinancial frictions affect the transmission of monetary policy and distort the real economy. During the global financial crisis, the interest rate channel was weakened (Gambacorta et al., 2015), suggesting that the monetary policy might have changed. According to Angelis et al. (2005), the transmission mechanism of monetary policy explains the complex process whereby changes in the monetary policy stance are transmitted to the real sector of the economy to achieve its objective, such as economic growth and a low and stable inflation rate.

The interest rate influences the decisions made by investors, firms, financial institutions and households, which changes the price level and economic activities. For instance, when the monetary authorities adopt tight monetary policy by raising the repo rate, this directly affects the money market by increasing the banks' interest rates (Arestis & Sawyer, 2004). Thus, the cost of capital increases, causing investment expenditure to fall, and thereby leading to a decrease in aggregate output and demand. Five different channels generalize the transmission process, namely, the interest rate channel, exchange rate channel, money effect channel, asset price channel and credit channel.

The regime of inflationary targets derives from the work that permeated the debate on rule-based versus discretionary monetary policy in the 1970s and 1980s, with the contributions of Kydland and Prescott (1977) and Barro and Gordon (1983), as well as the emergence of rational expectations with and Sargent and Wallace (1975). Later, in addition to the operability of monetary policy, Taylor (1993) joined this debate, giving support pillars of the so-called new monetary policy consensus. The idea is to use the microeconomic fundamentals within a macroeconomic model of general equilibrium, while still considering a range of hypotheses of rigidities in the adjustment process but incorporating rational expectations to explain the effects of monetary policy in particular to the real variables of the economy, so that its effects are only transitory (long-term neutrality of the currency). This unified the neoclassical and new Keynesian theories. In this sense, Woodford (2011) added that although monetary policy is not considered irrelevant to explain fluctuations, its most important sources are real. Thus, monetary policy is important

to contain inflation, whose dynamics have monetary roots. Therefore, following Friedman's monetarist idea, monetary policy should be used exclusively to control the price level, since it has no lasting effect on the real economy. The proponents of the inflation targeting regime rescued the quantity theory of money (QTM) regarding monetary control of inflation by the monetary authorities (exogenous currency) to defend the hypothesis of monetary policy neutrality. From there, more appropriate prescriptions can be extracted, which are the use of rules or practices of commitment of governments to monetary policy [Cukierman (1994); Walsh (1995); Mishkin (2000)], avoiding the own bias of inflation Kydland and Prescott (1977).

Despite its origin in the QTM, the rule the inflation targeting operates through the interest rate and not through control of the monetary aggregate, as advocated by monetarist theory. This is a result of discrediting the hypothesis that the velocity of money circulation is constant. According to the new consensus, it is the exact opposite. That is, the velocity of the currency that is unstable, which makes it difficult for central bank intervention regarding the currency, and consequently involving inflation. Over time, Friedman's monetarism, which prescribed price control by intervening in monetary aggregates, was gradually abandoned. In this sense, in a more modern version, monetary policy focused on the intervention of the interest rate as an instrument to control inflation. Although this change was considered a Keynesian victory over the monetarists, the theoretical and institutional framework is far from being a Keynesian theory. According to Arestis and Sawyer (2004), in the long run the inflation rate is the only macroeconomic variable that monetary policy can affect. Thus, in the long run monetary policy cannot affect economic activity, economic output, employment and so on. The inflation targeting regime is therefore based on the premises of the new macroeconomic consensus.

Taylor (1993) presented a proposition as part of the effort to obtain an interest rate rule, and a rule for monetary policy to replace monetary rules. He explained that monetary policies based on rules of interest rates related to inflation variations and product variations are more stable, achieving better control than other types of policy that may be adopted. In other words, he argued that well-enforced rules are compatible with changes in interest rates in response to changes in prices or economic activity, without compromising the expectations of other agents.

Empirical literature.

Bergman and Hansen (2002) examined empirically the relationship between financial instability and monetary policy in Sweden using quarterly data from the first quarter from 1982 to the third quarter of 2001. They used measures of financial instability in a standard vector autoregressive (VAR) framework with output, prices, and interest rate, and then extended it to include measures of credit expansions. The measures of financial stability constructed used firm bankruptcies and excess return on housing. They found that there was a significant effect of higher interest rates and lending expansions on financial instability, and a strong impact of price shocks as well. They concluded that price stability and financial stability cannot be rejected as mutually consistent goals for monetary policy.

In their study, Granville and Mallick (2009) investigated the nexus between monetary stability and financial stability twelve European Monetary Union countries over the period fourth quarter 1994-second quarter 2008. In analyzing the nexus relationship, they used the following variables: interest rates, share prices, exchange rates, property price inflation and

the deposit–loan ratio of the banking sector (proxies for financial stability) to changes in the consumer price level and ECB policy rate (proxies for monetary stability). They used a sign-restriction-based VAR approach, we find that there is a pro-cyclical relationship between monetary and financial stability in the long-run. With a positive inflation shock, they further found that on average a 2% estimated decline in share prices. In conclusion, they suggest that the interest rate instrument used for inflation targeting is conducive to financial stability.

Khataybeh and Al-Tarawneh (2016) analyzed the relationship between financial stability and monetary policy in Jordan. They have used an impulse function using a VAR framework together with Granger causality test to explore the impact of monetary policy shocks on a financial stability index. Their findings emphasize that changes in the excess reserves impact positively on the financial stability index, however, the effect is small in magnitude. On the same direction, changes in domestic credit have a significant impact on the financial stability index. These findings support the explanation that monetary policy has a significant effect on the financial stability through affecting its medium target, using its instruments, mainly excess reserves.

To study the impact of monetary policy and macroprudential policy coordination on financial stability and sustainability, Jiang et al (2016), used the yearly data spanning from 2003 to 2017. They used the System Generalized Method of Moments (System GMM) method to analyze the monetary policy and macroprudential policy coordination effect on 88 commercial banks' risk-taking; from the macro level, they used the Structural Vector Autoregression (SVAR) method to analyze the two policies coordination effect on housing prices and stock price bubbles. They found that for regulating bank risk-taking, monetary policy and macroprudential policy should conduct counter-cyclical regulation simultaneously; secondly, for regulating housing prices, tight monetary policy and tight macroprudential policy should be implemented alternately; thirdly, for regulating stock price bubbles, macroprudential policy should be the first line of defense and monetary policy should be the second one.

Using a time-continuum changing parameter model, Baxa, Horvath, and Vasicek (2013) investigated how specific authorities responded to financial stress events over the previous 30 years. The findings imply that the government is most likely to alter interest rates, mostly by lowering them during times of extreme stress. These results are in line with those of (Lamers et al., 2019), who discovered that weaker banks gain from low interest rates at the expense of future financial stability concerns rising. Bank stress and stock market stress are the forms of stress that the authorities are most likely to respond to. In line with study taken by (Martinez-Miera and Repullo, 2019; Jiang et al., 2019), monetary policy through open market sales of government debt by a central bank is effective when improving banks monitoring incentives through an increase in the intermediation margin. Tight monetary policy, however, discourages investment from both safe and hazardous businesses. Consequently, a monetary policy without considering the function of credit and asset prices may not have a robust cost-benefit analysis (Adrian and Liang, 2018).

To explores the connection between Asian economies' inflation targeting (IT) and financial instability, Sethi and Acharya (2019) used data from 1990 to 2015. A multidimensional financial conditioning index is created to gauge financial instability using the ECB's methodology. The study disproves the "conventional knowledge" notion by demonstrating that the adoption of IT policy in Asian nations has a negative influence on financial

stability. The Vector Autoregression (VAR) result further demonstrates how an IT regime boosts housing returns and encourages investors to take bigger risks.

Dlamini (2020) studied financial stability and monetary policy in South Africa with monthly frequency time series data spanning from 2000:2 to 2017:8. Markov Switching Vector Autoregression (MSVAR) model was estimated together with Bayesian methods to investigate this dynamic relationship. The results show that interest rates react negatively to a severe financial stress shock, which causes credit growth to expand. Real GDP growth somewhat rises despite the expansion of credit before steadily declining. It is concluded that monetary policymakers must take financial stability into account given the complimentary nature of the objectives of financial stability and monetary policy. Furthermore, monetary policy has an impact on more than simply interest rate changes; it also has an impact on things like loan risk functions.

To understand the effects of South Africa's Unexpected Monetary Policy Shocks in the Common Monetary Area, Seoela (2020) used a structural vector autoregressive (SVAR) using monthly data spanning from the period 2000M2 to 2018M12. The major findings demonstrate that a positive shock to the South African repo rate is often followed by a decline in economic output and a rise in price levels, with a 90% level of confidence across all Common Monetary Area nations. In addition, the study found that, a positive repo rate shock causes an asymmetric response in the money supply, domestic credit, and lending rate spread between Lesotho, Eswatini, and Namibia countries and South Africa. According to these results, the governments of Lesotho, Eswatini, and Namibia must take additional measures to lessen the negative effects of South Africa's monetary policies on their financial sectors.

The study by Yalçinkaya, Celik, and Emsen (2021) highlighted how price and financial stability are related in monetary policy designs that have evolved since the 1990s and conducted an empirical analysis of how price and financial stability are related in US monetary policy designs. To this end, the study uses the TVP-SVAR model to examine the time-varying structure of the relationship between price and financial stability in the US, where monetary policies are intended to achieve price stability, full employment, and targets for moderate long-term interest rates. The study used monthly data spanning from 1993:12 to 2020:12. These findings essentially indicate the need to restructure US monetary policy in light of the new environment hypothesis while also taking into account the changing pattern of symmetrical or asymmetrical linkages between monetary and financial stability factors over time.

In general, the scant empirical literature lends itself to the idea that financial markets development is key to determining the effectiveness of monetary policy. The impact, however, could be facilitative or dampening. In one dimension, a well-developed financial system provides the structures for the transmission of policy to the economy, thus contributing to effectiveness. On another dimension, well-developed financial markets could also provide insulation against monetary policy shocks by providing numerous media/innovations by which economic agents can counter the effects flowing from monetary policy shocks.

As shown above, number of studies tried to explore the relationship between monetary policy and financial stability. They used different models and got different results. Herein, the study tests the existence of such shocks and policy response in South Africa, unlike that of Dlamini (2020), which did not look at shocks but interested in the relationship. Again,

the study made use of quarterly latest data from 2003 to 2020 as opposed to high frequency data such as monthly where we know very well that monetary policy conduct has lag effects. Thus far, there is a gap in the literature on this area in South Africa. The model used should serve the study objectives. And answer the study question: does monetary policy affect the financial stability in South Africa?

Research methodology.

Model specification.

The estimated model was informed by recent empirical studies including Dlamini (2020), and Mahajan (2018). The estimated model, with a few modifications, can be expressed as:

$$FS = \alpha_0 + \beta_1 cpi_{t-1} + \beta_2 ms_{t-1} + \beta_3 geai_{t-1} + \beta_4 int_{t-1} + \beta_5 dum1_{t-1} + \beta_6 dum2_{t-1} + \varepsilon_t \quad (1)$$

Where

FS is financial stability proxied by credit to non-financial sector,

CPI is the consumer price index capturing the effects of inflation in the financial sector,

MS is money supply measured by broad money (M2),

$GEAI$ is the global economic activity index measuring the influence of the international economic activities,

INT is Interest rate,

$DUM1$ is a dummy variable to capture the shock of the 2008 financial crisis,

$DUM2$ is a dummy variable to capture the effects of the 2016 sovereign debt crisis on the South African financial system and,

ε_t is the error term.

Credit to non-financial sector, inflation, money supply, global economic activity index, and interest rates are all important variables for explaining monetary policy shocks on financial stability in South Africa. Credit to non-financial sectors refers to the amount of credit provided by financial intermediaries, such as banks and other lending institutions, to non-financial businesses or households. Credit availability and accessibility for non-financial sectors can stimulate economic activity and promote financial stability. However, excessive credit growth can lead to financial instability and debt distress. Monetary policy shocks can affect the availability of credit to non-financial sectors, influencing financial stability.

Inflation is another variable that is used to explain the impact of monetary policy shocks on financial stability in South Africa. High inflation rates can affect price stability, leading to economic instability. Monetary policy shocks can either decrease or increase inflation by influencing the money supply, interest rates, and credit availability. Money supply refers to the amount of money in circulation in an economy, and it is critical in explaining monetary policy shocks on financial stability in South Africa. Monetary policy shocks, such as interest rate adjustments, can influence the money supply, which subsequently affects economic activity and financial stability. Global economic activity index, which is an index used to measure the growth rate of the global economy, also plays an important role in explaining monetary policy shocks on financial stability in South Africa. Changes in the global economic activity index can affect the financial stability of South Africa's economy, particularly through exports and imports, which form a significant part of the country's GDP.

Lastly, interest rates are critical variables for explaining the impact of monetary policy shocks on financial stability in South Africa. Interest rates impact the cost of borrowing money, which influences investment, savings, and consumption, all of which affect financial stability. Monetary policy shocks, such as interest rate adjustments, can stimulate or slow down economic activity, which can either promote or hinder financial stability. All these variables are all critical variables for explaining the impact of monetary policy shocks on financial stability in South Africa. A better understanding of these variables can help policymakers formulate effective monetary policies that promote financial stability and sustainable economic growth.

Data sources.

The study made use of quarterly time-series data collected from several secondary data servers including the South African Reserve Bank online statistical query and St Louis Federal Reserve database. The period ranged from 2003:Q3 to 2020:Q4.

Data analysis and discussion.

Unit root analysis.

Table 1 below provides a summary of the stationarity analysis. This includes both the Augmented Dickey-Fuller and Philips Perron tests. In general, the findings reveal that the variables are stationary at different levels. For example, credit to non-financial sector and the consumer price index are stationary at level while, on the contrary, global economic activity, interest rates and broad money supply are stationary after first differencing. Further to this, the findings reveal that in all instances, the Augmented Dickey-Fuller and Philips Perron stationarity tests agree.

Table 1: ADF and PP output.

Variable	M.S	ADF		PP		Output
		Level	1st diff	Level	1st diff	
CNFS	Intercept	-3.75	-8.43	-6.68	-28.85	I(0)
	Trend	-4.04	-8.38	-6.85	-29.18	
CPI	Intercept	-3.87	-4.97	-9.05	-29.57	I(0)
	Trend	-4.78	-5.04	-8.90	-30.20	
GEAI	Intercept	-2.29	-8.82	-2.14	-10.39	I(1)
	Trend	-3.47	-8.75	-3.43	-10.28	
INT	Intercept	-2.46	-7.68	-2.32	-8.13	I(1)
	Trend	-2.77	-7.83	-2.52	-13.08	
MS	Intercept	-1.75	-4.43	-2.00	-7.68	I(1)
	Trend	-1.41	-4.40	-1.82	-7.776	

Source: Author's computations, Note: asterisk * and ** indicate significance level at 10% and 5%, respectively.

Optimal lag length.

This process is extremely crucial in econometric analysis to ensure that the correct number of lags is specified in the model as well as to ensure that the model is not over-fitted. The results are provided in table 2.

Table 2: Lag order selection.

Lag	LogL	LR	FPE	AIC	SC	HQ

0	-1038.71	NA	222074.3	32.17	32.41	32.26
1	-767.52	475.62	240.55*	25.33	27.21*	26.07*
2	-719.08	74.52	257.38	25.35	28.86	26.74
3	-680.94	50.46	411.51	25.69	30.84	27.72
4	-623.06	64.11	413.40	25.41	32.20	28.09
5	-545.44	69.26*	284.97	24.53	32.96	27.86
6	-467.23	52.94	283.94	23.63*	33.70	27.61
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Author's computations

This is particularly important when utilizing Vector autoregressive models. The Akaike information criterion recommends six lags while the Schwarz information criterion and Hannan-Quinn information criterion recommend one lag. For the purposes of this study, the Schwarz information criterion will be utilized to avoid the loss in degrees of freedom which might result from a higher number of lags.

Johansen cointegration.

An interesting aspect of time series analysis involves establishing a long relationship between the dependent variable and explanatory variables. This was achieved by means of the Johansen Cointegration test.

Table 3: Johansen Cointegration output.

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.67	153.58	125.61	0.00
At most 1	0.38	76.86	95.75	0.47
At most 2	0.21	43.97	69.81	0.86
At most 3	0.16	27.27	47.85	0.84
At most 4	0.11	15.34	29.79	0.75
At most 5	0.09	7.16	15.49	0.55
At most 6	0.00	0.06	3.84	0.79
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.67	76.72	46.23	0.00
At most 1	0.38	32.89	40.07	0.25
At most 2	0.21	16.69	33.87	0.93
At most 3	0.16	11.93	27.58	0.93
At most 4	0.11	8.181	21.13	0.89
At most 5	0.09	7.09	14.26	0.47
At most 6	0.00	0.06	3.84	0.79

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

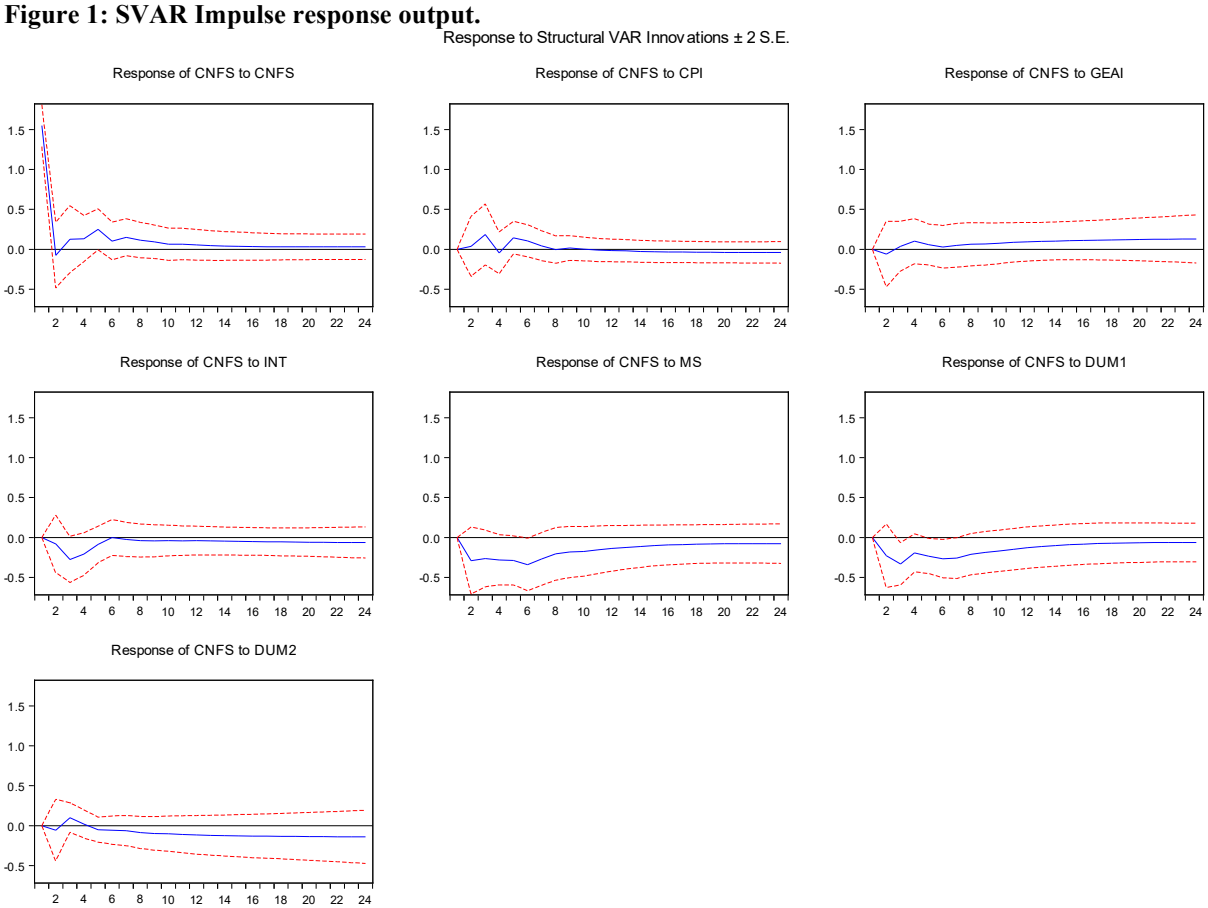
Source : Author's computations

Table 3 above provides a summary of findings from the Johansen cointegration test. The test was performed to determine if a long run relationship exists between the dependent variable and explanatory variables. The results in Table 5.4 indicate that a long run relationship exists between the dependent and explanatory variables. This is because, the trace statistic value of 153.58 is greater than the critical value of 125.61 at the 5% significance level. As such, at least one cointegrating relationship exists at the 5% significance level. Similarly, the maximum eigenvalue of 76.72 is greater than the critical value of 46.23 at the 5% significance level. This indicates that both the trace test and maximum eigenvalue confirm that at least one cointegrating relationship exist at the 5% significance level

Structural VAR analysis.

The impulse response function was estimated through structural factorization to account for structural shocks in the financial system. The primary goal of impulse responses is to determine the response of endogenous variables to a one standard deviation

Figure 1: SVAR Impulse response output.



Source: Author's computations

Figure 1 above illustrates the response of credit to non-financial sector to shocks in interest rates, consumer prices index, money supply, global economic activity, the 2008 global financial crisis and 2016 sovereign debt crisis. Credit to non-financial sector responds negatively to its own innovations in the short and positively to its own innovations in the medium to long term. Also, the response is found to be permanent during this period. Meanwhile, credit to non-financial sector responds negatively to shocks in interest rates and money supply during the entire period. Also, the response is temporary overtime. Similarly, the findings reveal that credit to non-financial sector responds negatively to systematic risks, that is, shocks induced by poor financial conduct. Likewise, the shocks are found to be permanent overtime. Systematic risks create disturbances in the financial market, and this hampers financial market stability. This implies that enhancements in global economic activity result in a more stable financial market whereas a deterioration in global economic activity would result in a more volatile financial market.

The response of credit to non-financial sector to shocks in the consumer price index is found to be positive in the short run although this trend becomes negative overtime. This is largely because as inflation rises, monetary authorities employ contractionary monetary policy which involves hiking interest rates or reducing the quantity of money in circulation through bond purchases in the secondary market. As a result, credit to non-financial sector decreases given the increased cost of borrowing by non-financial firms. These results are similar to those of Dlamini (2020) though the time horizons in which the shocks effects wore out differs. In contrast, credit to non-financial sector responds positively to shocks in global economic activity and this response is found to be permanent. As the economy recovers and expands, central banks are more likely to keep interest rates and the quantity of money the same. This creates a favorable lending environment to non-financial firms to expand their operations and capacity.

In the recent literature, such as that of Dlamini (2020) have examined the impact of monetary policy shocks on financial stability in South Africa using SVAR analysis. These studies have found that fluctuations in the monetary policy rate have a significant impact on the stability of the country's financial system. Other studies found that a tightening of monetary policy leads to a reduction in financial sector activity, which can in turn lead to an increase in the likelihood of financial stress. Another study found that monetary policy shocks have a significant impact on the volatility of the stock market and that these shocks may propagate into the real economy through changes in firms' investment decisions. Overall, these studies highlight the importance of considering the impact of monetary policy on financial stability in South Africa and the need for policymakers to carefully balance the objective of maintaining price stability with the potential risks to financial stability.

Variance decomposition.

In line with impulse responses, the variance decomposition was executed to measure forecast errors of each variable in relation to its own shock which was estimated using structural factorization.

Table 4: Structural variance decomposition.

Period	S.E.	CNFS	CPI	GEAI	INT	MS	DUM1	DUM2
1	1.54	100.00	0.00	0.00	0.00	0.00	0.00	0.00

2	1.59	94.14	0.05	0.13	0.24	3.26	2.03	0.11
3	1.69	84.30	1.26	0.17	2.85	5.33	5.61	0.46
4	1.75	79.70	1.24	0.50	4.06	7.56	6.47	0.44
5	1.81	75.93	1.79	0.56	4.01	9.53	7.66	0.49
6	1.87	71.66	2.01	0.55	3.76	12.23	9.20	0.55
7	1.91	68.95	1.97	0.59	3.60	13.64	10.59	0.63
8	1.94	67.25	1.91	0.68	3.54	14.35	11.42	0.81
9	1.97	65.88	1.87	0.78	3.50	14.86	12.05	1.03
10	1.99	64.64	1.83	0.91	3.46	15.33	12.51	1.27
11	2.00	63.61	1.80	1.08	3.44	15.65	12.83	1.54
12	2.02	62.72	1.78	1.28	3.43	15.87	13.04	1.85

Source: Author's computations

The results indicate that in the short run, a larger proportion of the variations in credit to non-financial sector are explained by its own innovations and to a small extent by innovations in interest rates, money supply and the 2008 global financial crisis. In the medium to long term however, approximately 50% of the discrepancies in credit to non-financial sector are explained by its own innovations and to a relatively larger extent by innovations in the money supply and the 2008 global financial crisis. Global economic activity, the consumer price index and the 2016 sovereign debt crisis are relatively less effective in explaining discrepancies in credit to non-financial sector.

Residual diagnostics.

Residual diagnostics were performed by means of the auto-correlation test, heteroskedasticity test and inverse roots test. The estimated auto-correlation test revealed a chi-square value of 58.11 and a corresponding p-value of 17%. This indicates that the estimated residuals by means of structural VAR do not suffer from serial correlation since the corresponding p-value is greater than 5%. Further to this, the corresponding probability value of the chi-square under the White heteroskedasticity test also confirms that the model is free from heteroskedasticity. This is because, the probability of 23.5% is greater than 5%, which, once again, confirms the absence of heteroskedasticity in the model.

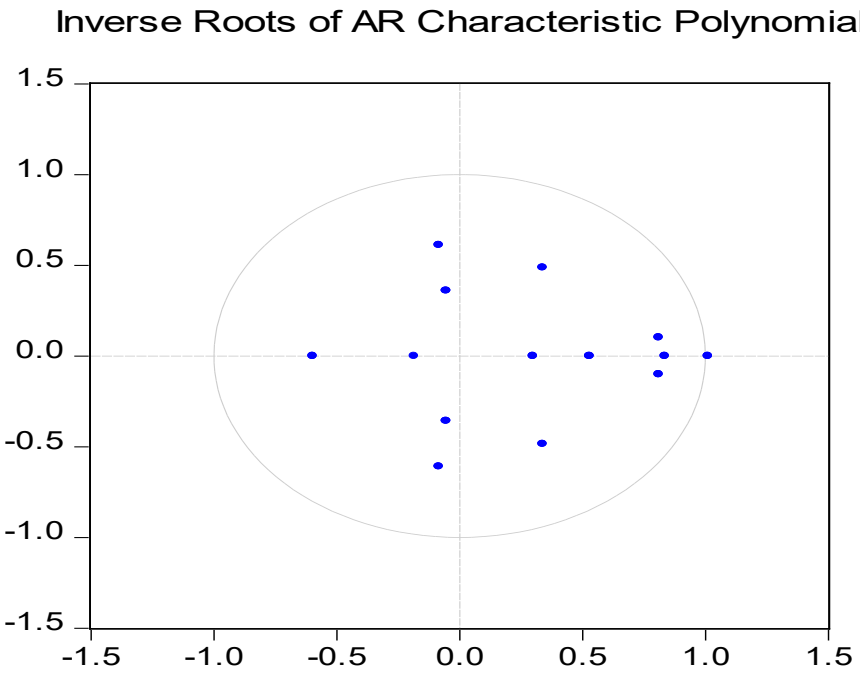
Table 5: Residual Analysis and Stability.

Residual Test	Chi-square	p-value
Auto Correlation LM	58.115	0.174
Heteroskedasticity Test: White	740.025	0.235

Source: Author's computations

Figure 2 below graphs the inverse roots of AR polynomial. As can be seen, the estimated VAR is stable since all roots have modulus less than one and lie inside the unit circle.

Figure 2: Stability test.



In the analysis, it was found that all the modules lie inside the unity circle, which is in line with Lütkepohl (1991), who argued strongly that the VAR estimated model is said to be stationary when all variables have a modulus that is less than one or lie inside the unity circle.

Granger causality.

Table 6 below provides a summary of findings from the granger causality analysis. A uni-directional causation can be observed between credit to non-financial sector and global economic activity at the 5% significance level. Similarly, uni-directional causation can be seen between the 2008 global financial crisis dummy and credit to non-financial sector at the 1% statistical significance level. Interestingly, a bi-directional causality was established between broad money supply and credit to non-financial sector at the 1% and 5% statistical significance levels, respectively. This implies that past values in broad money supply contain information that can help predict values in credit to non-financial sector and vice versa.

Table 6: Granger causality output.

Null Hypothesis:	Obs.	F-Statistic	Prob.
CPI does not Granger Cause CNFS	70	1.29	0.25
CNFS does not Granger Cause CPI		1.16	0.28
GEAI does not Granger Cause CNFS	70	2.36	0.12
CNFS does not Granger Cause GEAI		4.41	0.03**
INT does not Granger Cause CNFS	70	2.56	0.11
CNFS does not Granger Cause INT		0.43	0.51
M2 does not Granger Cause CNFS	70	4.01	0.04**
CNFS does not Granger Cause M2		10.04	0.00*
DUM1 does not Granger Cause CNFS	70	8.84	0.00*
CNFS does not Granger Cause DUM1		1.47	0.22
DUM2 does not Granger Cause CNFS	70	0.75	0.38

CNFS does not Granger Cause DUM2	2.71	0.10

Source: Author's computations

Conclusion, implication, suggestion, and limitations.

The study examined the monetary policy shocks on financial market stability. This was achieved by means of econometric analysis. The study made use of quarterly time series macroeconomic data spanning from 2003Q2 to 2020Q4. While the variables were found to be stationary at different levels, the Johansen cointegration test revealed a long run relationship between the dependent variable and explanatory variables. In addition, the impulse response function indicated that financial market stability responds negatively to shocks as a result of interest rates, money supply and systematic risks. Further to this, the finding revealed that discrepancies in financial market stability are largely explained by its own innovations in the short run and partially by innovations in money supply and the 2008 global financial crisis at least in the long run. Lastly, a bi-directional causation was observed between broad money supply and credit to non-financial sector.

In conclusion, the impact of monetary policy shocks on financial stability in South Africa is a critical issue that requires analysis and understanding to ensure sustainable economic growth. This study has highlighted the importance of several variables, including credit to non-financial sectors, inflation, money supply, global economic activity index, and interest rates in explaining the impact of monetary policy shocks on financial stability in South Africa. The study's findings suggest that monetary policy shocks such as interest rate adjustments can significantly affect credit availability, inflation, and economic activity, which can impact financial stability. Thus, policymakers need to adopt approaches that ensure monetary policy shocks promote financial stability in South Africa.

Based on the study's findings, several recommendations could be adopted by policymakers to promote financial stability in South Africa. These recommendations include maintaining a stable inflation rate to promote price stability and reduce market volatility, monitoring the money supply to ensure it supports economic activity and financial stability, and adopting policies that promote stable economic growth internally and externally. The Limitations of the study include the use of secondary data for analysis. As such, the data may not be entirely representative of the current economic and financial conditions in South Africa. Further, the study only examined the impact of monetary policy shocks on financial stability, overlooking other variables that may have a significant impact on financial stability.

In conclusion, this study has contributed to the literature on the impact of monetary policy shocks on financial stability in South Africa. The findings can inform policymakers and financial analysts in making more informed decisions to promote financial stability and sustainable economic growth in South Africa. However, further research is recommended to explore the impact of other variables on financial stability in South Africa. The results suggest that it is important for the South African authorities to pay close attention to the economic conditions when implementing monetary policy in order to avoid exacerbating economic instability. Furthermore, capturing both the bank and non-bank sectors would enhance policy reform, especially with regard to financial risk that may emerge in the post2007/2008 financial crisis period. The introduction of other macro-prudential policy instruments for example the debt-to-income ratio would explore the extent to which they could complement countercyclical capital requirement regulations. Finally, the interaction

of monetary and macro-prudential policies could be extended to include fiscal and structural policies.

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