DOI: https://doi.org/10.37075/EA.2023.2.04 Economic Alternatives, 2023, Issue 2, pp. 291-311

Robust Optimal Monetary Policy in a Forward Looking Structural Vector Autoregression Model for the Kingdom of Eswatini

Received: 20.03.2022
Available online: 30.06.2023

Samuel Nkosinathi Dlamini[*],
Dr Pfano Mashau[**]

Abstract

The purpose of the study was to establish the optimal monetary policy to influence inflation, credit extension to the private sector, and real GDP in the right direction in the Kingdom of Eswatini. Based on the three estimated models of the Structural Vector Autoregressive (SVAR) using monthly data for the period 2000 to 2019, the results indicate that the discount rate is optimal/ superior over the reserve requirement and liquidity requirement. Monetary policy shocks to the reserve requirement and liquidity requirement are not effective to stimulate economic growth and bank credit to the private sector, which indicates that the three instruments do not complement each other. The results of the variance decomposition show that the discount rate's contribution is 0.62% on real GDP, 3.25% on inflation, and 3.31% on bank credit in month twenty-four, which is significant. The study also recommends that the Central Bank of Eswatini should consider a policy mix of 5.60% for the discount rate, 4.30% for the reserve requirement, 13.29% for the liquidity requirement to influence inflation, bank credit to the private sector and economic growth in the right direction.

Keywords: Cointegration, SVAR, Thresholds, Kingdom of Eswatini

JEL:

1. Introduction

The Central Banks ensures stability and promotes growth through several instruments (Holston, Laubach and Williams, 2017). While all the targets are important, the central banks usually placed prominence on ensuring low stable inflation rates. Unless policymakers know more about how monetary policy decisions influence macroeconomic variables, they will always face greater uncertainty about the timing and effectiveness of policy actions and consequently in maintaining macro-financial

[*] Graduate School of Business and Leadership, University of KwaZulu-Natal, Westville Campus, Durban, South Africa.

[**] Graduate School of Business and Leadership, University of KwaZulu-Natal, Westville Campus, Durban, South Africa.

stability. Accordingly, gathering evidence on the efficacy of monetary policy instruments remains a priority for both developed and developing countries, including the Kingdom of Eswatini.

According to the Central Bank of Eswatini Order of 1974, the objective of monetary policy is to promote price and financial stability that ensures a stable and sound financial system, to foster financial conditions conducive for economic development. The Kingdom of Eswatini is a member of the Common Monetary Area (CMA), therefore its monetary policy formulation is to a large extent influenced by its membership to the CMA. Pegging the Lilangeni to the South African Rand is an intermediate target for monetary policy. The fixed exchange rate and free capital flow between South Africa and the Kingdom of Eswatini indicate that there is limited monetary policy independence. The Central Bank of Eswatini uses the discount rate, reserve requirement, and liquidity requirement as monetary policy instruments to influence the economy (Central Bank of Eswatini, 2019).

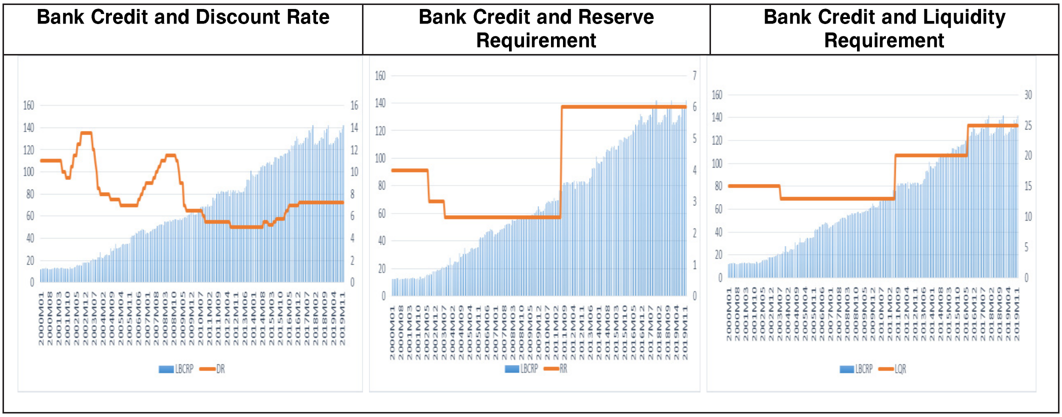

Figure 1. Central Bank of Eswatini Monetary Policy Mix 2000-2019

Since the year 2000, the Central Bank of Eswatini adopted several strategies in a stride to achieve stable inflation and to stimulate bank credit to the private sector and economic growth. Despite changes in monetary policy instruments, the problem surrounding non-stable inflation, low credit to the private sector, and subdued economic growth persisted. In 2012 in the Kingdom of Eswatini, the monetary policy mix became a cause for concern following a decline in credit to the private sector and economic growth. Inflation remains volatile but within reasonable levels. The country experienced major fiscus challenges in 2010 and 2011 which resulted in significant government financing shortfalls. A slowdown in bank credit usually reflects a cut in investment. In 2015, the country experienced a major shock on credit to the private sector (corporate lending turned negative), which reduced the average to 7.5% in 2016 (Central Bank of Eswatini, 2015). This episode was accompanied by deterioration in banks' asset quality, with NPL escalating to more than 10% of total loans in March 2017, a surge in inflation and very low economic growth (International Monetary Fund (2017)). Hence, the need to establish the existing channels and optimal monetary policy mix that can ensure reasonable inflation levels, encourage bank lending to the private sector and stimulate economic growth. Therefore, this study contributes to the existing literature by providing an empirical guide in terms of the optimal monetary policy instrument(s) that emphasize low inflation, promote bank credit to the private sector and economic growth.

This study is envisaged to have great significance to the Central Bank of Eswatini, which is statutorily saddled with the mandate of formulating and implementing a sound monetary policy in the Kingdom of Eswatini. First, the study contributes to available literature by advancing scholarly debates on monetary policy transmission channels, in particular the discount rate, reserve requirement and liquidity requirement. Secondly, the paper contributes by determining the relevant thresholds or policy mix to maintain inflation within reasonable levels and encourage bank credit to the private sector to stimulates economic growth in the Kingdom of Eswatini. The results of this study are envisaged to guide and influence policy on Central Bank regulation in general and that of the Common Monetary Area member states. The findings are also expected to unlock existing economic growth bottlenecks that are associated with the choice of policies.

2.Theory and Literature Review

2.1. Theoretical Literature

Monetary policy regulation is founded in four schools of thought, namely classical theory, Keynesian theory, monetarist theory, and Bernanke and Gertler's theory. The four schools of thought analyzed the impact of monetary policy instruments in the context of four transmission channels (interest rate, exchange rate, asset price, credit channel (bank lending and the balance sheet), and the expectation channel (Nwoko, Ihemeje and Anumadu, 2016).

The classical theory asserts that the interest rate influence the economy by increasing the cost of borrowing to reinvestment (Su, Khan, Tao and Umar, 2020). This implies that money affects the economy in different ways hence the central banks should adopt relevant monetary policy instruments to control the flow of money in the economy. The Keynesian theory postulates that the influence of monetary policy instrument is more pronounced in the exchange rate channel. The Keynesians provide that an increase in interest rate alters the interest rate parity between the two economies (Johnson, 2017).

The monetarist suggest that monetary policy instruments affect the stock market, financial wealth and consumption (Asiedu, Oppong, Gulnabat, 2020). This theory also suggests that a contractionary monetary policy reduces financial wealth of the public and automatically decreases the level of consumption (Holston, Laubach and Williams, 2017). The inference of the Keynesian theory is that low levels of interest rate, as a component of cost, is not conducive encourage savings and investment demand (Guerrieri and Lorenzoni, 2017).

Finally, Credit theory also known as Bernanke and Gertler's theory provides that there are two components of the credit channel, namely the bank lending channel and the balance sheet channel. In the case of the balance sheet channel, monetary policy changes affect the net worth of business firms and the present value of loan collateral. The theory suggests that banks are well suited to deal with borrowers, such as small and medium enterprises and households, from where the problem of asymmetric information emanates. The bank lending channel theory also postulates that a contractionary monetary policy stance shrinks commercial banks' deposits and compels them to utilize managed liabilities which increase the cost of loans. The classical and the credit theory are relevant in developing countries such as the Kingdom of Eswatini, where the financial sector is underdeveloped, and the private sector is highly dependent on the banking system for loans.

2.2. Empirical Literature Review

Previous research studies on developed, emerging and developing economies found conflicting results on the effectiveness of the different monetary policy instruments and existence of channels (Twinoburyo and Odhiambo, 2018a;). Studies that provide evidence of credit, interest rate and asset price channels are effective in transmitting monetart policy (Twinoburyo and Odhiambo, 2018a; Tule, Ogundele, and Apinran, 2018; Heryan and Tzeremes, 2017; Berg and Portillo, 2018; Berger, Guedhami, Kim and Li, 2018; Berg, Charry, Portillo, and Vicek, 2019). Contrary, a study by Borio and Gambacorta (2017), shows insignificant or no effect of monetary policy instruments.

The debate on which is the optimal monetary policy instrument between the discount rate, reserve requirement and liquidity requirement to drive bank credit, economic growth and contain inflation within reasonable bands is still on-going. Economists who advocate for the use of interest rate instrument assert that, since short-term economic shocks are a function of aggregate expenditure, the optimal policy instrument is the one that influences monetary aggregates and economic growth (Salihu, Baba and Hamman; 2018; Anwar and Nguyen, 2018; Kim and Lim, 2018; Evans, Adeniji, Nwaogwugwu, Kelikume, Dakare and Oke, 2018) using different methodologies. Following the paper by Sims of 1980, the use of VARs to assess monetary policy effect has increased.

Salihu *et al.* (2018),analyzed the components of current monetary aggregates and suggest more appropriate higher-order monetary aggregates that have a more stable relationship with macroeconomic variables for Nigeria. The study excludes foreign variables. The results of the SVAR show high persistent positive feedback of the economic activities as a result of a positive shock to M3. The results also show less response of prices to shock in M3. The study, therefore, advocates for the adoption of the new higher-order monetary aggregate (M3) for Nigeria. Adofu and Salami (2017) conclude that a shock to the discount rate results in a sudden decline in real GDP.

Anwar and Nguyen"s (2018) study for Vietnam using quarterly data for the period 1995 to 2010, provides evidence of a strong interest rate channel. They analysed the effect of interest rate, exchange rate and foreign shocks on output. The results based on structural vector autoregressive (SVAR) provide evidence that interest rate shocks have a strong influence on Vietnam's output. This is in line with the economic theory, which highlights that higher interest rates negatively affect consumer and investment expenditure, through its indirect effect on asset values and income expectations (Evans, Adeniji, Nwaogwugwu, Kelikume, Dakare and Oke, 2018). In a case of South Africa, Kim and Lim (2018) used the three stage least square technique on quarterly data from 2000 to 2018, to assess the impact of monetary policy on inflation and output in South Africa. The repo rate, interbank rate, gross fixed capital formation, private sector credit, deposit, inflation (seasonally-adjusted) and monetary aggregates (M2) were used. The study findings suggest that interest rate and lending channels are functioning in South Africa. A one percent restriction in monetary policy result to 0.29% increase in the lending rate and it is significant. For the lending channel, a percent reduction of monetary policy restricts credit by 0.22%. These studies support the notion of the classical and the credit theory.

Studies on optimal monetary policy applied different methodologies and hence they reached different conclusions. Olaniyi (2019) determined the threshold at which a shock on the interest rate affects economic and investment growth for Nigeria. A threshold estimation approach was applied using data for the period 2006 to 2017. The results suggest that there are two thresholds. The interest rate thresholds are 21.1% for GDP growth and 22.6% for investment. This implies that during the period 2006 to 2017, below the thresholds of 21.1% for GDP growth and 22.6% for investment, interest rate had a significant positive contribution. Glocker and Towbin (2018) assessed the circumstances under which reserve requirement is used as a monetary policy tool for price or financial stability. They used a small open-economy model with sticky prices, financial frictions, and a banking sector to estimate the optimal reserve requirement and interest rate. Their conclusion suggests that the reserve requirements support the price stability objective. Further, the study by Corradin, Eisenschmidt, Hoerova, Linzert, Schepens and Sigaux (2020) suggest that liquidity provision may result in lower money market tensions, asset purchases induce scarcity effects for selected money market segments which may worsen money market conditions. On the contrary, Agenor (2019) concludes that an increase in liquidity requirement promotes financial stability and provides an incentive to save.

In this respect, this study uses the SVAR to examine monetary policy instruments used by the Central Bank of Eswatini to identify first the existing channel for monetary policy transmission. Further, this study determines the optimal tool that can drive the economy of the Kingdom of Eswatini. Studies on optimal thresholds of monetary policy instruments can be traced back to the seminal work of Tong in the early 1980s. Studies on non-linear approach are well documented in literature. Recent research studies which applied the quadratic approach for monetary policy thresholds include: Tule *et.al.* (2015); Olade (2015); and Asaduzzaman (2021).

2.3. Gaps in Literature

While the studies that were reviewed provide evidence of the different channels, none attempt to establish the optimal monetary policy to influence inflation and bank credit to the private sector in the right direction to stimulate economic growth. The paper attempts to bridge the existing gap in the literature by going beyond just identifying existing channels by further determining the relevant thresholds or policy mix to maintain inflation within reasonable levels, and encourage bank credit to the private sector which will, in turn, stimulate economic growth in the Kingdom of Eswatini. No study has combined analysis on existing monetary policy transmission channels and threshold determination in one paper to guide central banks on how to influence inflation, credit extension to the private sector and economic growth in the right direction.

The conceptual framework for this research study is based on the classical theory, Keynesian theory, credit theory (Bernanke and Gertler's theory) because they are interconnected and relevant to this study. In terms of the approach, the researcher is motivated by the work of Tule *et al.* (2015), Olade (2015), Anwar and Nguyen (2018), Glocker and Towbin (2018), Salihu *et al.* (2018), Olaniyi (2019) and Asaduzzaman (2021), who applied different methods including the SVAR and Quadratic thresholds equations, to assess monetary policy transmission and optimal turning points.

3. METHODOLOGY

3.1. Data and source

This study uses monthly data over the period 2000 to 2019, mainly because it is available for this period in the Kingdom of Eswatini. Three models were estimated using Eviews software program and each consists of seven variables. The discount rate was replaced by the reserve requirement in Model 2 and the liquidity requirement was used in Model 3. The other variables include real GDP, Consumer Price Index, bank credit to the private sector, treasury bills, savings and investment. The data was obtained from the Central Bank of Eswatini statistics, quarterly reports, annual reports and Eswatini Central Statistics Office. Before estimating the structural vector autoregressive impulse response and variance decomposition, four tests were conducted, namely: unit root test, co-integration test, diagnostics test and Granger causality test.

3.2 Unit root test

The first step in using time series data is to subject all variables to a unit root test. The unit root test is conducted to avoid spurious results, not to use variables that are stationary at second difference *I*(2), to better understand the behavior and order of integration of all the variables. While there are several unit root tests in existence, the Augmented Dickey–Fuller (ADF) and Phillips-Perron (PP) tests were used in line with Foluso (2020). Both the ADF and PP tests the null hypothesis that the variables have a unit root. If the null hypothesis is rejected, it would imply that there is no unit root.

3.3. Co-integration test

The essence of cointegration is to determine if the linear relationship between the variables is cointegrated or not. Johansen co-integration approach is used to test for cointegration. The choice of using the Johansen co-integration approach of over the Engle-Granger co-integration approach was due to its superiority. Olaniyi (2019) provides that this approach applies a VAR model assuming that the errors are white noise and it is flexible to detect structural breaks for unpredicted timing emanates from monetary policy changes, institutional arrangements transformation and economic crises. If the trace statistic (λ_{trace}) and maximum eigenvalues (λ_{max}) are less than their critical values at the 5% level, it suggests the presence of cointegrating vectors, and the opposite is true (Olade (2015)). If the null hypothesis of no cointegration is rejected, it implies that the linear combination of the variables is cointegrated, hence a non-spurious long-run relationship exists between the variables. The trace and the maximum eigenvalues of the Johansen cointegration technique is presented as follows:

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{N} In(1-\hat{\lambda}_i) \quad [1]$$

and

$$\lambda_{\max}(r, r+1) = -TIn(1-\hat{\lambda}_{r+1}) \quad [2]$$

where r shows the number of cointegrating vectors under the null hypothesis, T denotes the number of observations used for estimation and $\hat{\lambda}_i$ represents the estimated value for the i^{th} ordered eigenvalue from the Π matrix. The λ_{max} is premised on the greatest eigenvalue and conducts a separate test on the eigenvalue.

3.4. Diagnostics test

Before determining the Structural Vector Autoregression (SVAR) impulse response and variance decomposition the diagnostic test is conducted. These include testing for autocorrelation, heteroscedasticity and Bera-Jarque normality test (Oladimeji, Bowale and Okodua (2022). The Granger causality test was used to ascertain the existence and direction of causality in line with Asaduzzaman (2021) and Mushtaq 2016).

3.5. Structural vector autoregressions

The SVAR is an extension of the traditional less theoretic VAR approach. The SVAR is based on economic theory especially in imposing long-run restrictions or contemporaneous on the estimated reduced-form model. Motivated by Salihu *et al.*'s (2018) study, we do not include foreign variables since the country is under the CMA. Money supply was not included because of its close correlation with bank credit. The SVAR used for this study is presented in this form:

$$\begin{bmatrix} e^{LRGDPt} \\ e^{LCPISWt} \\ e^{LBCRPt} \\ e^{TBRt} \\ e^{DRt} \\ e^{LSAVt} \\ e^{LINVt} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 1 & 0 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 & 0 \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon^{LRGDPt} \\ \varepsilon^{LCPISWt} \\ \varepsilon^{LBCRPt} \\ \varepsilon^{TBRt} \\ \varepsilon^{DRt} \\ \varepsilon^{LSAVt} \\ \varepsilon^{LINVt} \end{bmatrix}$$

The left-hand side of the equation provides a vector of residuals in the reduced form, and on the far right is the squared matrix (A0) of coefficients related to lagged variables and structural shocks through the column vector. The study estimates the following three models to examine the effect of a shock on the discount rate, reserve requirement and liquidity requirement.

Model 1 = *DR= , logRGDP, logCPISW, logBCRP, TBR, logLSAV, logINV,*

Model 2 = *RR= logBCRP, logCPISW, logRGDP, TBR, logLSAV, logINV,*

Model 2 = *LQR= logBCRP,logCPISW, logRGDP,TBR, logLSAV, logINV,*

Where: discount rate (DR), reserve requirement (CRR), liquidity requirement (LQR), real Gross Domestic Product (RGDP), Consumer Price Index (CPISW) Bank Credit to the private sector (BCRP), treasury bills (TBR), savings (SAV) and investment (INV). All variables were transformed to logarithm except for the monetary policy instruments series.

The econometric identification of monetary policy shocks is important in the SVAR model specification. The ordering of real GDP, price level and bank credit to the private sector is first given that they react to innovation in policy rate with a lag. The discount rate/ reserve requirement/liquidity requirement comes after real GDP, inflation and bank credit which reflects the idea that central banks change the policy rate after observing the inflation trends.

3.6. Impulse response and Variance Decompositions

The impulse response and variance decomposition analysis were estimated to determine the effect of contractionary shocks to the discount rate, reserve requirement and liquidity ratio on inflation, real GDP and bank credit to the private sector. The impulse response function captures effects in the system as a result of an impulse of one standard deviation shock, while the variance decomposition detects the information on the contribution of each variable to the other series in the system (Tenreyro and Thwaites, 2016; Olamide, Maredza and Ogujiuba, 2022).

3.7. Determination of monetary policy instruments thresholds

Motivated by Tule *et al*. (2015), Olade (2015) and Asaduzzaman (2021) we used a bivariate quadratic function to determine the thresholds for the discount rate, reserve requirement and liquidity requirement for inflation and bank credit to the private sector.

The quadratic model specification

$$y_t = \alpha_0 + \alpha_1 f_{t'} + \alpha_2 f_t^2 + \beta' Z_t + \varepsilon_t \qquad (3.1)$$

In this equation, f_t and f^2 denotes the linear and non-linear terms of the threshold series. Equation 3.1 represents the relationship between y_t and f_t, which is non-linear of an upturned U-shape. A positive coefficient of f_t is expected and a negative figure is expected for the squared variable. Therefore, differencing equation 3.1 when it is equated to zero produces:

$$\frac{\partial y_t}{\partial f_t} = \alpha_1 + 2\alpha_2 f_t = 0 \qquad (3.2)$$

The optimal threshold level is obtained by solving equation 3.2 above for f^* as shown below:

$$f^* = \frac{\alpha_1}{2\alpha_2} \qquad (3.3)$$

4. Empirical Results and Discussions

4.1. Descriptive statistics

Preceding model estimation and in line with the methodology for dealing with time series data, we provide the descriptive statistics, which include the mean, standard deviation, minimum and maximum values. As can be observed from Table 1, the total bank lending to the private sector for all the banks in the Kingdom of Eswatini for the sample period ranged between a minimum of 13.99 percent to a maximum of 16.47 percent and had an average of 15.40 percent. The discount rate of the Central Bank of Eswatini for the period 2000 to 2017 recorded a mean of 7.95 percent with a minimum discount rate of 5 percent and a maximum discount rate of 13.50 percent. The reserve requirement fluctuated from a minimum of 2 percent to a maximum of 6 percent with an average of 4 percent. The liquidity requirement has minimum value of 13 percent and a maximum value of 25 percent, with a mean of 16.34 percent. The Treasury bill rate has a minimum of 5.62 percent and a maximum 13.04 percent, with a mean of 7.63 percent. The inflation was ranging from a minimum value of 0.955 percent and a maximum value of 2.69 percent, with a mean of 1.88 percent. The real gross domestic product ranged from a minimum of 10.11 percent to a maximum of 10.69 percent and had a mean of 10.41 percent. The savings recorded an average of 8.96 percent and with a minimum value of 5.73 percent rising to a maximum of 16.11 percent. The standard deviations for all the variables show that data was broadly spread around their corresponding means. Lastly investment had an average of 9.42 percent and with a minimum value of 9.13 percent rising to a maximum of 9.98 percent. The standard deviations for all the variables show that data was broadly spread around their corresponding means. The p-values of the Jarque-Bera are above 5% for all variables. Therefore, normality does not seem to be a problem in this case.

Table 1. Descriptive Statistics

	LBCRP	DR	CRR	LQR	TBR	LCPISW	LRGDP	LSAV	LINV
Mean	15.39535	7.951389	4.002315	16.34259	7.673750	1.876337	10.41071	8.961072	9.42071
Median	15.55186	7.250000	3.500000	15.00000	6.990000	1.840550	10.44423	7.917700	9.43323
Maximum	16.46880	13.50000	6.000000	25.00000	13.04000	2.687847	10.68868	16.10850	9.97768
Minimum	13.99177	5.000000	2.500000	13.00000	5.620000	0.955511	10.11222	5.732200	9.13422
Std. Dev.	0.755991	2.489036	1.582975	3.912204	1.535728	0.363915	0.175102	2.555134	0.26512
Skewness	-0.522173	0.600852	0.336879	0.853580	1.148712	0.135652	-0.211331	0.977568	-0.211331
Kurtosis	2.029534	2.182089	1.294336	2.470551	3.603517	2.430970	1.778348	2.828933	1.443423
Jarque-Bera	18.29217	19.01762	30.26916	28.75243	50.78151	3.576607	15.03968	34.66641	13.103858
Probability	0.173117	0.216437	0.082165	0.062131	0.09532	0.567244	0.312542	0.07011201	0.341232
Sum	3325.396	1717.500	864.5000	3530.000	1657.530	405.2888	2248.713	1935.592	2066.713
Observations	216	216	216	216	216	216	216	216	216

4.2. Unit root test

The Augmented Dickey–Fuller (ADF) and Phillips-Perron (PP) tests were used to test for stationarity of the selected variables. The ADF and PP test the null hypothesis that the variables have a unit root. If the null hypothesis of the first two tests (ADF and PP) is rejected, that would suggest that the selected variables do not have a unit root. The results of the unit root test are presented in Table 2.

Table 2. Unit root test

Variable	ADF		Decision	PP		Decision
	Level	1st Diff	Status	Level	1st Diff	Status
DR	-2.1238 [-4.0017] (0.5291)	-4.6151*** [-4.0019] (0.0013)	I(1)	-2.1089 [-4.0013] (0.5375)	-13.9646*** [-4.0015] (0.0000)	I(1)
CRR	-1.9408 [-4.0013] (0.6296)	-14.6073*** [-4.0015] (0.0000)	I(1)	-1.9434 [-4.0013] (0.6282)	-14.6073*** [-4.0015] (0.0000)	I(1)
LQR	-1.6886 [-4.0013] (0.7532)	-14.7589 *** [-4.0015] (0.7532)	I(1)	-1.6886 [-4.0013] (0.7532)	-14.7589*** [-4.0015] (0.0000)	I(1)
LRGDP	-0.4036 [-4.0015] (0.9869)	-11.3755*** [-4.0015] (0.0000)	I(1)	-0.6962 [-4.0013] (0.9715)	-11.7601*** [-4.0015] (0.00000	I(1)
LCPISW	-1.7212 [-4.0013] (0.7387)	-13.1127*** [-4.0015] (0.0000)	I(1)	-1.7212 -4.0013 (0.7387)	-13.0950*** [-4.0015] (0.0000)	I(1)

Variable	ADF		Decision	PP		Decision
	Level	1st Diff	Status	Level	1st Diff	Status
LBCRP	-1.1845 [-4.0015] (0.9105)	-20.4723*** [-4.0015] (0.0000)	I(1)	-1.2700 [4.0013] (0.8923)	-21.1707*** [-4.0015] (0.0000)	I(1)
TBR	-2.6352 [-4.0013] (0.2652)	-15.1610*** [-4.0015] (0.0000)	I(1)	-2.7210 [-4.0013] (0.2292)	-15.1598*** [-4.0015] (0.0000)	I(1)
LSAV	-2.2426 [-4.0017] (0.4631)	-6.3263*** [-4.0017] (0.0000)	I(1)	-2.1984 [-4.0013] (0.4876)	-10.9334*** [-4.0015] (0.0000)	I(1)
LINV	-2.58787 [-4.0017] (0.2864)	-4.5850*** [-4.0017] (0.2864)	I(1)	-2.1851 [-4.0013] (0.4950)	-7.6984*** [-4.0015] (0.0000)	I(1)
Asterisks (***, **. *) denote significance at the 1%, 5% and 10% level, respectively.						

4.3. VAR lag order selection criteria

The lag length was selected based on the Akaike (AIC) and Schwarz information criterion (SC). Both lags for AIC and SC were tried and finally, the lag length suggested by the AIC proved to provide better results. Therefore, the analysis was based on the AIC results. Table 3 below provided the lag length of the three models used in this study.

Table 3. VAR lag order selection criteria

MODEL 1: LRGDP LCPISW LBCRP TBR DR LSAV LINV						
Lag	LogL	**LR**	FPE	AIC	SC	HQ
0	3017.443	NA	5.50e-22	-29.08640	-28.97370*	-29.04083
1	3137.388	230.6187	2.77e-22	-29.77186	-28.87026	-29.40726*
2	3190.695	98.88971	2.66e-22*	-29.81348*	-28.12297	-29.12985
3	3228.432	67.45211*	2.98e-22	-29.70466	-27.22524	-28.70200
MODEL 2: LRGDP LCPISW LBCRP TBR CRR LSAV LINV						
Lag	LogL	**LR**	FPE	AIC	SC	HQ
0	3046.221	NA	4.17e-22	-29.36445	-29.25175*	-29.31888
1	3153.752	206.7505	2.37e-22*	-29.92997*	-29.02837	-29.56537*
2	3193.410	73.56948	2.60e-22	-29.83971	-28.14921	-29.15609
3	3218.983	45.71010	3.27e-22	-29.61337	-27.13395	-28.61071
MODEL 3: LRGDP LCPISW LBCRP TBR LQR LSAV LINV						
Lag	LogL	**LR**	FPE	AIC	SC	HQ
0	2865.258	NA	2.39e-21	-27.61602	-27.50332*	-27.57044
1	2973.199	207.5391	1.36e-21*	-28.18550*	-27.28389	-27.82089*
2	3013.579	74.90758	1.48e-21	-28.10221	-26.41170	-27.41858
3	3041.734	50.32559	1.81e-21	-27.90081	-25.42140	-26.89816
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						

The results for Model 1 show 2 lags for the AIC, while the SC selected lag length 1. In Model 2 and 3 both the AIC and SC selected lag length 1. As indicated above the AIC selection criteria were used for the analysis presented in this paper. Therefore, lag 2, lag 1, and lag 1 were used in Mode 1, Model 2, and Model 3, respectively.

4.3. Cointegration test

The number of cointegrating vectors were determined by applying the Johansen cointegration procedure. The procedure involves two test statistics to establish the number of cointegrating vectors, namely, the trace (λ_{trace}) and the maximum eigenvalue statistics (λ_{max}). The null hypothesis for the trace test is that the number of the cointegrating vectors is less than or equal to *r*. The maximum eigenvalue test, the null hypothesis is that there are *r* cointegrating vectors present against the alternative hypothesis that there are (*r*+1).

As shown in Appendix 1, Table 1, for Model 1 the trace (λ_{trace}) suggests that there are six cointegrating vectors while the maximum eigenvalue (λ_{max}) indicates that there are five. Both the trace and maximum eigenvalue in Model 2 and 3, provides that all seven variables are cointegrated, respectively.

4.4. Granger Causality test

The Granger causality test ascertains if one-time series can forecast another. The Granger causality test results are presented in Table 4. For Model 1, the results show evidence of a bidirectional causal relationship between real GDP and bank credit, and real GDP and investment. There is also evidence of unidirectional causality running from real GDP to investment, Consumer Price Index to treasury bills, discount rate to Consumer Price Index, and bank credit to the discount rate. In Model 2, a bidirectional causal relationship is observed between bank credit and real GDP only. There is unidirectional causality running from investment to real GDP, treasury bills to the reserve requirement, reserve requirement to investment and savings to investment. Model 3 also provides that there is a bidirectional causal relationship between real GDP and bank credit. Further, we observed a unidirectional causality running from investment to real GDP, Consumer Price Index to liquidity requirement, liquidity requirement to investment, savings to investment. The findings of this study advance the notion of Mushtaq (2016) that causality can either run from one endogenous variable or the other way round.

Table 4. Granger Causality Test

Model 1 with Lags: 2			
Null Hypothesis		**F-Statistic**	**Probability**
D(LBCRP) does not Granger Cause D(LRGDP)	214	4.55566	0.0116
D(LRGDP) does not Granger Cause D(LBCRP)		2.91563	0.0564
D(LINV) does not Granger Cause D(LRGDP)	214	1.29618	0.2758
D(LRGDP) does not Granger Cause D(LINV)		3.40343	0.0351
D(TBR) does not Granger Cause D(LCPISW)	214	0.16283	0.8498
D(LCPISW) does not Granger Cause D(TBR)		6.31676	0.0022
D(DR) does not Granger Cause D(LCPISW)	214	3.58919	0.0293
D(LCPISW) does not Granger Cause D(DR)		2.18054	0.1155
D(DR) does not Granger Cause D(LBCRP)	214	0.55798	0.5732

D(LBCRP) does not Granger Cause D(DR)		3.09634	0.0443
D(DR) does not Granger Cause D(TBR)	214	14.8229	0.0000
D(TBR) does not Granger Cause D(DR)		11.9442	0.0000
Model 2 with Lags: 1			
D(LBCRP) does not Granger Cause D(LRGDP)	215	11.1427	0.0010
D(LRGDP) does not Granger Cause D(LBCRP)		4.57007	0.0337
D(LINV) does not Granger Cause D(LRGDP)	215	4.58537	0.0334
D(LRGDP) does not Granger Cause D(LINV)		3.47046	0.0639
D(CRR) does not Granger Cause D(TBR)	215	0.31945	0.5725
D(TBR) does not Granger Cause D(CRR)		4.92178	0.0276
D(LSAV) does not Granger Cause D(CRR)	215	0.34054	0.5601
D(CRR) does not Granger Cause D(LSAV)		31.9725	0.0000
D(LINV) does not Granger Cause D(CRR)	215	2.10171	0.1486
D(CRR) does not Granger Cause D(LINV)		19.1247	0.0000
D(LINV) does not Granger Cause D(LSAV)	215	0.01813	0.8930
D(LSAV) does not Granger Cause D(LINV)		28.2130	0.0000
Model 3 with Lags: 1			
D(LBCRP) does not Granger Cause D(LRGDP)	215	11.1427	0.0010
D(LRGDP) does not Granger Cause D(LBCRP)		4.57007	0.0337
D(LINV) does not Granger Cause D(LRGDP)	215	4.58537	0.0334
D(LRGDP) does not Granger Cause D(LINV)		3.47046	0.0639
D(LQR) does not Granger Cause D(LCPISW)	215	0.04746	0.8277
D(LCPISW) does not Granger Cause D(LQR)		4.69367	0.0314
D(LINV) does not Granger Cause D(LQR)	215	3.47610	0.0636
D(LQR) does not Granger Cause D(LINV)		6.50776	0.0114
D(LINV) does not Granger Cause D(LSAV)	215	0.01813	0.8930
D(LSAV) does not Granger Cause D(LINV)		28.2130	0.0000

4.5. Diagnostic tests

Motivated by Asaduzzaman (2021), residual tests were conducted to establish the risk of serial correlation, heteroskedasticity and non-normality distribution. The most important aspect in these cases is that residuals diagnostics should be free from heteroskedasticity and serial correlation. The results are provided in Table 5 below:

Table 5. Residual tests result

Diagnostic test		Model 1	Model2	Model 3
Serial correlation	Breusch-Godfrey LM - Probability of Chi-square	0.2831	0.3314	0.0578
Heteroskedasticity	Breusch-Pagan-Godfrey – Probability of Chi-square	0.1183	0.3847	0.1139
Normality	Jarque Bara	0.0658	0.07515	0.0632

The diagnostic test results indicate that the three models are free from serial correlation and heteroskedasticity. The results also show that the data is normally distributed. The probability values for all tests are above 5%. Further, the inverse roots which provide information about the characteristic of the autoregressive polynomials of the three models have a modulus of less than one and all are inside the unit root circle (Oladimeji, Bowale and Okodua (2022). This suggests that all three models are stable as they are less than one and are within the unit root circle.

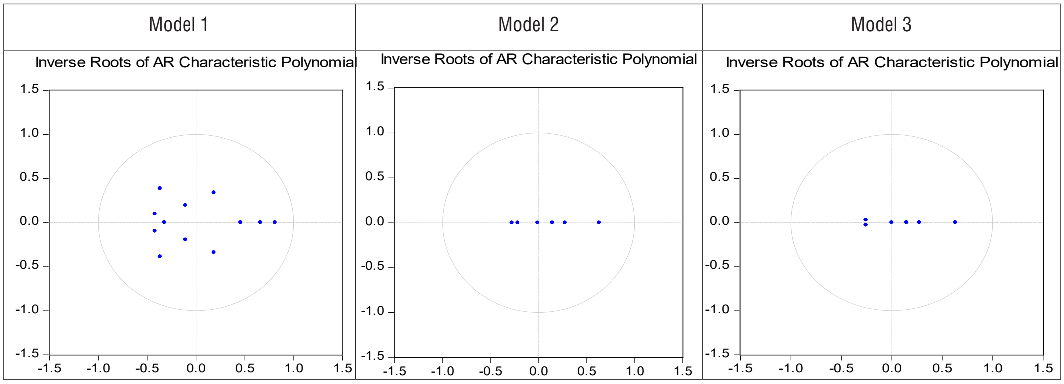

Figure 1. Inverse Roots AR Characteristic Polynomials

4.6. Structural Vector Autoregression Estimates

Having determined the existence of cointegration, causality and diagnostic test among the series, we advanced to estimate the SVAR where the emphasis was on impulse responses and variance decomposition. Only the 1st, 3rd, 6th, 9th, 12th, 15, 18th, 21st, and 24th periods into the future variations on the included macroeconomic variables explained by shock to the discount rate, reserve requirement and liquidity requirement were reported for the variance decomposition.

4.6.1. Impulse Responses and Variance Decomposition

(a) Model 1: Response of selected variables after a one-time shock to the discount rate

The shock to the discount rate leads to an instantaneous decline in the discount rate. The results provide evidence that a shock that increases the discount rate reduces inflation. The response of inflation to a contractionary of the discount rate shock reaches its minimum point after five months. The moderate interest rate channel in controlling inflation reflects imported inflation, which the Central Bank of Eswatini has no control over. The results are consistent with the findings of Tenreyro and Thwaites (2016). The results show an increase of credit to the private sector first, before it declines significantly, reaching its lowest level within three months and does not recover to the level of its initial peak within the 24 months. The effect of a shock to the discount rate result to a decline on real GDP after six months. A contractionary policy shock to the discount rate also causes a decline in treasury bills but it remains above zero up to month-eight before it settles to zero. As expected, a decline in bank credit is followed by an increase in savings which remains positive for about 12 months. The effect of a shock to the discount rate is immediate on investment but it lasts only for a month, then investment increases above zero before it maintains a plateau that lasts only for about 14 months.

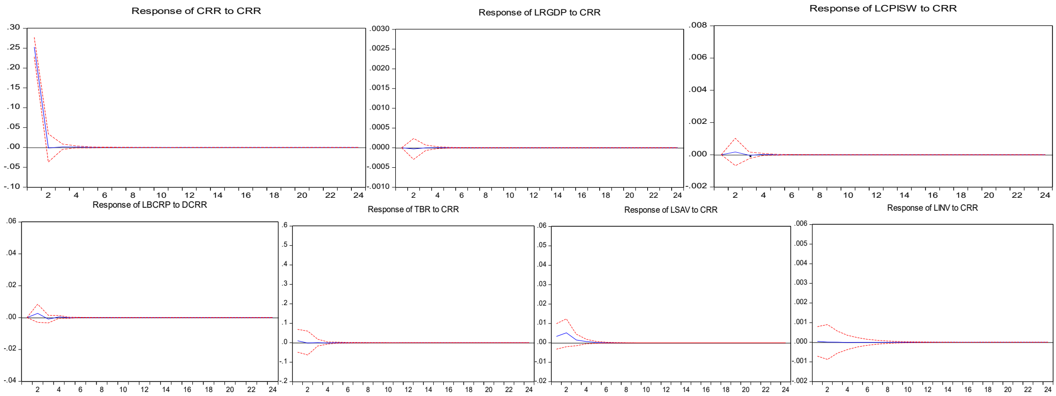

Figure 2. Model 1 Impulse response of a one-time shock to the discount rate

As shown in Table 6, the results of the variance decomposition indicate that the discount rate contributes 83.93% (from its own) variations in the first month and decline over time, recording 81.34% in month twenty-four. The effect on the other variables is zero on real GDP, 1.74% on inflation, 2.81% on bank credit, 11.52% on treasury bills, zero on savings and investment, in the first month. After twenty-four months the contribution of the discount rate to the variation of the selected variables is 0.62% on real GDP, 3.25% on inflation, 3.31% on bank credit, declined to 10.44% on treasury bills, 0.77% on savings and 0.28% on investment. Findings of this study suggest the impact of a monetary shock to the discount rate is more on bank credit that to inflation.

Table 6. Variance Decomposition for Discount Rate

Period	S.E.	D(LRGDP)	D(LCPISW)	D(LBCRP)	D(TBR)	D(DR)	D(LSAV)	D(LINV)
1	0.309517	0.000394	1.738504	2.812042	11.51893	83.93013	0.000000	0.000000
3	0.336049	0.480346	3.180007	3.353638	10.40992	81.98270	0.391625	0.201762
6	0.340374	0.613119	3.250918	3.312548	10.46320	81.43015	0.673660	0.256405
9	0.340771	0.617482	3.246404	3.309726	10.44321	81.35554	0.752449	0.275192
12	0.340810	0.617391	3.245699	3.309450	10.44090	81.34141	0.764209	0.280940
15	0.340816	0.617497	3.245636	3.309355	10.44058	81.33837	0.765853	0.282713
18	0.340818	0.617564	3.245634	3.309327	10.44052	81.33767	0.766076	0.283213
21	0.340818	0.617588	3.245634	3.309319	10.44051	81.33749	0.766108	0.283353
24	0.340818	0.617595	3.245634	3.309317	10.44050	81.33745	0.766113	0.283391

The results indicate that the discount rate is effective to reduce inflation but its impact on bank credit is negative. The negative impact of the discount rate on bank credit is translated to slow economic growth which is a cause for concern in this paper. The significant contribution to treasury bills indicates that an increase in the discount rate turns to discourage banks from issuing loans and they invest in treasury bills.

(b) Model 2: Response of selected variables after a one-time shock to the reserve requirement

The results for Model 2 show that a shock to the reserve requirement results in a minimal increase in bank lending which does not last even for a month before declining to its lowest level and never recovers to its initial peak. The results also suggest that a contractionary shock to the reserve requirement increases inflation which is contrary to the mandate of the central bank. The impact of the shock to the reserve requirement on real GDP, treasury bills and investment is insignificant.

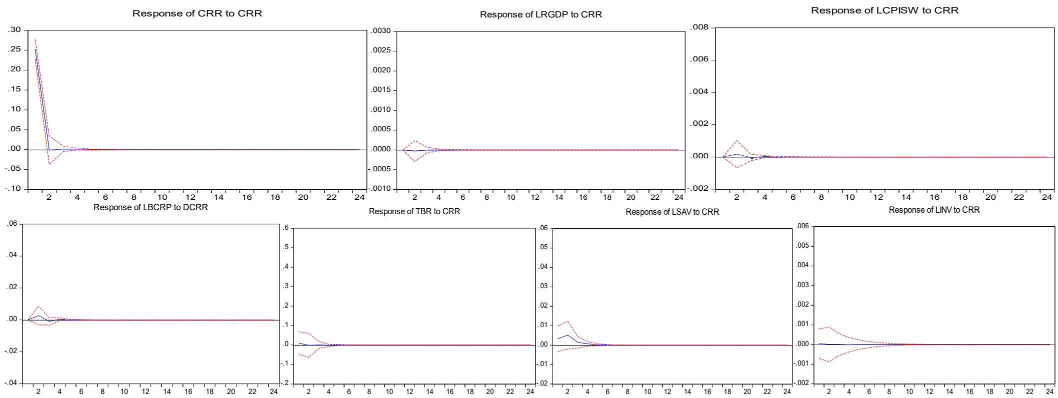

Figure 3. Model 2 Response of selected variables following a shock to the reserve requirement

The variance decomposition of Model 2 indicates that the contribution of the reserve requirement contributes to its variations is 99.59% in the first month and it declines insignificantly to 97.44% in month twenty-four. The reserve requirement contributes 0.05% to real GDP, 0.27% to inflation, zero to bank credit, 0.08% to treasury bills, zero to savings and investment, in the first month. We observe a minimal change of 0.15% on real GDP, 0.43% on inflation, 0.55% on bank credit, 0.13 % on treasury bills, 0.90% on savings and 0.40% on investment, in month twenty-four. Table 7 provides the variance decomposition for the liquidity requirement on the selected variables.

Table 7. Model 2 Variance Decomposition after a shock to the reserve requirement

Period	S.E.	D(LRGDP)	D(LCPISW)	D(LBCRP)	D(TBR)	D(CCR)	D(LSAV)	D(LINV)
1	0.253037	0.051465	0.268917	0.000801	0.084747	99.59407	0.000000	0.000000
3	0.255727	0.151550	0.434055	0.533896	0.133625	97.52096	0.890322	0.335596
6	0.255836	0.154226	0.434207	0.548159	0.133821	97.44025	0.895060	0.394280
9	0.255842	0.154444	0.434192	0.548142	0.133821	97.43630	0.895109	0.397996
12	0.255842	0.154457	0.434191	0.548140	0.133820	97.43603	0.895120	0.398241
15	0.255842	0.154458	0.434191	0.548140	0.133820	97.43601	0.895120	0.398257
18	0.255842	0.154458	0.434191	0.548140	0.133820	97.43601	0.895121	0.398258
21	0.255842	0.154458	0.434191	0.548140	0.133820	97.43601	0.895121	0.398258
24	0.255842	0.154458	0.434191	0.548140	0.133820	97.43601	0.895121	0.398258

(c) Model 3: Response of selected variables after a one-time shock to the liquidity requirement

A similar pattern with that of reserve requirement was observed on the selected variable after a one-time shock to the liquidity requirement. Only the significant shocks were reported in this section. A shock to the liquidity rate results in a decline in bank credit and treasury bills within three months. The impact on real GDP and investment is insignificant. Surprisingly, a contractionary shock to the liquidity requirement brings inflation to its lowest levels within three months. This implies that it is more effective to control inflation than the discount rate. Hence, this paper recommends that a periodic review of the liquidity requirement should be done to complement the discount rate in the short-run.

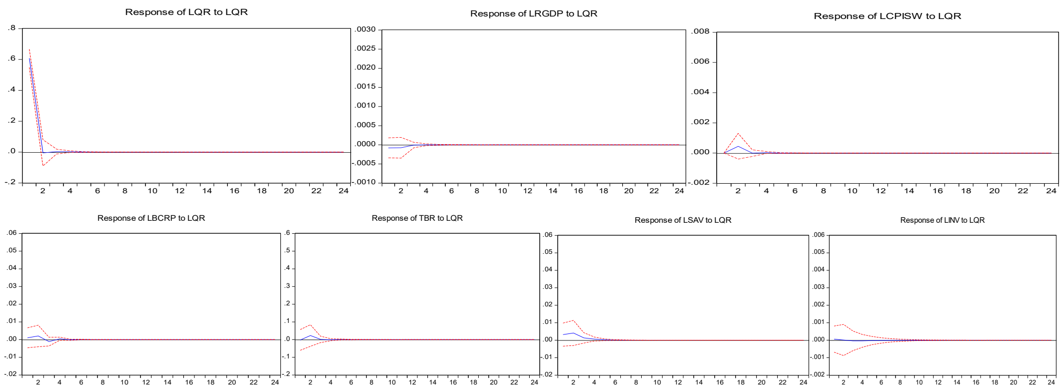

Figure 4. Model 3 Response of selected variables following a shock to the liquidity requirement

The results of the variance decomposition in Model 3 show that the contribution of the liquidity requirement contributes to its variations is 99.47% in the first month and it declines insignificantly to 97.63% in month twenty-four. The liquidity requirement's contribution to the variation of the selected series is 0.17% to real GDP, 0.29% to inflation, 0.06% to bank credit, zero to treasury bills, savings and investment, in the first month. We observe a minimal insignificant change of 0.45% on real GDP, 0.59% on inflation, 0.40% on bank credit, 0.13% on treasury bills, 0.63% on savings and 0.16% on investment, in month twenty-four. Table 7 provides the variance decomposition for the liquidity requirement on the selected variables.

Table 8. Model 3 Variance Decomposition after a shock to the liquidity requirement

Period	S.E.	D(LRGDP)	D(LCPISW)	D(LBCRP)	D(TBR)	D(LQR)	D(LSAV)	D(LINV)
1	0.607819	0.173706	0.288981	0.064075	0.000135	99.47310	0.000000	0.000000
3	0.613432	0.451866	0.588809	0.387043	0.131697	97.67670	0.630836	0.133049
6	0.613577	0.453964	0.588639	0.399433	0.131874	97.63255	0.634625	0.158918
9	0.613583	0.454067	0.588630	0.399433	0.131876	97.63083	0.634645	0.160518
12	0.613583	0.454072	0.588629	0.399432	0.131876	97.63072	0.634649	0.160624
15	0.613583	0.454073	0.588629	0.399432	0.131876	97.63071	0.634650	0.160631

Period	S.E.	D(LRGDP)	D(LCPISW)	D(LBCRP)	D(TBR)	D(LQR)	D(LSAV)	D(LINV)
18	0.613583	0.454073	0.588629	0.399432	0.131876	97.63071	0.634650	0.160631
21	0.613583	0.454073	0.588629	0.399432	0.131876	97.63071	0.634650	0.160631
24	0.613583	0.454073	0.588629	0.399432	0.131876	97.63071	0.634650	0.160631

Taken together the results of the impulse response function and variance decomposition suggests that there is evidence of interest rate and asset price channel though relatively weak. The variance decomposition confirms that reserve requirement and liquidity requirement are effective in reducing inflation and positively contribute positive to bank credit, investment and growth.

Monetary Policy Thresholds

The optimal monetary policy mix for the three variables of concern is premised on the hypothesis that the three policy instruments are not optimal to influence inflation and bank lending to the private sector in the right direction to stimulate economic growth against an alternative hypothesis that they are optimal in the Kingdom of Eswatini. With all other factors held constant, a shock was applied on each instrument, respectively based on the quadratic approach:

$$y_t = \alpha_0 + \alpha_1 f_{t'} + \alpha_2 f_t^2 + \beta' Z_t + \varepsilon_t$$

$$\frac{\partial y_t}{\partial f_t} = \alpha_1 + 2\alpha_2 f_t = 0$$

$$f^* = \frac{\alpha_1}{2\alpha_2}$$

The optimal threshold level f^* for the discount rate, reserve requirement and liquidity requirement is presented in Table 9 below:

Table 9. Threshold Results

Monetary Policy Instruments	Average (2000-2019) to stimulate	Optimal Threshold to Stimulate Bank Credit to Private Sector $f^* = \frac{\alpha_1}{2\alpha_2}$	Optimal Threshold to maintain one digit inflation and supports growth $f^* = \frac{\alpha_1}{2\alpha_2}$
Discount Rate	7.95%	4.869271/(2x0.43504) = 5.596%	
Reserve Requirement	5.18%	4.405445/(2x0.512122) = 4.301%	0.225164/(2x0.017493)= 6.44%
Liquidity Requirement	16.34%	0.269064/(2x0.010121) =13.292%	

The optimal thresholds for the three monetary policy instruments on bank credit to the private sector are 5.60% for the discount rate, 4.30% for the reserve requirement, 13.29% for the liquidity requirement. This implies that any increase below: 5.60% for the discount rate, 4.30% for the reserve requirement and 13.29% for the liquidity requirement contributes positively to bank credit to the private sector and economic growth, respectively. Above these thresholds, the three monetary policy instruments would have a negative impact on bank credit to the private sector and economic growth in the Kingdom of Eswatini, respectively. Overall, the above results suggest that the three instruments are not optimal to influence private sector credit and economic growth positive. The optimal level of the discount rate to stabilize any divergences including imported inflation is 6.44% and it is lower than the average of the period under review, which confirms its negative effect on economic activities in the country.

5.7. Discussion of the results

The results of the three estimated SVAR impulse responses and variance decomposition indicate that the discount rate is superior compared to the reserve requirement and liquidity requirement, to influence inflation, credit extension to the private sector and real GDP in the right direction in the Kingdom of Eswatini. The results are consistent with those by Anwar and Nguyen (2018), Kim and Lim (2018), and Evans et al (2018), who also established the superiority of the discount rate over other monetary policy instruments. These findings are contrary to those of Adofu and Salami (2017), who assert that a shock to the discount rate results in a sudden decline in real GDP. It terms of bank credit to the private sector, the results indicate that there is a negative effect of a shock to the discount rate and the reserve requirement. This is consistent with the results of Glocker and Towbin (2012) and Glocker and Towbin (2018), who established that a shock to the discount rate and reserve requirement leads to a decrease in bank credit. In addition, the results of this study provide that a shock to the reserve requirement and liquidity requirement reduces inflation faster than the discount rate.

The findings of this study also suggest that the three policy instruments are fixed at levels that are detrimental to bank credit and economic growth. The optimal monetary policy mix to keep inflation within reasonable levels and encourage credit to the private sector which in turn stimulate economic growth is 5.60% for the discount rate, 4.30% for the reserve requirement and 13.29% for the liquidity requirement. These results of this study advance the debate of Tule *et al*. (2015), Olade (2015) and Asaduzzaman (2021). The results also complement those of International Monetary Fund (2018) by concluding that interest rate, reserve requirement and liquidity requirement could increase to a certain threshold level with a matching positive effect on bank lending and economic growth.

6. Conclusion and Recommendations

The purpose of the study was to establish the optimal monetary policy to influence inflation, credit extension to the private sector and real GDP in the right direction in Kingdom of Eswatini. Based on the three estimated models of the SVAR using monthly data for the period 2000 to 2019, the results indicate that the discount rate is optimal/superior over the reserve requirement and liquidity requirement. Monetary policy shock to the reserve requirement and liquidity requirement is not effective to stimulate economic growth and bank credit to the private sector, which indicates that the three instruments do not complement each other. Overall, the results are consistent with those of Tule *et al*. (2015), Olade (2015), Tenreyro and Thwaites (2016), International Monetary Fund (2018), Nguyen (2018), Kim and Lim (2018), Evans *et al*. (2018), Anwar and Nguyen (2018), Glocker and Towbin (2018); Salihu *et al.* (2018) and Asaduzzaman (2021).

Since the reserve requirement and the liquidity requirement were found to be fast in controlling inflation, this study recommends that lowering both instruments can serve two objectives: to stimulate bank credit and to complement the discount rate in controlling inflation. The study also recommends that the Central Bank of Eswatini should consider a policy mix of 5.60% for the discount rate, 4.30% for the reserve requirement, 13.29% for the liquidity requirement to influence inflation, bank credit to the private sector and economic growth in the right direction. In addition, the policy implication of this study is that there is a need to strengthen collaboration with commercial banks to ensure that appropriate policies are in place to encourage lending to the private sector in a stride to boost investment and economic growth in the Kingdom of Eswatini.

The limitation of this study is that, it does not include foreign variables in the model because the country is under the CMA. Worth noting is that, the Kingdom of Eswatini is an open economy and about 40% of its global trade is influenced by international shocks such as commodity prices. Therefore, we recommended that a further study with similar approach should include foreign variables such as oil prices to capture the effect on the domestic economy.

References

Adofu, I. & Salami, A. (2017). Effects of Monetary Policy Shocks in Nigeria: Evidence from Structural VAR Modeling. *Lafia Journal of Economics and Management Sciences*. 2(1) 6-19

Agenor, P.R. (2019). Growth and welfare effects of macroprudential regulation. *Macroeconomic Dynamics* 23(8): 3140-3162.

Anwar, S., & Nguyen, L.P. (2018). Channels of Monetary Policy Transmission in Vietnam. *Journal of Policy Modeling* 40 (3): 709–729.

Asaduzzaman, M. D. (2021). Relationship Between Threshold Level of Inflation and Economic Growth in Bangladesh: *A Multivariate Quadratic Regression Analysis, SSRN Electronic Journal*.

Asiedu, M., Oppong, M., Gulnabat, O. E. (2020. Effects of Monetary Policy on Stock Market Performance in Africa Evidence from Ten (10) African Countries from 1980 to 2019. *Journal of Financial Risk Management*, (9).3.

Berg, A., Charry, L., Portillo, R. & Vicek, J. (2019), "The monetary transmission mechanism in the tropics. A case study approach*", Journal of African Economics*, (27). 6, 112-128.

Berger, A.N., Guedhami, O., Kim, H.H. & Li, X. (2018), "Economic policy uncertainty and bank liquidity hoarding", available at: https://ssrn.com/abstract53030489 .

Borio, C. & Gambacorta, L. (2017). Monetary policy and bank lending in a low interest rate environment: diminishing effectiveness? *Journal of Management and Administration.*

Carrera, C. (2013). The Evolving Role of Reserve Requirements in Monetary Policy, *The Business and Economic Research Journal*, 6, 11-25.

Central Bank of Eswatini (2019). *Central Bank of Eswatini Annual Report.* Central Bank of Eswatini *1*(1): 1-44.

Corradin, S., Eisenschmidt, J., Hoerova, M., Linzert, T., Schepens, G., & Sigaux J. D. (2020). Money markets, central bank balance sheet and regulation. *ECB Working Paper No*. 2483.https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2483˜24d0fb56ec.en.pdf?a1c34b01e0b81050f23b77807fe461b6

Evans O. (2019). How much is too much? The threshold effects of interest rate on growth and investment in Nigeria. *Journal of Management and Administration*. (volume, issue??)

Evans, O., Adeniji, S., Nwaogwugwu, I., Kelikume, I., Dakare, O. and Oke, O. (2018). The relative effect of monetary and fiscal policy on economic development in Africa: A GMM approach to the St. Louis equation. *Business and Economic Quarterly*, 2, pp.3-23.

Foluso, A. (2020). Monetary Policy and the Real Sector:A Structural VAR Approach for Nigeria. *American Journal of Economics, 10*(6): 339-351.

Glocker, C. & Towbin, P. (2018). Reserve Requirements for Price and Financial Stability: When Are They Effective? (publisher?)

Glocker, C. & Towbin, P. (2012). Reserve Requirements for Price and Financial

Stability:When are they Effective? *Banque de France Working Paper,* No. 363.

Guerrieri, V. & Lorenzoni, G. (2017). "Credit Crises, Precautionary Savings, and the Liquidity Trap," *The Quarterly Journal of Economics, Oxford University Pres*s, 132(3), 1427-1467.

Gujarati, D. N. (2003). *Basic Econometrics, Gary Burke, New York*.

Holston, K., Laubach, T., & Williams, J. C. 2017. Measuring the natural rate of interest: International trends and determinants*. Journal of International Economics*, (108), S59-S75.

International Monetary Fund., (2018). Kingdom of Lesotho Report. *International Monetary Fund Country Report,* No. 18/59. Available from: https://www.tralac.org/images/docs/12810/lesotho-selected-issues-paper-imf-country-report-no-18-59-february-2018.pdf [Accessed: 1 December 2020].

Johnson, H. G. (2017). Macro-economics and monetary theory. 1st Ed. New York: Routledge.

Kim, S and Lim, K. (2018). Effects of monetary policy shocks on exchange rate in small open Economies. *Journal of Macroeconomics*, (56), 324-339.

Mushtaq, S. (2016). Causality between bank's major activities and economic growth: evidences from Pakistan Saba Mushtaq. *Mushtaq Financial Innovation* (2016) 2:7

Nwoko, N. M., Ihemeje, J. C. & Anumadu, E. (2016). The Impact of Monetary Policy on the Economic Growth of Nigeria. *International Multi-Disciplinary Journal*, Ethiopia 10(3), Serial No.42, 192-206.

Obstfeld, M. & Taylor, A. M. (2017). International monetary relations: Taking finance seriously. *Journal of Economic Perspectives*, 31(3), 3-28.

Olade, S.O. (2015). Determination of an Optimal Threshold for the Central Bank of Nigeria's Monetary Policy Rate, *Central Bank of Nigeria Working Paper Series,* CBN/WPS/01/2015/01. Central Bank of Nigeria.

Oladimeji, E. O., Bowale, E. & Okodua, E (2022) Re-examining Monetary Policy Effects and Sectoral Real Sector in Nigeria. *Journal of African Research in Business & Technology*. 2022 (2022).

Olamide.E, Maredza, A. & Ogujiuba, K., (2022). Monetary Policy, External Shocks and Economic Growth Dynamics in East Africa: An S-VAR Model.

Quarles, R. K. (2018). Liquidity Regulation and the Size of the Fed's Balance Sheet. Speech at "Currencies, Capital, and Central Bank Balances: A Policy Conference a Hoover Institution Monetary Policy Conference", *Stanford University*.

Salihu, A., Baba, N., & Hamman, I. (2018). Money Supply, Output and Inflation Dynamics in Nigeria: The Case of New Higher Order Monetary Aggregates. *American Journal of Economics*. *8*(6): 289-302.

Su, C.-W., Khan, K., Tao, R. & Umar, M. (2020). A review of resource curse burden on inflation in Venezuela*. Energy*, *204*, 117925.

Tenreyro, S. & Thwaites, G. (2016). Pushing on a string: US monetary policy is less powerful in recessions. *American Economic Journal: Macroeconomics*, 8(4), 43–74.

Tule, M. K.1., Audu, I., Oji, O.K., Oboh, V.U., Imam S.Z. & Ajay K.J. (2015). Determination of an Optimal Threshold for the Central Bank of Nigeria's Monetary Policy Rate. Central Bank of Nigeria.

Tule, M.K., Ogundele, O.S. & Apinran, M.O. (2018), Efficacy of monetary policy instruments on economic growth: evidence from Nigeria, *Asian Economic and Financial Review*, (8)10, 1239-1256.

Twinoburyo, E.N. & Odhiambo, N.M. (2018a), "*Monetary policy and economic growth: a review of international literature*", *Journal of Central Banking Theory and Practice*, (7)2, 123-137.

Appendix 1: Cointegration test results

Model 1					Model 2					Model 3				
Unrestricted Cointegration Rank Test (Trace)					Unrestricted Cointegration Rank Test (Trace)					Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 CriticalValue	Prob.**	Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 CriticalValue	Prob.**	Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 CriticalValue	Prob.**
None *	0.453103	394.5195	150.5585	0.0000	None *	0.493928	530.1335	150.5585	0.0000	None *	0.493342	532.1362	150.5585	0.0000
At most 1 *	0.365968	266.5787	117.7082	0.0000	At most 1 *	0.414871	385.0642	117.7082	0.0000	At most 1 *	0.431392	387.3132	117.7082	0.0000
At most 2 *	0.271740	169.9795	88.80380	0.0000	At most 2 *	0.344813	270.9125	88.80380	0.0000	At most 2 *	0.337634	267.0612	88.80380	0.0000
At most 3 *	0.187959	102.7549	63.87610	0.0000	At most 3 *	0.290516	180.8487	63.87610	0.0000	At most 3 *	0.284461	179.3187	63.87610	0.0000
At most 4 *	0.119528	58.61548	42.91525	0.0007	At most 4 *	0.215020	107.7436	42.91525	0.0000	At most 4 *	0.215227	108.0236	42.91525	0.0000
At most 5*	0.086584	31.62850	25.87211	0.0086	At most 5*	0.161081	56.17680	25.87211	0.0000	At most 5*	0.162030	56.40077	25.87211	0.0000
At most 6					At most 6*	0.084330	18.76521	12.51798	0.0040	At most 6*	0.084257	18.74812	12.51798	0.0040
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)					Unrestricted Cointegration Rank Test (Maximum Eigenvalue)					Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 CriticalValue	Prob.**	Hypothesized No. of CE(s)	Eigenvalue	Max-igen Statistic	0.05 Critical value	Prob.**	Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.453103	127.9407	50.59985	0.0000	None *	0.493928	145.0693	50.59985	0.0000	None *	0.493342	144.8230	50.59985	0.0000
At most 1 *	0.365968	96.59920	44.49720	0.0000	At most 1 *	0.414871	114.1517	44.49720	0.0000	At most 1 *	0.431392	120.2520	44.49720	0.0000
At most 2 *	0.271740	67.22461	38.33101	0.0000	At most 2 *	0.344813	90.06379	38.33101	0.0000	At most 2 *	0.337634	87.74258	38.33101	0.0000
At most 3 *	0.187959	44.13944	32.11832	0.0011	At most 3 *	0.290516	73.10516	32.11832	0.0000	At most 3 *	0.284461	71.29505	32.11832	0.0000
At most 4 *	0.119528	26.98698	25.82321	0.0350	At most 4 *	0.215020	51.56677	25.82321	0.0000	At most 4 *	0.215227	51.62285	25.82321	0.0000
At most 5					At most 5*	0.161081	37.41159	19.38704	0.0001	At most 5*	0.162030	37.65264	19.38704	0.0000
At most 6					At most 6*	0.084330	18.76521	12.51798	0.0040	At most 6*	0.084257	18.74812	12.51798	0.0040

* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-value

Source: Author's Contribution, Genarated in Software EViews, version 9