Targeting financial stress as opposed to the exchange rate

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Abstract

This paper analyses the role of monetary policy in targeting financial stress as opposed to the exchange rate in South Africa. This is achieved by augmenting the central bank's monetary policy reaction function with the composite indicator of financial stress and the nominal bilateral exchange rate between the US dollar and the South African rand. The results show that the monetary authorities adopt an accommodative monetary policy stance in the face of financially stressful economic conditions while the opposite is true for the depreciation of the nominal bilateral foreign exchange rate. The results further show a statistically significant reaction of the indicator of financial stress to the changes the monetary policy interest rate while the reaction of the nominal exchange rate is statistically insignificant and negligible. The paper concludes that, although evidence shows that monetary policy in South Africa has reacted to both the indicator of financial stress and the nominal exchange rate, the impact of such a reaction seems to be significant on the indicator financial stress as opposed to the exchange rate.

JEL Classification: C11, E43, E58, F31
Keywords: Monetary policy, Financial stress, Foreign exchange rate

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Introduction

The adequacy of the Taylor (1993) rule type monetary policy reaction function as a tool to conduct monetary policy with the aim to ensure macroeconomic stabilisation is a hotly contested debate in academic and policy cycles. Woodford (1999) contends that inflation and output stabilisation are the sensible goals of monetary policy. Svensson (2000), Svensson (2003) and Bernanke and Boivin (2003) argue that the research departments at central banks monitor and analyse innumerable data series from different sources implying an endogenous reaction function of all the relevant information. Bernanke and Boivin (2003) further argue that modeling the monetary policy reaction functions and evaluating central bank policies while ignoring the other variables, over and above inflation and output, may be both less accurate and informative. The reason is because it implies a disconnect between central bank practice and the analysis of monetary policy reaction functions that are confined to inflation and output stabilisation. Thus such monetary policy reaction functions ignore an important dimension of central bank behaviour and the policy environment in which central banks operate.

Svensson (2000) contends that, in reality, central banks are not confined to modeling and analysing the monetary policy reaction functions that exploit information that is limited to inflation and output stabilisation. For instance, over and above the responsibility of maintenance of inflation and output stabilisation, central banks are also charged with the function to ensuring macroeconomic stabilisation which encompasses the exchange rate as well as financial stability. According to Guillermo and Reinhart (2002) and Taylor (2001), central banks monitor exchange rate fluctuations and incorporate them into their respective monetary policy strategies given that significant exchange rate movements that deviate from the economic fundamentals can adversely affect macroeconomic performance. Guillermo and Reinhart (2002) further argue that central banks usually stabilise exchange rate movements because exchange rate volatility may affect financial stability particularly if such volatility results from capital inflows as well as sharp terms of trade fluctuations. Thus, central banks use all relevant information to bring the target variables in line with the envisaged macroeconomic policy outcomes.

Incorporating exchange stabilisation in the central banks' monetary policy reaction functions is an established practice in academic research. For instance, Taylor (1999, 2001) argue that research that integrates the exchange rate in the Taylor (1993) type monetary policy reaction functions demonstrate either small performance improvements in stabilising inflation and real output or that such reaction can in some instances make the performance of the monetary policy rules worse than the policy rules that do not react directly to the exchange rate. This view is supported by Svensson (2000) and Obstfeld and Rogoff (1995), among others. In particular, Svensson (2000) argue that monetary policy reactions that incorporate the exchange rate can actually lead to a deterioration of output performance. Obstfeld and Rogoff (1995) further contend that reacting directly to the exchange rate may not improve performance of monetary policy rules because some deviations of the exchange rate from purchasing power parity cannot be offset by changes in interest rates. They further suggest that the magnitude of the required changes in monetary policy interest rates may adversely affect real output and inflation worse than the movements in exchange rate themselves due to inertia and irrational expectations.

The consensus view before the recent global financial crisis was that central banks should ignore fluctuations in asset prices and focus on inflation and output stabilisation. The crisis has demonstrated that financial assets play an important role in macroeconomic fluctuations and has strengthened the view that central banks should pay closer attention and respond systematically to asset price misalignments. Notable policy makers such as the former European Central Bank governor Trichet (2005) argue that the lack of policy reaction to asset price misalignments delivers sub optimal macroeconomic outcomes particularly during periods of deteriorating conditions in financial markets. This view is supported by Borio and White (2004), Stiglitz (2010), Mishkin (2011), Curdia and Woodford (2010), Curdia and Woodford (2011), Woodford (2012) and Borio (2014). An alternative view is that central banks should take asset prices into account only if they adversely effect on the outlook for inflation and output stability. This view is supported by the former and current Federal Reserve chairs Greenspan (2002), Bernanke (2009) and Yellen (2009) and has also received empirical support by Bernanke and Gertler (2001), Bernanke and Gertler (2003), Svensson (2013) as well as Svensson (2017).

Of particular interest are the monetary policy rules that incorporate a composite indicator of systemic financial stress over and above the conventional measures of inflation and output. Curdia and Woodford (2010) modify a standard Taylor (1993) rule to incorporate adjustments for measures of financial conditions and find that such a modification can improve upon the standard monetary policy rule. Kremer (2016) finds that the policy rate reacts indirectly through the impact of financial stress on macroeconomic conditions in the Euro area. Kafer (2014) concludes that an interest rate reaction to financial instability by the European Central Bank would be inappropriate in times of crisis as opposed to periods of no crisis. Raputsoane (2014) finds that the financial stress indicator variables from the bond, equity, commodity and exchange rate markets are robustly correlated with movements in the monetary policy interest rate, while the opposite is true for those from commodity and exchange rate markets. Raputsoane (2015) concludes that monetary policy in South Africa supports leaning against the wind hyothesis as opposed to benign neglect hypothesis. Contributions that include Naraidoo and Raputsoane (2010) and Naraidoo and Paya (2012) also find a statistically significant relationship between the monetary policy interest rate and the financial conditions index in South Africa.

This paper analyses the role of monetary policy in targeting financial stress as opposed to the exchange rate in South Africa. The paper augments the Taylor (1993) type monetary policy reaction function with the indicator of financial stress index and the exchange rate. The indicator of financial stress collects and synthesises information from the main segments of the South African financial market. This indicator is constructed and described in detail in the next section. A vector autoregressive model, estimated using Bayesian methods, is specified to estimate the augmented Taylor (1993) type monetary policy reaction function. The augmented monetary policy reaction function is motivated by Taylor (1999, 2001) and Guillermo and Reinhart (2002) who argue that the central banks, even those in freely floating regimes, are concerned about exchange rate movements because of their influence macroeconomic stabilisation. Borio and White (2004) and Gali and Gambetti (2015) contend further that financial imbalances cannot build up without some form of excessive monetary accommodation. Thus understanding the role of targeting financial stress as opposed to the foreign exchange rate will help policy makers to design informed economic policies to maintain macroeconomic stability.

The paper is organised as follows. The next section discusses data. This is followed by the specification of the econometric model. Then its the discussion of the results and last is the conclusion

Data

Monthly data spanning the period January 2000 to December 2016 is used in the paper. The data is sourced from the South African Reserve Bank. The interest rate, denoted REPO, is the repurchase rate which is the monetary policy interest rate in South Africa. Inflation, denoted CPI, is the annual percentage change in consumer price index. Industrial production, denoted IPN, is a proxy of the Gross Domestic Product (GDP) gap. It is constructed as the deviation of industrial production index from its Hodrick and Prescott (1997) trend. 12 months are forecasted at the end of the industrial production index data series to correct the end point problem following Ravn and Uhlig (2002) and Mise et al. (2005). Nominal foreign exchange rate, denoted RAND, is the bilateral exchange rate between the US dollar and the South African Rand. Financial stress index, denoted FSI, is the composite indicator that comprise variables that cover the main segments of the South African financial market.

The indicator of financial system stress is not directly observable but is assumed to be reflected in financial market variables. Therefore, the paper will attempt to identify the episodes of financial stress using an indicator constructed as a composite index of the financial market variables that cover the main segments of the South African financial market, including the bond and equity securities markets as well as the commodity and foreign exchange markets. The financial stress indicator variables comprise a set of 15 variables. These financial market variables are described in Table 1. The selection of the variables that are used to construct the financial stress index relied heavily on the existing literature as well as on their relevance and the availability of data. The financial stress index variables were standardised and then aggregated using the principal components analysis weighting scheme.

Variable	Description
Interbank spread	Spread between the 3 month JIBAR rates and the 3 month Treasury bill rate
Future spread	Spread between the 3 month FRAs and the 3 month treasury bill rate
Government bond spread	Spread between the yield on 3 year government bond and the yield on 10 year government bond
A rated bond spread	Spread between the yield on A rated Eskom bond and the yield on 10 year government bond
Corporate bond spread	Spread between the FTSE/JSE All Bond yield and the yield on 10 year government bond
Stock market return	Annual change in the FTSE/JSE All Share stock market index
Financial sector return	Annual change in the FTSE/JSE Financials stock market index
Banking sector return	Annual change in the FTSE/JSE Banks stock market index
Financial sector beta	CAPM beta of the one year rolling window of the annual FTSE/JSE Financials stock market index returns
Banking sector beta	CAPM beta of the one year rolling window of the annual FTSE/JSE Banks stock market index returns
Nominal eff. exchange rate return	Annual change in nominal effective exchange rate
Credit extension growth	Annual change in total private credit extension
Property market return	Annual change in the average price of all houses compiled by the ABSA bank
Commodity market return	Annual change in the Economist's commodity price index
Oil market return	Annual change in the Brent crude oil price
VIX S&P500	Chicago Board's implied volatility of the S&P 500 index

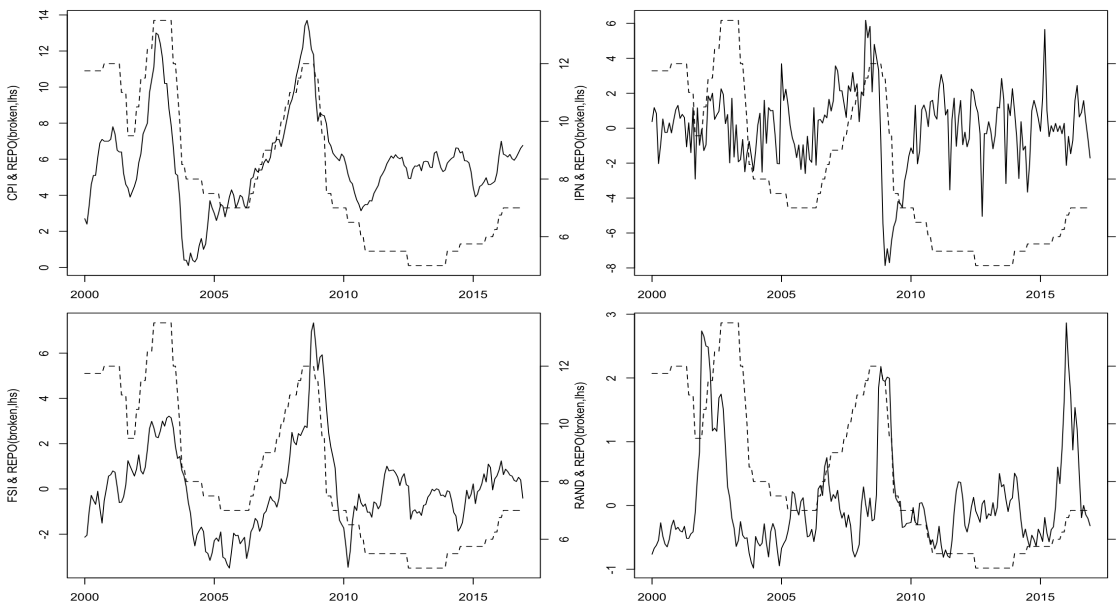
Notes: Own calculations. JIBAR rate is the Johannesburg Interbank Agreed Rate, FRAs are Forward Rate Agreements, Eskom is , FTSE/JSE is a joint venture between Johannesburg Stock Exchange Limited and the Financial Times Stock Exchange Group, CAPM is the Capital Asset Pricing Model, ABSA is a commercial bank and S&P is Standard & Poor's.

Table 1: Financial stress indicator variables

The standardisation of the financial market variables involved demeaning them by subtracting their respective means and then dividing them by their respective standard deviations. As such, a value of 1 in each one of these variables represents a 1 standard deviation difference from their mean value over the sample period. The first component from the Principal Components Analysis, which is a method of extracting the factors that are responsible for ensuring the comovement of a group of variables, was extracted and its implied weights were used to aggregate the indicator of financial stress variables. Thus the indicator of financial stress captures the interruption of the normal functioning of the financial markets. This interruption is characterised by increased uncertainty about the fundamental value of financial assets, increased information asymmetry and heightened aversion from holding illiquid and risky assets that result in liquidity shortages as well as significant shifts in asset prices.

The similar indicators of financial stress have been constructed by Illing and Liu (2006), Balakrishnan et al. (2011), Cardarelli et al. (2011), Hakkio and Keeton (2009), Borio (2014), Cevik et al. (2013) as well as Raputsoane (2014, 2015), among others while Kliesen et al. (2012) further provides a survey of the similar the indicators of financial stress. The financial stress indexes are also constructed and issued by different institutions including the Federal Reserve Systems of Kansas City, Saint Louis, Chicago and Cleveland as well as Bank of Canada and the European central bank, the Organisation for Economic Co-operation and Development and the International Monetary fund. Kliesen et al. (2012) find that, although the indicators of financial stress are different in their construction, the correlation between them is high given that each of the indexes measure the same thing in principle.

Figure 1 depicts the evolution of the variables. The monetary policy interest rate exhibits two distinct peaks in 2003 and 2008. It dropped somewhat at the beginning of 2001 but started to rise again later in the same year reaching a peak in late 2002. It then dropped dramatically from early 2003 reaching a low in early 2005. From early 2006, the repurchase rate increased steadily and peaked in the middle of 2008 before it significantly dropped again to late 2010 where it remained range bound until 2015. It then increased steadily to the end of 2016. The movements in interest rate are closely mirrored by the movements in inflation rate, industrial production, financial stress index and the dollar denominated bilateral domestic exchange rate. All these variables also exhibit two distinct peaks 2003 and 2008. The peak in 2003 coincides with the 9/11 attacks in the US and the resulting war on terror while the peak on 2008 coincides with global financial crisis. The only notable exception is that the South African currency depreciated sharply in 2016 due to domestic political developments.



Notes: REPO is the monetary policy interest rate (broken line), CPI is the annual change in consumer price index, IPN is the deviation of industrial production from its long term trend, FSI is the financial stress index, and RAND is the nominal exchange rate between the US dollar and the South African rand

Figure 1: Plots of the variables

The movements of the composite indicator of financial stress are comparable to those of the similar indexes constructed in the literature. The only notable exception is that the indicators of financial stress for developed countries show a relatively heightened financial stress that peak in late 2011 as a result of the sovereign debt crisis. This observation is supported by Kliesen et al. (2012) who survey the literature on financial stress indexes by comparing their datasets and provide evidence that the financial stress indexes are highly correlated even though they are different in their construction.

Methodology

A Vector Autoregression (VAR) model is specified to capture the dynamic relationships between the monetary policy interest rate and the response variables following Stock and Watson (2001) and Kadiyala and Karlsson (1997). Vector Autoregression (VAR) models were introduced in applied macroeconomic research by Sims (1980) while the early contributions to their Bayesian equivalents include Litterman (1984). According to Stock and Watson (2001) and Rudebusch (1998), the Vector Autoregression (VAR) is a system of linear equations, one for each variable. In the reduced form, each equation specifies one of the variables as a linear function of its own lagged values as well as lagged values of the other variables being considered in the system and a serially uncorrelated error term.

The Vector Autoregression (VAR) models have become standard tools in macroeconomics structural analysis and forecasting as argue Banbura et al. (2010), Koop and Korobilis (2010) and Koop (2013). According to Del Negro and Schorfheide (2011), these models can capture the important stylised facts about the economic time series despite their simple formulation. These include the decaying pattern in the values of the autocorrelations as the lag order increases as well as the dynamic linear interdependencies between the variables. The following Vector Autoregression (VAR) model is specified

$$Y_t = C + \theta_1 Y_{t-1} + ... + \theta_p Y_{t-p} + \epsilon_t \tag{1}$$

where $Y_t = (Y_{1,t}, ..., Y_{n,t})$ is the $n * 1$ vector of random variables observed at time t. $C = (C_1, ..., C_n)$ is the $n * 1$ vector of constants or intercept terms, $\theta_1, ..., \theta_p$ are $n * n$ matrices of coefficients, p is the number of lags of each variable to include and $\epsilon_t = (\epsilon_{1,t}, ..., \epsilon_{n,t})$ is the $n * 1$ dimensional white noise error terms denoted

$$\epsilon_t \sim N(0, \Sigma) \tag{2}$$

where Σ is the $n*n$ variance covariance matrix. Rudebusch (1998) and Stock and Watson (2001) argue that the error terms are the unanticipated policy shocks or the surprise movements in the variables after taking the Vector Autoregression's (VAR's) past values into account.

The Vector Autoregression (VAR) model is estimated using Bayesian methods. A normal inverse Wishart prior is specified and a Gibbs style sampler is used in estimation following Kadiyala and Karlsson (1997). At the heart of Bayesian analysis is the Bayes theorem specified as

$$p(\theta_i, \Sigma \mid Y_t, M_i) = \frac{p(Y_t \mid \theta_i, \Sigma, M_i)\, p(\theta_i, \Sigma \mid M_i)}{p(Y_t \mid \Sigma, M_i)} \tag{3}$$

where M_i is an arbitrary model among a general class of models, θ_i is the parameter vector described above, $p(\theta_i \mid Y_t, M_i)$ is the posterior model probability, $p(Y_t \mid \theta_i, M_i)$ is the marginal likelihood of the model, $p(\theta_i \mid M_i)$ is the prior model probability and $p(Y_t \mid M_i)$ is the constant integrated likelihood over all models. The details on a Bayesian Vector Autoregression (BVAR) model estimation with normal inverse Wishart prior used in this paper, including a brief introduction to Bayesian econometrics and Bayesian Vector Autoregression models, can be found in OHara (2015). A more general treatment of Vector Autoregression models including Bayesian estimation with the different types of priors can be found in Koop and Korobilis (2010), Canova (2011) as well as Giannone et al. (2015).

Rudebusch (1998) argues that the appeal of using Vector Autoregression (VAR) models for analysing monetary policy reaction functions is that they have the ability to identify the effects of monetary policy without a need to specify the complete structural model of the economy. Banbura et al. (2010) contend that the Vector Autoregression (VAR) models have become popular among the empirical macroeconomists because they facilitate the insight into the dynamic relationships between macroeconomic variables in a relatively unconstrained manner. Koop and Korobilis (2010) and Koop (2013) further argue that the Bayesian methods have become an increasingly popular way of dealing with the problem of over parameterisation given the limited length of standard macroeconomic datasets. The Vector Autoregression (VAR) models can successfully be used in macroeconomic forecasting with a large number of variables when coupled with Bayesian estimation, as argue Sims and Uhlig (1991), due to the flexibility that is provided by the application of the Bayesian parameter shrinkage. Sims and Uhlig (1991) further argue that Bayesian versions of these models can incorporate unit root nonstationary variables with no adverse influence to the inference on the parameters of the model.

Results

A Bayesian Vector Autoregression (BVAR) model is estimated to capture the dynamic relationships between the monetary policy interest rate and the target variables that comprise the annual inflation rate, Gross Domestic Product gap, financial stress index and the bilateral exchange rate between the South African rand and the US dollar. The estimated Bayesian Vector Autoregression (BVAR) specifies a normal inverse Wishart prior and uses a Gibbs style sampler following Stock and Watson (2001) and Kadiyala and Karlsson (1997). The 0.00 prior was set on all coefficients except the own first lags which were set to 0.95 to account for persistence in the variables. The number of lags to include of each variable was set to 2 following the Bayesian information criterion. The integer value for the horizon of the impulse response calculations was set to 60 corresponding to 5 years given that monthly data is used in estimation. 10000 is the number of Gibbs sampling replications to keep from the sampling run, while 1000 is the sample burnin length for the Gibbs sampler.

The list of variables in the monetary policy reaction function comprise the monetary policy interest rate, denoted REPO, the annual inflation rate, denoted CPI, the deviation of industrial production from its long term trend, denoted IPN, financial stress index, denoted FSI and the nominal foreign exchange rate, denoted RAND. Therefore Y_t in equation 1 can be rewritten as

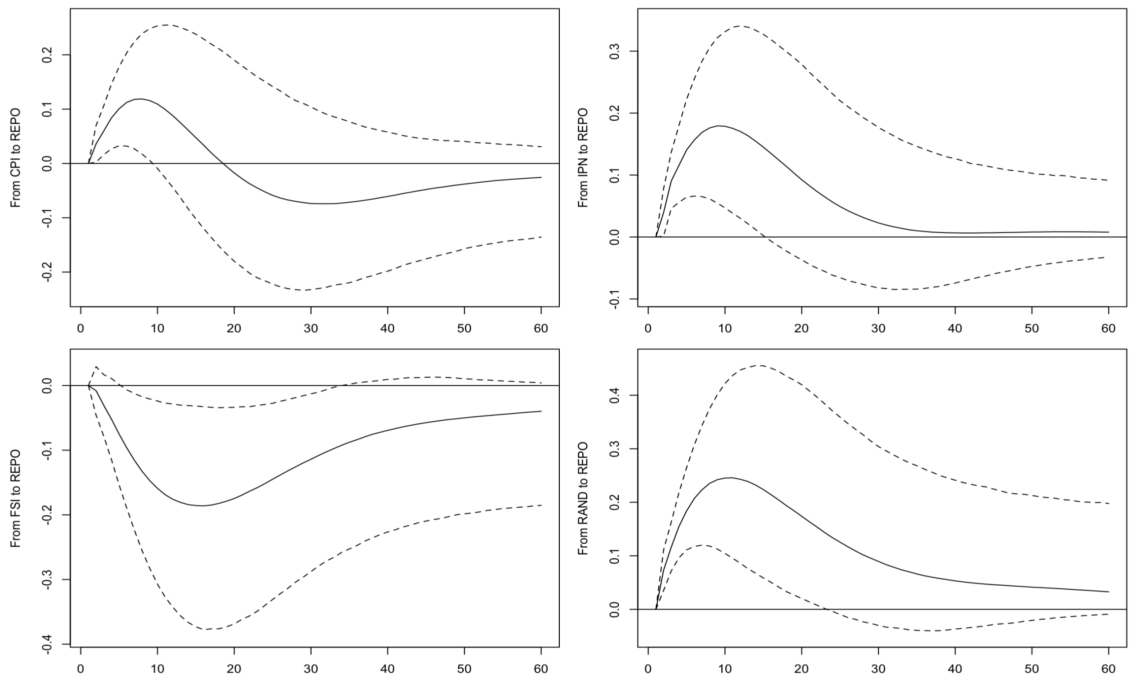
$$Y_t = (REPO_t, CPI_t, IPN_t, FSI_t, RAND_t) \tag{4}$$

which is the vector of random variables observed at time t. Stock and Watson (2001) argue that a reduced form the Vector Autoregression (VAR), on the one hand, expresses each variable as a linear function of its own past values, the past values of all other variables being considered and a serially uncorrelated error term. On the other hand, a recursive the Vector Autoregression (VAR) constructs the error terms in each regression equation to be uncorrelated with the error in the preceding equations by including contemporaneous values as regressors. As a result, the results of a a recursive the Vector Autoregression (VAR) depend on the order of the variables where changing the order changes the the Vector Autoregression (VAR) equations, coefficients and residuals while reduced form does not.

According to Stock and Watson (2001), the standard practice in the Vector Autoregression (VAR) model analysis is to report the results from impulse response functions and forecast error variance decompositions. The reason is because these statistics are more informative than the estimated Vector Autoregression (VAR) regression coefficients. Rudebusch (1998) further argues that most Vector Autoregression (VAR) model equations do not have a clear structural interpretation. In this particular paper, the impulse response functions are the only model statistics that are reported given that the interest is to analyse the advantage of targeting of financial stress as opposed to the exchange rate. Thus the paper compares the impulse response functions of the financial stress index and the bilateral rand to US dollar exchange rate due to a shock in the monetary policy interest rate as well as impulse response functions of the monetary policy interest rate to the changes in the target variables.

All the variables were transformed to stationarity in that they are either percentage changes or deviations from their long term trends. As such, the variables are mean reverting and as such the BVAR is assumed to be covariance stationary. As discussed above, Rudebusch (1998) as well as Stock and Watson (2001) point out that the residuals of the the Vector Autoregression (VAR) model are unanticipated shocks or surprise movements in the variables. According to Stock and Watson (2001), the impulse responses trace out the response of current and future values of each of the variables to a one unit increase in the current value of one of the the Vector Autoregression (VAR) errors. This error is assumed to return to zero in subsequent periods and that all other errors are equal to zero. Consequently, the impulse response functions show the effect of a 1 percentage point change in the variable of interest on the rest of the the Vector Autoregression (VAR) model variables.

Figure 2 depicts the impulse response functions of the reaction of the monetary policy interest rate to the 1 percentage point increase in inflation rate, industrial production gap, which a proxy for output gap, the financial stress index and the nominal rand dollar exchange rate together with their 95 percent confidence bands. An unexpected 1 percentage point increase in inflation rate causes the monetary authority to hike the monetary policy interest rate by about 0.13 percentage points up to 8 months where the effect of such an increase begins to fade away reaching equilibrium by about 18 months. The monetary policy interest rate then remains below its equilibrium level up to 60 months. An unexpected 1 percentage point increase in industrial production gap causes the monetary authority to hike the policy interest rate by a maximum of about 0.18 percentage points up to 8 months where the effect of such a hike slowly fades away reaching the equilibrium level at about 36 months.



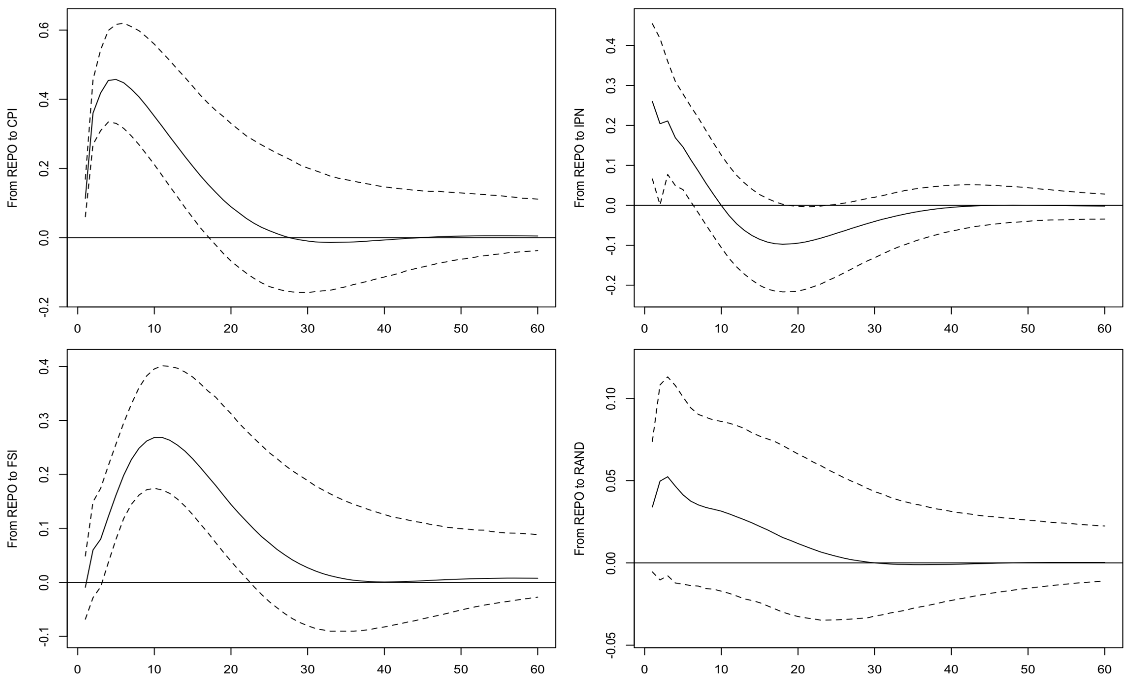
Notes: REPO is the monetary policy interest rate, CPI is the annual change in consumer price index, IPN is the deviation of industrial production from its long term trend, FSI is the financial stress index and RAND is the nominal exchange rate between the US dollar and the South African rand.

Figure 2: Impulse response functions of monetary policy interest rate

An unexpected 1 percentage point increase in the indicator of financial stress causes the monetary authority to relax the monetary policy interest rate by about a maximum of 0.18 percentage points up to 14 months where policy rate slowly begins to fade away reaching the equilibrium in about 60 months. Lastly, an unexpected 1 percentage point increase, or depreciation, in the nominal exchange rate between the US dollar and the South African rand causes the monetary authority to increase the monetary policy interest rate by a maximum of about 0.24 percentage points up to 10 months where such an effect slowly fades away to its equilibrium level. Overall, an unexpected 1 percentage point increase in the target variables causes the monetary authority to hike the monetary policy interest rate in reaction to inflation, the output gap and the nominal exchange rate while the monetary authority ease the monetary policy interest rate in reaction to the increase in indicator of financial stress.

Figure 3 depicts the impulse response functions of the annual inflation rate, industrial production gap, the indicator of financial stress and the nominal exchange rate to the 1 percentage point increase in the monetary policy interest rate together with their 95 percent confidence bands. An unexpected 1 percentage point increase in the monetary policy interest rate by the monetary authority causes the annual inflation rate to increase by about a maximum of 0.43 percentage points in about 4 months where annual inflation rate slowly begins to fade away reaching the equilibrium by about 26 months. An unexpected 1 percentage point increase in the monetary policy interest rate causes industrial production gap to initially increase by about a maximum of 0.25 percentage points where it slowly begins to fade away reaching the equilibrium by about 10 months. Industrial production gap subsequently decreases by about 0.1 percentage points and goes back reaching the equilibrium by about 40 months.

An unexpected 1 percentage point increase in the monetary policy interest rate by the monetary authority causes the indicator of financial stress to increase by about a maximum of 0.27 percentage points in about 9 months where the effect slowly begins to fade away reaching the equilibrium by about 36 months. Lastly, an unexpected 1 percentage point increase in the monetary policy interest rate causes the nominal exchange rate between the US dollar and the South African rand to increase, or depreciate, by about a maximum of 0.06 percentage points up by about 3 months where the effect of such an increase in the policy rate slowly begins to fade away reaching the equilibrium by about 26 months. However, the reaction of the currency is statistically insignificant. Overall, an unexpected 1 percentage point increase in the monetary policy interest rate by the monetary authority causes all



Notes: REPO is the monetary policy interest rate, CPI is the annual change in consumer price index, IPN is the deviation of industrial production from its long term trend, FSI is the financial stress index and RAND is the nominal exchange rate between the US dollar and the South African rand.

Figure 3: Impulse response functions of target variables

the target variables to increase at least initially before they go back to equilibrium. However industrial production gap, a proxy for the output gap, subsequently falls due the tight monetary policy conditions in about 10 months while the reaction of the South African rand is statistically insignificant.

The results are generally in line with the findings in Stock and Watson (2001). In particular, the finding of the initial increase in inflation as a result of the tightening monetary policy interest rate, or the so called price puzzle, is a well documented phenomenon and has been found in a number of studies including Bernanke and Gertler (1995), Christiano et al. (1999) as well as Stock and Watson (2001). A similar finding is also present in the output gap in a number of studies that use Vector Autoregression (VAR) models. According to Sims (1992) and Christiano et al. (1999), this puzzling result reflects the omitted variables bias where the monetary policy interest rate is set in a forward looking manner whereas the Vector Autoregression (VAR) could have omitted variables that could be used to predict future target variables. Thus the monetary authority is acting on information not captured in the Vector Autoregression (VAR) model that may provide signals of the future path of the target variables hence the model may be capturing this behaviour and confusing causation and correlation. Furthermore, Stock and Watson (2001) argues that the timing conventions in Vector Autoregression (VAR) models do not reflect the real time data hence the variables such as output and inflation are sticky and do not respond to monetary policy shocks within the expected period.

With regard to the main theme of targeting financial stress as opposed to the exchange rate in South Africa, of particular interest are the findings that the monetary authority adopts an accommodative monetary policy stance in the face of financially stressful economic conditions while the opposite is true for the the US dollar and the South African rand nominal exchange rate. Of further interest is the statistical insignificance of the reaction of the nominal exchange rate between the US dollar and the South African rand to the change in the monetary policy interest rate. These findings are important because although there is evidence that the monetary authority in South Africa reacts to both the financial stress and the nominal exchange rate, the impact of such reaction seems to be statistically significant on financial stress while the opposite is true for the exchange rate. The reaction of the bilateral nominal exchange rate between the US dollar and the South African rand to the change in monetary policy interest rate is not only statistically insignificant but is also negligible in comparison to all the impulse response functions of the rest of the specified monetary policy target variables.

Conclusion

This paper analysed the role of monetary policy in targeting financial stress as opposed to the exchange rate in South Africa. This was achieved by augmenting the central bank's monetary policy reaction function with the indicator of financial stress as well as the bilateral nominal exchange rate between the US dollar and the South African rand. Financial stress was captured using a composite indicator that collects and synthesises information from the main segments of the South African financial market that include the bond and equity securities markets as well as the commodities market and the foreign exchange market. The results show that the monetary authorities adopt an a statistically significant accommodative monetary policy in the face of financially stressful economic conditions while the opposite is true for the depreciation of the nominal bilateral exchange rate. The results further show a statistically significant reaction of the indicator of financial stress to the changes the monetary policy interest rate while the reaction of the nominal exchange rate is statistically insignificant and negligible. The paper therefore concludes that, although evidence exists that the monetary policy interest rate in South Africa has reacted to both the financial stress and the exchange rate, the impact of such a reaction seems to be more significant on financial stress as opposed to the nominal exchange rate.

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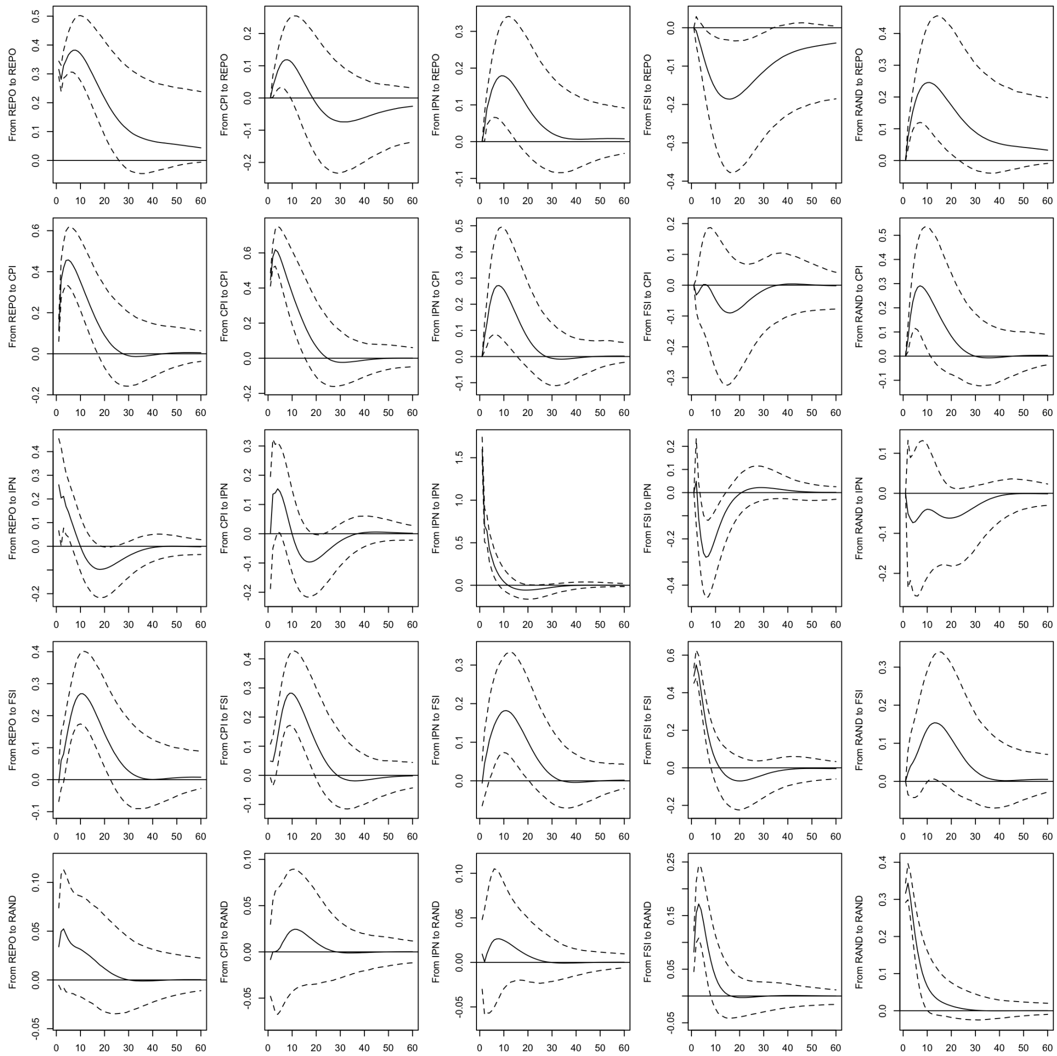
Appendix

The impulse response functions of all the variables

(The impulse response functions of all the variables are shown in Figure 4. This Figure is not intended to be part of the paper but is included to demonstrate the completeness of the analysis.)



Notes: REPO is the monetary policy interest rate, CPI is the annual change in consumer price index, IPN is the deviation of industrial production from its long term trend, FSI is the financial stress index, and RAND is the bilateral nominal exchange rate between the US dollar and the South African rand

Figure 4: The impulse response functions of all the variables