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Impact of Macroeconomic Developments on Financial System Stability in Malawi

by

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Abstract

While it is difficult to foresee the triggers for financial crisis, continuous monitoring and assessment of the buildup of risks need to be an integral part of any policy framework for maintaining overall economic and financial stability. This paper is an attempt in that direction. Specifically, the study analyses the impact of macroeconomic developments on financial system stability in Malawi. The empirical analysis identifies the impact of the developments in selected key macroeconomic variables on the financial system stability. Using the Structural Vector Auto Regressive analysis function the results reveal that real GDP and exchange rate developments have a significant impact on the functioning of the financial system and its stability.

Key Words: *Macroeconomic developments, financial system stability, Structural VAR*
JEL: E44, G21, O16

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I: Introduction

The importance of the financial sector came to the forefront with the onset of the global financial crisis of 2007-08 and it was understood during that time that the costs are immense if the instability of the financial sector spreads to the real sector. Consequently, maintaining macroeconomic stability and financial stability concurrently become a major target and a challenge for policy makers. However, (Bernanke and Gertler 2001), (Svensson 1999) and (Woodford 2003) theorized that inflation rates, inflation expectations and the implied relative intertemporal prices are all that matter when it comes to central banking.

Nonetheless, the insurgence of the two global financial crises has motivated economists and key policymakers to appreciate the need for implementing policies aimed at reducing systemic risk and enhancing financial system stability. It was for that reason understood that due to the interconnectedness of financial systems and institutions, crisis in the financial sector can easily be transferred to other economic sectors. Therefore, it becomes imperative to take a holistic approach towards understanding complexities of financial institutions at large and the environment within which they operate other than just regulating and supervising them.

In the late 90s, (Goodhart and Tsomocos 1997) suggested that there is no consensus either in theory or practice on a clear definition of financial stability. Moreover, in the late 2000s, (Alawode and Al Sadek 2008) in their efforts after reviewing several concepts of financial stability failed to come up with a widely accepted definition on the matter. Hence, economists have not agreed on what constitutes financial stability as they see it to be multifaceted. In this paper however, we use the definition adopted by the Reserve Bank of Malawi (RBM) in which its defined as condition represented by a sound financial system, capable of withstanding shocks to the economy; one that is able to allocate savings into investments, facilitate the settlement of payments efficiently and manage risks in a satisfactory manner.

After the global financial crisis, most central banks and financial regulatory bodies established financial stability units as a way of giving more emphasis on macro-prudential analysis focusing on the ability of banks to withstand macroeconomic shocks based on stress tests. The RBM established the Financial Stability unit within the Research Department in 2012, to help assess financial stability in the Malawi financial system. The aim was to analyze potential risks and vulnerabilities to financial system stability. Before 2012, the main business of the central bank focused on monetary policy with the ultimate goal of achieving price stability, giving little attention to financial stability issues.

It has been largely argued that the macroeconomic environment plays a critical stability role in the economy. Achieving and maintaining a stable financial system is now one of the key targets set out by most central banks worldwide. Swamy (2013) suggested that a stable macroeconomic environment is essential for banking system stability and consequently for the whole financial system stability. This considers that the banking system constitutes the largest part of the financial system particularly in emerging and developing economies. Unstable macroeconomic conditions such as volatile inflation and subdued economic growth may impair banks' soundness as it reduces the debt servicing capacity of firms and households.

As the economy of Malawi becomes more integrated globally, its interlinkages of financial systems mean that stress in one institution may have a contagion effect on other sectors of the economy.

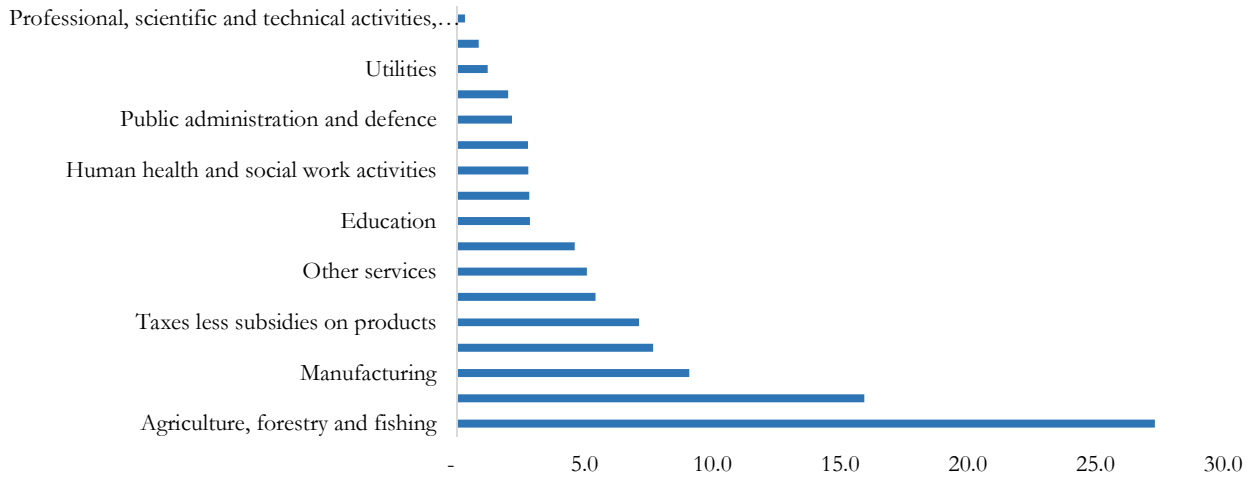
The challenge comes with trying to establish the main link between financial stability and macroeconomic conditions as policy decisions are formulated. It is not specifically known what impact developments in macroeconomic variables have on the Malawi's financial stability system as policy decisions are implemented. Therefore, this study will address the knowledge gap by providing empirical evidence on how the prevailing macroeconomic developments affect the stability of the financial system in Malawi. The main objective of this paper is to investigate the impact of macroeconomic developments on financial stability. Specifically, the paper establishes the main determinant of the state of financial system; and investigates the impact of developments in key macroeconomic variables on financial stability.

The remainder of the paper is organized as follows. Stylized facts of the Malawi economy are given in Section 2, while in Section 3, existing literature on financial stability in relation to macroeconomic conditions is reviewed. Section 4 outlines the methodology to be employed in the study, the empirical results are in Section 5 while Section 6 provides the conclusion and policy recommendations.

II: Stylized Facts on the Malawi Economy

The macroeconomic environment in Malawi has been relatively unstable, with periods of economic slowdown, high inflation, high interest rates and volatile exchange rates. Rain fed agriculture is the main economic driver, as it contributes about 30.0 percent to gross domestic product (GDP) (see Figure 1). From 2007-09 the economy grew to levels above 6.0 percent due to the introduction of farm input subsidy program and favorable weather conditions. Between 2011 and 2018 economic growth averaged about 4.1 percent. A slowdown in average growth to 2.0 percent was witnessed in 2012 soon after the devaluation of the currency. Malawi's GDP per capita increased to about US$512.13 in 2011 and has since dropped to US$338.48 in 2017.

Figure 1: Sectoral Contributions to Malawi's GDP



Source: National Statistics Office

The evolution of exchange rate policy in Malawi from the early 1970s to present encompasses a transition from a single and multiple currency peg regime in the 1970s to flexible regime in 1990s, then managed peg in the early 2000s and reversion to floating exchange rate regime since 2012. The exchange rate from 2005-11 was fixed at an average of K150 per US dollar, but the major devaluation in 2012 resulted in the kwacha trading at K250 per US dollar. In the period 2013-16 the kwacha depreciated and stabilized to an average of K750 per US dollar in 2018. However, interest rates in Malawi have been relatively higher than other countries in the Southern African region. In 2000, the lending rates were as high as 58 percent but later declined to about 18 percent in 2011.

Nevertheless, due to the devaluation of the exchange rate that resulted into higher inflation in 2012, interest rates rose again and averaged at about 33.6 percent. Following inflation targeting policies by the central bank, interest rates stabilized to 24.8 percent in 2018 and have declined further to 13.9 in June 2019. Malawi's financial sector is composed of the banking sub-sector, general insurance sub-sector, life insurance sub-sector, pensions sub-sector, capital markets sub-sector and microfinance sub-sector. The banking sector has ten banking institutions composed of nine commercial banks and one discount house. Of the nine banks, five are domestic private-owned banks while four banks are foreign owned banks. By December 2018 the banking sector reported an aggregate profit after-tax of K43.7 billion.

The total assets for the banking sector increased to K1, 743.9 billion in June 2019 from K1, 670.5 billion reported in December 2018. Malawi's capital market sector comprises of one stock exchange, four brokerage firms, two collective investment schemes, seven investment advisers, four transfer secretaries and five portfolio managers. With fourteen registered pointers, the number of shares traded on the stock exchange in 2018 increased to 958 million translating to K48.7 billion in value of shares. Total funds under management were reported at K1.09 trillion in December 2018, with the money market and equity instruments constituting 43.6 percent and 35.1 percent, respectively while the rest of the funds comprised unlisted property investments at 6.7 percent, unlisted debt at 6.4 percent, and unlisted equity at 8.2 percent.

The pension sector introduced a mandatory pension regime in 2018 which saw the Public Service Pension Fund being registered as a stand-alone restricted pension fund. The pension sector portfolio is comprised of government securities, listed equities, unlisted equities, real estate and fixed deposits. Assets of the pension sector grew by 34.6 percent to K716.5 billion as at end December, 2018. The assets grew substantially on account of an increase in contributions and investment income. Membership of the national pension scheme increased to 406,068 largely following the inclusion of the newly registered pension funds into the industry. The general insurance sector composes of fire, motor, personal accidents and miscellaneous.

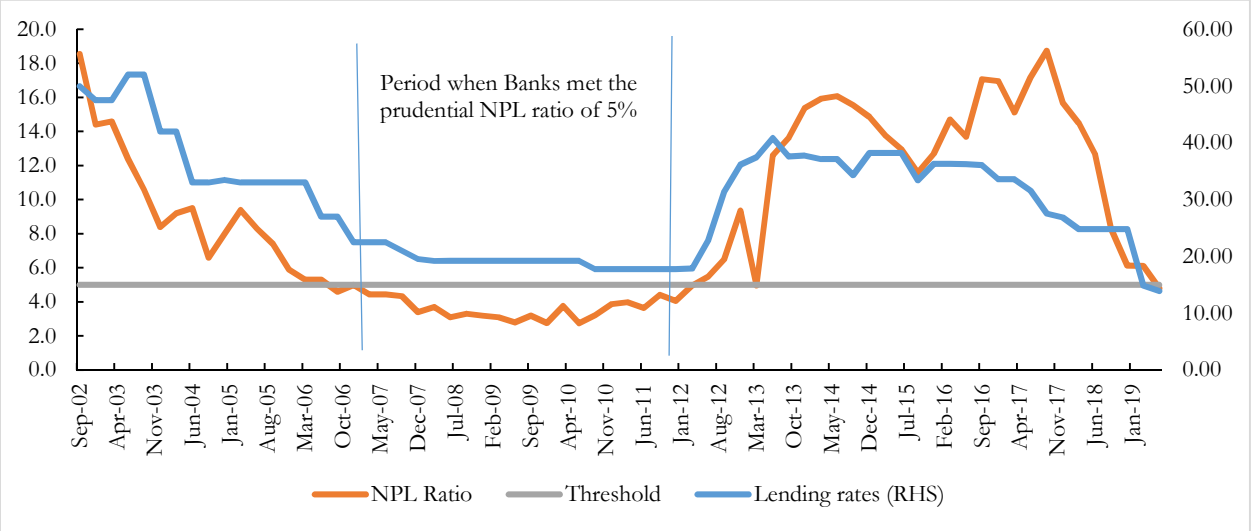
There was a combined total of 197,427 general insurance policies in 2018. The sector also reported an underwriting surplus of K12.9 billion and profit for the year of K1.9 billion. Total assets of the sector grew by 13.1 percent to K48.5 billion. With regards to asset composition, investments accounted for the largest portfolio of assets at 54.9 percent, followed by insurance receivables at 25.3 percent. In 2018 the life insurance sector comprised five life insurance companies and 375 sales agents. The number of lives covered under group life insurance increased to 346,053 and total assets attributed directly to life insurance business increased by 11.6 percent to K165.1 billion. The life insurance industry sector remained profitable in 2018 with profits after tax reported at K9.1 billion.

The microfinance sector had forty-nine registered and licensed microfinance institutions comprising forty microcredit agencies, eight non-deposit taking Institutions and one deposit taking institution. Aggregate assets for the sector comprising microcredit agencies, non-deposit taking microfinance institutions and deposit taking microfinance institutions, increased to K38.1 billion in 2018. Total assets of deposit taking microfinance institutions decreased by 15.5 percent to K12.4 billion while total assets of the non-deposit taking microfinance institutions decreased by 2.2 percent to K22.3 billion. Financial Cooperatives total assets grew by 35.6 percent to K19.1 billion. As at end 2018, the sector had thirty-seven licensed financial cooperatives also known as savings and credit cooperative societies (SACCOs), of these SACCOs, thirty-one were employer based, while six were community based.

The total assets for the financial cooperatives grew by 35.5 percent to K19.1 billion in 2018. The growth in assets was largely attributed to growth of loans and investments which was financed by total savings which grew by 40.2 percent to K14.3 billion. The banking industry faces challenges with credit risk as reflected by high levels of Non-Performing Loans (NPLs). NPLs displayed a rather mixed pattern, declining from 2002-09 and rising thereafter until around December 2013, then decreasing again between January 2014 and December 2015 from 16 percent to 10.8 percent. NPLs started to increase again from January 2016 to peak at 19.4 percent in August 2017, then resumed the declining trend thereafter to reach 4.8 percent as at June 2019, the lowest in five years.

This decline is partly due to more cautious lending occurring on the back of rising loans extended to the private sector as well as increase in loan write-offs. Notably, there have been significant efforts to unwind the NPL position by the banking system since 2017.

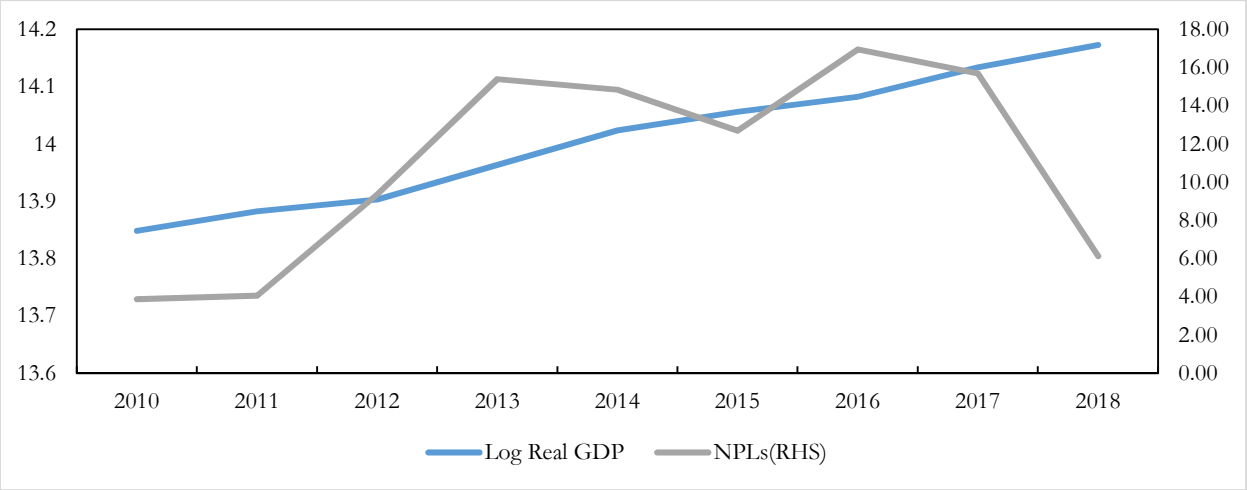
Figure 2: Ratio of NPLs to Gross Loans and Leases



Source: Reserve Bank of Malawi

Considering the relationship between GDP and the trend of NPLs in the banking sector, figure 3 shows that as GDP has been steadily growing over the years, NPLs have been volatile.

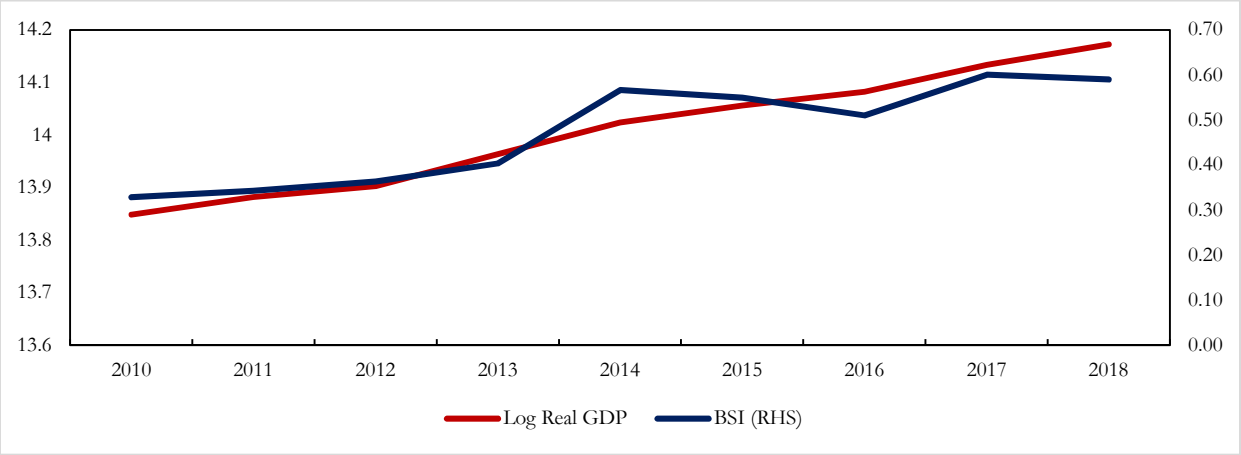
Figure 3: GDP and NPLs



Source: Reserve Bank of Malawi

On the other hand, GDP and the Bank Stability Index (BSI) shows that as GDP has grown over the years, the BSI has also been on an upward trend as is expected. Specifically, the BSI increased from 0.33 in 2010 to 0.59 in 2018. The BSI reduced slightly to 0.51 in 2016 but it rose again to 0.60 in 2017 (see Figure 4). The higher the BSI the more stable the financial system. The main components of BSI are soundness, asset quality, profitability and liquidity.

Figure 4: GDP and BSI

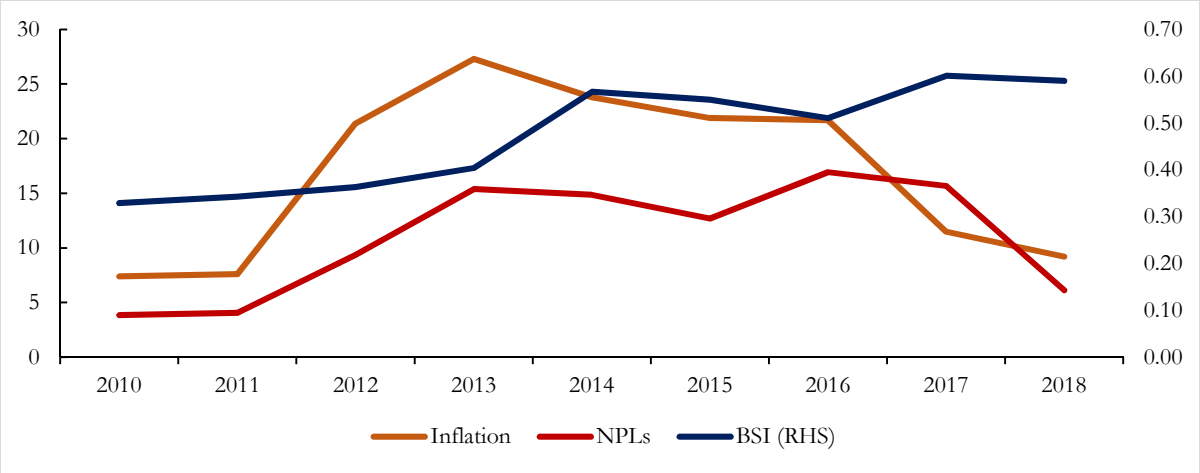


Source: Reserve Bank of Malawi

Relationship between inflation and NPLs shows that as inflation rose in 2011 to a peak of 27.3 in 2013, NPLs also rose from 4.06 percent to 15.39 in respectively. The fall in inflation from 2013 to 21.7 percent in 2016 saw the NPL ratio also fall but slightly rise to 16.96 percent in 2016. Figure 5 shows that since 2016, both inflation and NPLs have been declining and the BSI has been improving. Particularly, inflation dropped from 21.7 percent in 2016 to 9.2 percent in 2018 while NPLs declined from 17 percent to 6.2 percent in a similar period and the BSI rose to 0.59 percent from 0.51. Overall, a reduction in inflation seems to improve the NPLs and BSI. The positive relationship between the BSI and inflation is a reflection of the fact that commercial banks tend to

make more profits when there has been an increase in inflation since interest rates rise to counter high inflation.

Figure 5: Inflation, NPLs and BSI



Source: Reserve Bank of Malawi

III: Literature Review

3.1 Theoretical Review

Different perspectives on the relationship between finance and economic performance have been emphasized, and theoretical and empirical controversies on this subject exist since the beginning of the 20th century (Ang 2008). The debate can be summed up as follows. Pros highlight that the development of finance induces a better allocation of resources, mobilizes savings, can reduce risks and facilitates transactions. The financial sector acts as a lubricant for the economy, ensuring a smoother allocation of resources and the emergence of innovative firms. Cons recall that stock markets have destabilizing effects and that finance liberalization leads to financial crises. These more skeptical authors believe that the link between finance and economic growth is exaggerated (Stiglitz, 2000; Rodrik and Subramanian, 2009).

De Gregorio and Guidotti (1995) argue that the link is tenuous or even non-existent in the developed countries and suggest that once a certain level of economic wealth has been reached, the financial sector makes only a marginal contribution to the efficiency of investment. It abandons its role as a facilitator of economic growth in order to focus on its own growth. This generates banking and financial groups that are finally "too big to fail", enabling these entities to take excessive risk since they know it will be mutualized via public authorities' interventions. Their fragility rapidly transmits to other corporations and to the real economy.

The subprime crisis is certainly a good example of the power and magnitude of the effects of correlation and contagion on financial markets. Numerous empirical studies have investigated these questions. However, until recently, the literature highlighted a positive relationship between financial development and economic growth (Bumann et al. 2013).

3.2 Empirical Review

The subject matter of financial stability received limited attention until (Kindleberger 1978) and later (Minsky, 1991) looked at financial instability. Henceforth, there have been a number of studies on financial stability (Arteta, 2000; Sarat et.al., 2011; Subbarao, 2009, 2012; Gosh, 2011) but the literature on financial stability remains undeveloped. More specifically, available literature on financial stability in relation to macroeconomic conditions is very limited despite the important role that macroeconomic conditions play on financial system stability.

Jacobsen et. al. (2005) and Tsatsaronis (2005) argued that the role of the macro-economic environment on the financial sector is multi-dimensional. The study found that economic activities have a direct implication on the conditions of financial institutions and their stakeholders. This then has direct implications for both the financial institutions and the financial markets. In a recent post-financial crisis study, (Borio 2011) argued that financial and macroeconomic stabilities are two sides of the same coin and monetary policy plays a critical role in both.

Studies by Kraft and Galac (2007), Soedarmono et. al., (2011), Pan & Wang (2013) and Creel et. al. (2014) suggested that economic growth and interest rates play a crucial role on financial stability.

Through analysis of the impulse response of the VAR model, (Sarat et. al. 2011) established that financial stability has a statistically significant bi-directional causal relationship with macroeconomic variables. They observed that higher economic progress could lead to greater financial stability. On the other hand, higher inflation or price instability could adversely affect financial stability. Hence, financial stability can be associated with enhanced output and lower inflation.

Prochniak and Wasiak (2013) stipulated that the functioning of the financial system, including its level of development and stability depends on economic conditions. Using the Blundell and Bond's generalized method of moments (GMM) system estimator, they analyzed the interactions between macroeconomic policy and financial stability. Their findings showed that growth in GDP per capita, increase in economic growth and good fiscal stance have a positive impact on financial sector stability.

Further, in a more recent study by (Abdul-Karima et al 2015) where the ARDL methodology was used, the findings suggest existence of long-run relationship between banking stability and macroeconomic conditions such as GDP, interest rate and inflation. This confirms the critical role that the general economic conditions have on the financial sector. Zermano et al., (2018) explored the influence of in inflation on the conditional distribution of financial development with data from 84 countries covering the 1980-2010 period. Using panel quantile regression, the study found a consistently negative and nonlinear effect of price increases on financial variables.

Specifically, the impact of inflation was statistically significant in the full sample of countries, significant in developing countries, and insignificant in developed countries. Standard stress tests consider only first round effect from macroeconomic variables to financial stability indicators. However, the occurred shocks in banking sector reflect on macroeconomic indicators throughout different transmission mechanisms, such as expectations of economic agents and expected responses of banking sector to increased credit risk.

As such, Marghia (2018) explored dynamic relationship between macroeconomic variables and indicators of financial stability, proving the relevance of considering second-round effects for better policy analysis for Georgia. Using VAR approach to analyze various interactions between indicators through Impulse Response Functions (IRFs) and conducting different stress scenarios on exogenous variables, the results showed that there is a significant relationship between real and financial variables, proving the countercyclical nature of NPLs with respect to different estimates of GDP gap. The results also proved that change in NPL ratio strongly impacts credit growth represented as change in Credit to GDP ratio.

At the same time, change in Credit to GDP ratio explain significant part of output gap forecast error and has significant contribution to business cycle fluctuations, strengthening the impact of NPLs and financial stability as a whole on the real economy. Overall, empirical literature on financial sector and its stability shows an existing bi-directional relationship between the financial sector stability and macroeconomic variables. On one hand, the financial sector and its stability plays a vital role in driving economic growth. On the other hand, macroeconomic variables are essential for the smooth functioning and stability of the financial sector.

IV: Methodology

This study uses the Structural Vector Autoregression (SVAR)[1] modelling approach to analyze the impact of macroeconomic variables on financial stability in Malawi. VAR models are advantageous in that they provide a less theory-bound empirical analysis while taking into account interactions of important variables as proposed by Khan & Ahmed, (2011). Several studies such as Marghia (2018) explored dynamic relationship between macroeconomic variables and indicators of financial stability, proving the relevance of considering second-round effects for better policy analysis for Georgia using VAR.

4.1 Model specification and method of analysis

One assumption of regression analysis is that the variables on the right hand side of an equation are predetermined or exogenous (Gujarati, 2004). Most macroeconomic variables are said to be endogenous such that running a regression using Ordinary Least Squares (OLS) produces inconsistent and biased estimates. As such, literature suggests using Vector Autoregression (VAR) as an alternative to the simple OLS. However, an ordinary VAR model also has limitations such as the identification problem and it is a-theoretical. In our case an attempt was made to use alternative methods such as Vector Error Correction model (VECM) but the unit root tests showed that some of the variables were stationery in levels while others were stationary after first differencing. In addition, Autoregressive Distributed Lag (ARDL) method was also attempted but the models failed other tests such as the bounds test.

One procedure that has been proposed to resolve the identification problem in a VAR framework is to estimate a SVAR model which involves diagonalizing the variance-covariance matrix of the VAR system using a triangular orthogonalization process as in Lütkepohl, (1993). This is achieved by estimating the reduced-form VAR model, then computing the Cholesky factorization of the models' covariance matrix. This procedure is also called recursive VAR modelling procedure. It resolves the identification problem by ensuring that shocks to the VAR system can be identified as shocks to the endogenous variables in each equation (as in a reduced-form VAR).

Therefore, we assume that structural shocks are orthogonal, which means that the covariance matrix of the VAR residuals conveys information about the coefficients of the contemporaneous relationships between endogenous variables, as in Jarocinski (2010). The underlying assumption that innovations in the different equations are uncorrelated (that is diagonal) is in general not compatible with the observed data and with the theoretical background. This requires imposing restrictions on the correlation structure of the VAR residuals.

The relationship between reduced-form disturbances ε_t and structural shocks μ_t is as follows:

$$\varepsilon_t = B * \mu_t \tag{1}$$

with the following structure in the case of the Banking Stability Index (BSI):

$$\begin{pmatrix} \varepsilon_{gdp} \\ \varepsilon_{exr} \\ \varepsilon_{def} \\ \varepsilon_{bsi} \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 \\ b_{41} & b_{42} & b_{43} & 1 \end{pmatrix} * \begin{pmatrix} \mu_{gdp} \\ \mu_{exr} \\ \mu_{def} \\ \mu_{bsi} \end{pmatrix} \tag{2}$$

And the following structure for asset quality:

$$\begin{pmatrix} \varepsilon_{gdp} \\ \varepsilon_{exr} \\ \varepsilon_{def} \\ \varepsilon_{asset} \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 \\ b_{41} & b_{42} & b_{43} & 1 \end{pmatrix} * \begin{pmatrix} \mu_{gdp} \\ \mu_{exr} \\ \mu_{def} \\ \mu_{asset} \end{pmatrix} \tag{3}$$

where B is a lower triangular matrix obtained from a Cholesky decomposition of the covariance matrix. The present model with equation (2) is a B-model and $K(K-1)/2$ restrictions have to be imposed to identify B. Restricting B to be a lower triangular matrix ensures that the first component of μ_t, μ_{gdp} can have an instantaneous impact on all equations, where μ_{exr}cannot affect the first equation instantaneously but only all the others, and so on. Hence, the recursive structure implies the required K(K-1)/2 zero restrictions. Thus, in this paper, we assume a recursive transmission scheme under the assumption that real GDP does not respond immediately to shocks of the other variables while the financial stability index responds to shocks from all the other variables immediately.

4.2 Data and Variables

The study uses quarterly data for the period 2010Q1 to 2019Q2. The period is primarily based on availability of data for banking system financial soundness indicators, which are key for computation of our core variable (Banking Stability Index (BSI)). The other variables used in this study include real GDP, fiscal deficit and the exchange rate. The selection of the variables is based on similar research done in other countries such as Kraft & Galac, (2007), Soedarmono et. al., (2011), Pan & Wang, (2013) and Creel et. al., (2014). Real GDP and fiscal deficit are expected to have a positive impact on financial stability while the exchange rate is expected to have a negative impact.

The data on all the variables was obtained from Reserve Bank of Malawi (RBM) except for GDP which was sourced from the NSO but was transformed to quarterly frequency using the Kalman filter. The paper uses asset quality index and BSI as proxies for financial stability. Asset quality in this case is measured as ratio of NPLs to gross loans and leases.

BSI for Malawi is computed as the weighted aggregate of CAEL indicators for banking soundness namely: capital adequacy, asset quality, earnings, and liquidity. In order for the individual indicators to be summed into a single index, they need be put on the same scale using normalization procedure.

We therefore use the commonly used normalization technique as propose by Karanovic, (2015): empirical normalization, which uses max-min method as follows:

$$I_{it} = \frac{x_{it} - min(x_{it})}{\max(x_{it}) - \min(x_{it})} \qquad (4)$$

Where, $\boldsymbol{I_{it}}$ represent normalized indicator *i* at time *t*; $\boldsymbol{x_{it}}$ represent the value of indicator *i* at time *t*; $\mathbf{max}(\boldsymbol{x_{it}})$ and $\mathbf{min}(\boldsymbol{x_{it}})$ represent the respective best and worst values of each indicator. Each indicator is represented by at least two ratios as presented in table 1. In terms of the weighting, asset quality is given the highest weight of 0.35, soundness and liquidity have the weight of 0.25 each and while liquidity is given a weight of 0.15. The determination of the weights was based on the structure of the banking industry in Malawi.

Table 1: Soundness indicators

Soundness Indicator	Ratios
Capital adequacy	Tier 1 capital to risk-weighted assets Total capital to risk-weighted assets
Asset quality	NPLs to gross loans and leases NPLs to gross total assets
Earnings/profitability	Return on Asset (ROA) Return on Equity (ROE)
Liquidity	Net Interest Income ratio Liquid assets to total deposits and short-term liabilities Total deposits to gross total assets

V: Estimation Results

5.1 Diagnostic Tests

All the variables were tested for stationarity using the Phillips-Perron test. The results show that except for logarithm of fiscal deficit and the BSI, all the other variables were non-stationary in levels and only became stationary after differencing once. As such, we used logarithm of fiscal deficit and the BSI in levels and the other variables in their first differences.

The optimal lag length for the models was selected using the Akaike Information Criterion (AIC) thus one lag for the BSI model and 2 lags for the asset quality model. Residual tests of the models indicated that there was neither serial autocorrelation as determined by the Lagrange Multiplier (LM) test nor was there heteroscedasticity according to the Breusch Pagan Test. Both models were stable as the inverse roots of the AR characteristics polynomial were within the unit root circle. Results of the diagnostic tests are presented in Appendices I and II.

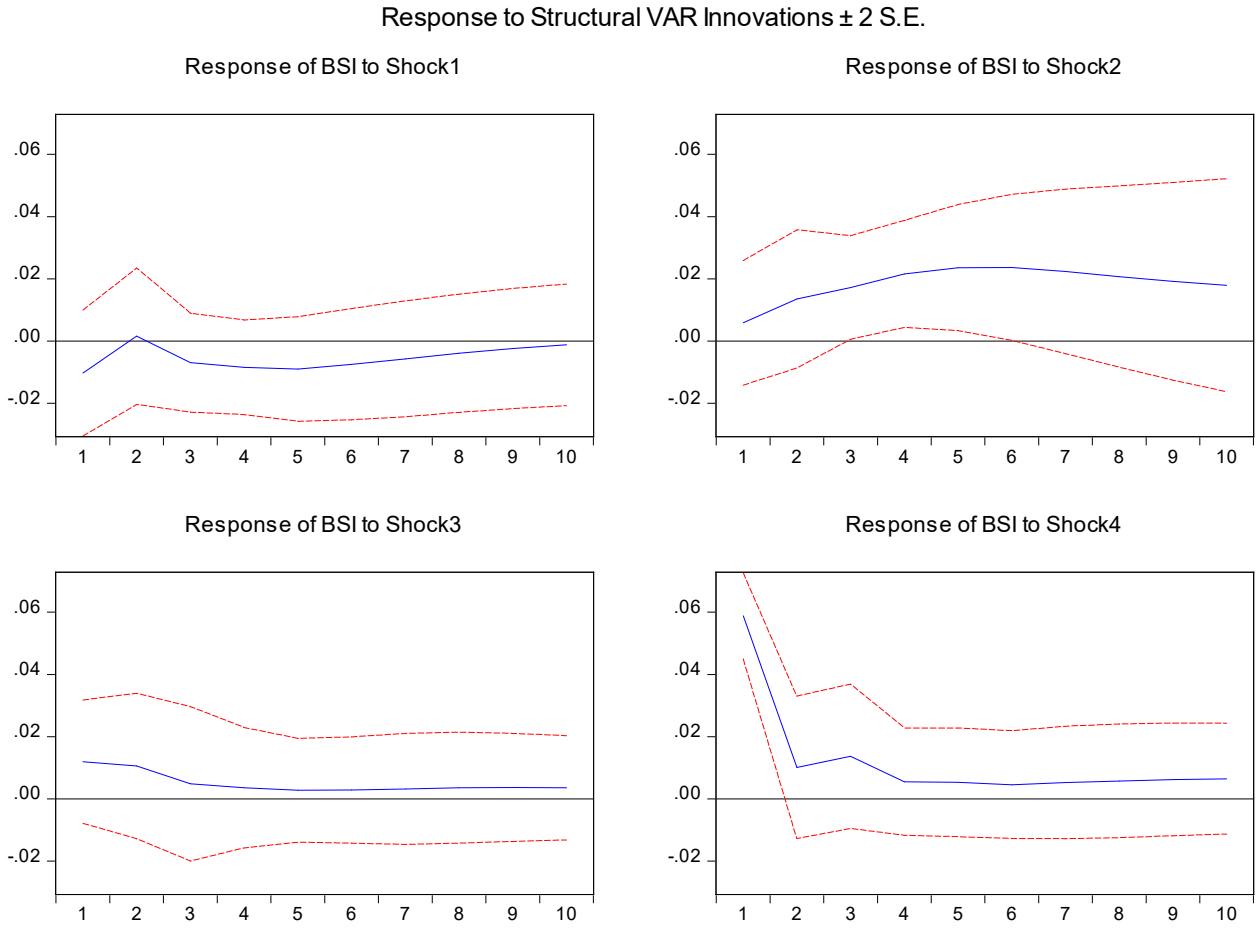
Table 2: Unit Root Test Results

Variable	T-Statistic and p-value (in parenthesis)	Order of Integration
Log Exchange Rate	3.09001 (0.9994)	I(1)
D(log Exchange Rate)	-5.1807 (0.0000)	
	-4.1658 (0.0084)	I(0)
Log Fiscal Deficit		
	-4.1964 (0.0108)	I(0)
BSI		
	-1.2525 (0.6465)	I(1)
Log Real GDP		
D(Log Real GDP)	-5.7858 (0.0000)	
	-0.7054 (0.4044)	I(1)
Asset-quality		
D(Asset-quality)	-5.8279 (0.0001)	

5.2 Results and Interpretation

In order to evaluate the impact of macroeconomic conditions on financial stability, we construct impulse response functions from the SVAR estimates. The impulse response functions trace the effects on a variable of a given shock to the innovations from an equation in the SVAR system over time (Enders 2015). Figure 6 contains impulse response function of BSI to a one standard deviation shock on exchange rate, real GDP and fiscal deficit.

Figure 6: Impulse response functions of BSI[2]

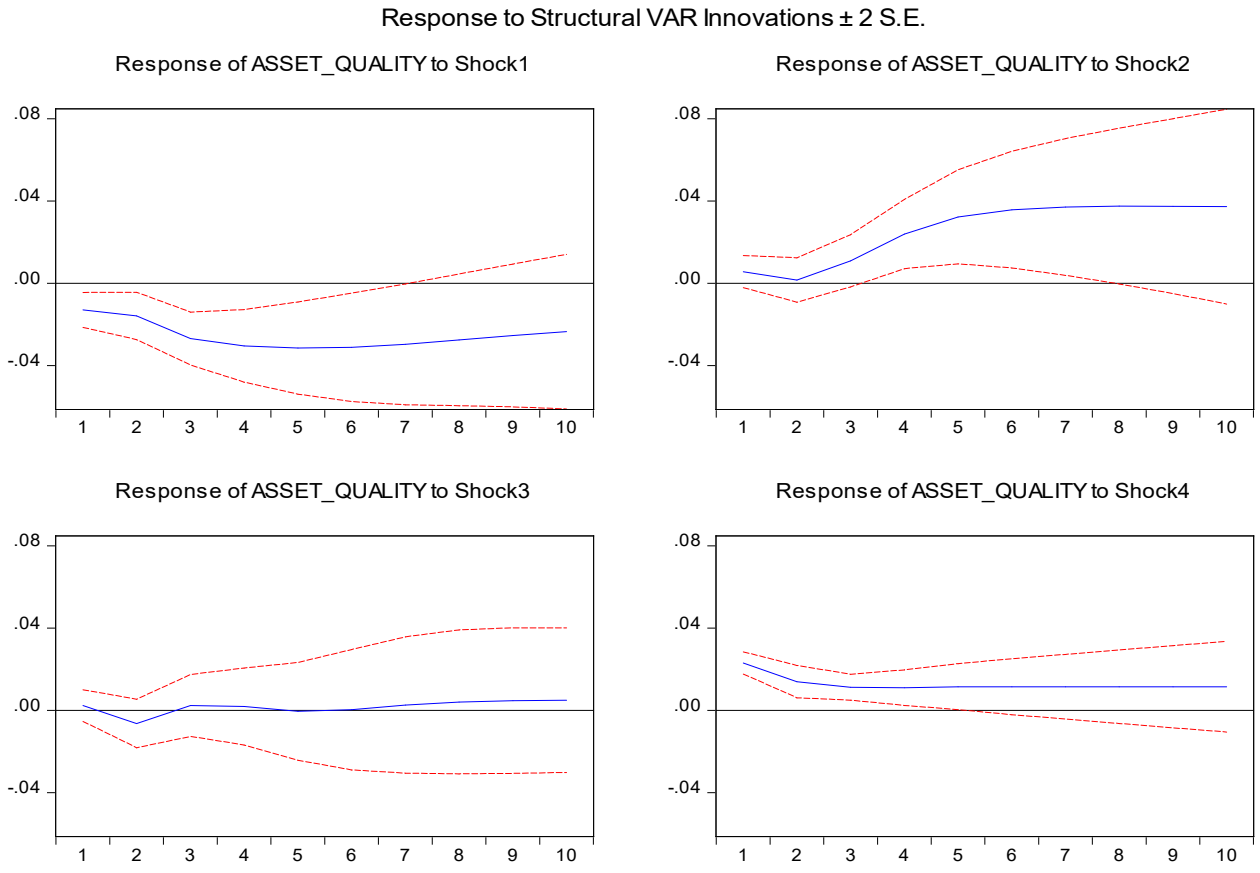


An analysis of the impulse response functions indicates that BSI responds positively to a one standard deviation shock to real GDP (shock 2) and that the impact is statistically significant in quarters 3 to 6. This implies that the increase in economic activity promotes financial sector stability. Understandably, with increased economic activity, economic agents tend to engage the financial system in a number of ways such as increased intermediation, repayment of loans and facilitation of imports which tend to generate positive returns for the financial system particularly the banks. A functioning economy increases disposable income for most economic agents hence their increased participation in financial activities.

The impulse response functions also indicate that the impact of shocks to exchange rate (shock 1) and fiscal deficit (shock 3) are not statistically significant despite the direction of the responses being according to expectations.

[2] Shock 1 is Exchange rate, Shock 2 is Real GDP, Shock 3 is fiscal deficit and Shock 4 is BSI

Figure 7: Impulse response functions of Asset Quality[3]



From the results, it can be observed that in the case of asset quality, two shocks have a significant impact namely, real GDP and the exchange rate. With a depreciation of the exchange rate, asset quality worsens. An exchange rate depreciation results into higher inflation for the case of Malawi. Under inflationary situations, the asset quality of financial intermediaries comes under pressure due to the adverse impact of inflation on growth. Thus, the higher the price instability, the greater will be asset quality concerns and pressure on earnings and need for higher capital and provisioning as non-performing loans tend to rise.

5.3 Variance Decomposition

Looking at the variance decomposition of BSI, it can be observed that after a 12 quarters, most of the variations are explained by itself and real GDP at 44 percent and 46 percent respectively. The exchange rate and fiscal deficit explain less than 5 percent of the variations in BSI.

[3] Shock 1 is Exchange rate, Shock 2 is Real GDP, Shock 3 is fiscal deficit and Shock 4 is Asset quality

On the other hand, the variance decomposition of asset quality shows that real GDP and the exchange rate are the two variables that explain a significant share of the variations in asset quality over 12 quarter period.

Figure 8: Variance Decomposition of BSI and Asset Quality

BSI

Period	S.E.	Exchange Rate	Real GDP	Deficit	BSI
1	0.061217	2.836162	0.907674	3.791641	92.46452
5	0.077151	5.209322	25.76587	4.984249	64.04056
10	0.091967	4.997800	43.85673	4.172650	46.97281
11	0.093803	4.805300	45.41914	4.135138	45.64043
12	0.095468	4.641173	46.72723	4.095482	44.53612

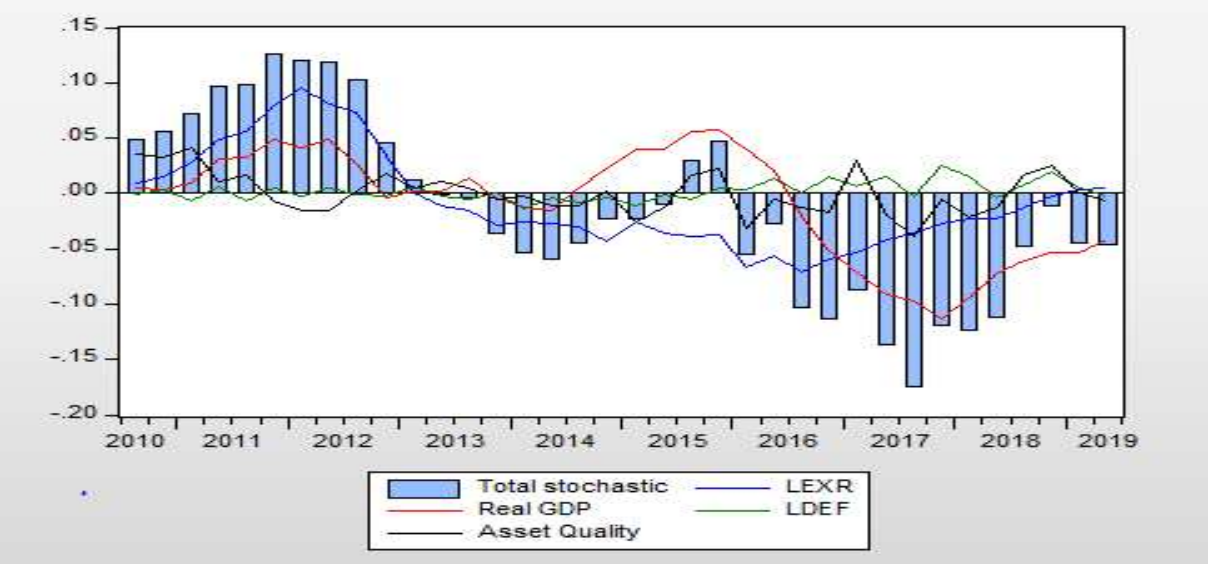
Asset Quality

Period	S.E.	Exchange Rate	Real GDP	Deficit	Asset Quality
1	0.088924	22.96287	4.269052	0.718255	72.04983
5	0.220171	51.27177	29.45540	0.921351	18.35147
10	0.275031	39.64483	49.55846	0.715188	10.08153
11	0.283017	37.98636	51.54215	0.769699	9.701796
12	0.290357	36.43942	53.32132	0.815433	9.423827

5.4 Historical Decomposition

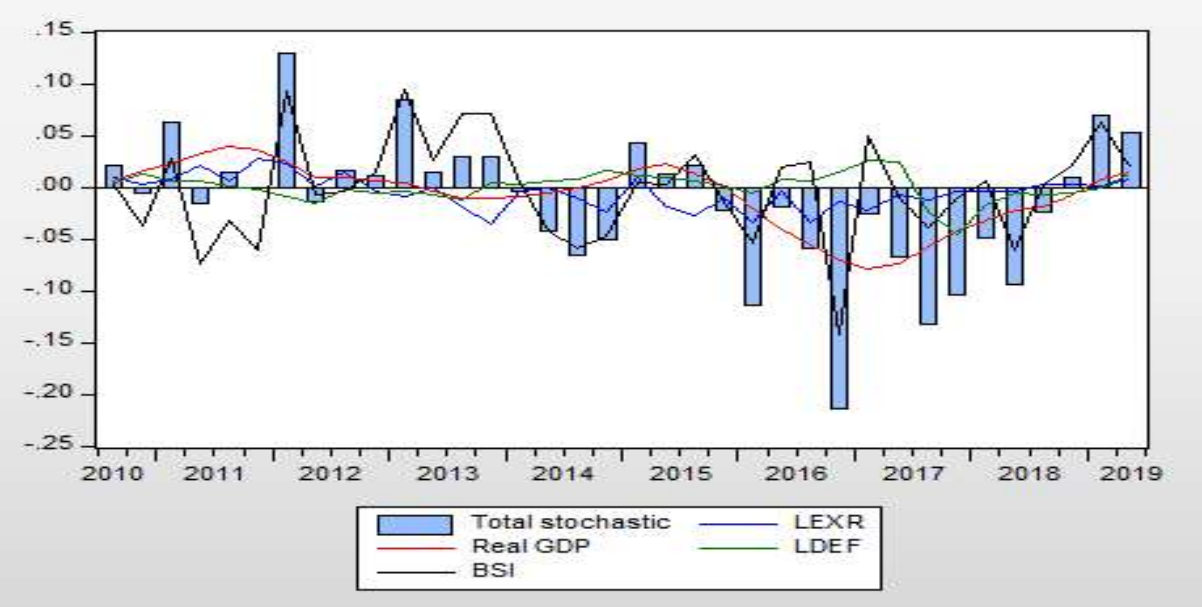
We use historical decomposition to determine the main sources of variations in BSI and asset quality over time (Figures 9 and 10).

Figure 9: Historical Decomposition of Asset quality



Over the sample period, it can be observed that it is the still the exchange rate and real GDP that explain most of the variations in asset quality. In the case of the BSI, it is only real GDP that explain a significant part of the variations in asset quality (Figure 10).

Figure 10: Historical Decomposition of Asset quality



Similar analysis was conducted using the other components of the BSI, namely profitability, liquidity and soundness. However, no significant results were obtained.

VI: Conclusion

From the foregoing, we conclude that economic performance is a major determinant of the state of a financial system. Periods of favourable economic growth in Malawi have been followed by low non-performing loans and high bank profits. An empirical analysis of the impact of macroeconomic conditions, indicate that increased economic activity is favourable to well-functioning financial system and therefore ensures stability. However, depreciating exchange rate yields higher inflation which reduces disposable income for economic agents, affects bank performance and undermines financial system stability. Thus, volatile exchange rates are undesirable for financial stability and have to be avoided if countries need to maintain financial stability. As such, there is need for continued monitoring of macroeconomic variables such as exchange rate to ensure the stability of the financial sector by the central bank.

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APPENDIX 1: DIAGNOSTIC TESTS FOR MODEL WITH BSI

VAR Lag Order Selection Criteria

Endogenous variables: EXR REAL_GDP DEF BSI

Exogenous variables: C

Date: 11/22/19 Time: 08:40

Sample: 2010Q1 2019Q2

Included observations: 33

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-97.42667	NA	0.005493	6.147071	6.328466	6.208105
1	16.10279	192.6561*	1.50e-05*	0.236194*	1.143169*	0.541364*
2	24.92607	12.83386	2.43e-05	0.671147	2.303701	1.220452
3	36.57977	14.12570	3.58e-05	0.934559	3.292692	1.727999
4	52.74348	15.67390	4.58e-05	0.924638	4.008350	1.962213
5	65.61607	9.361882	9.03e-05	1.114178	4.923470	2.395889

* indicates lag order selected by the criterion

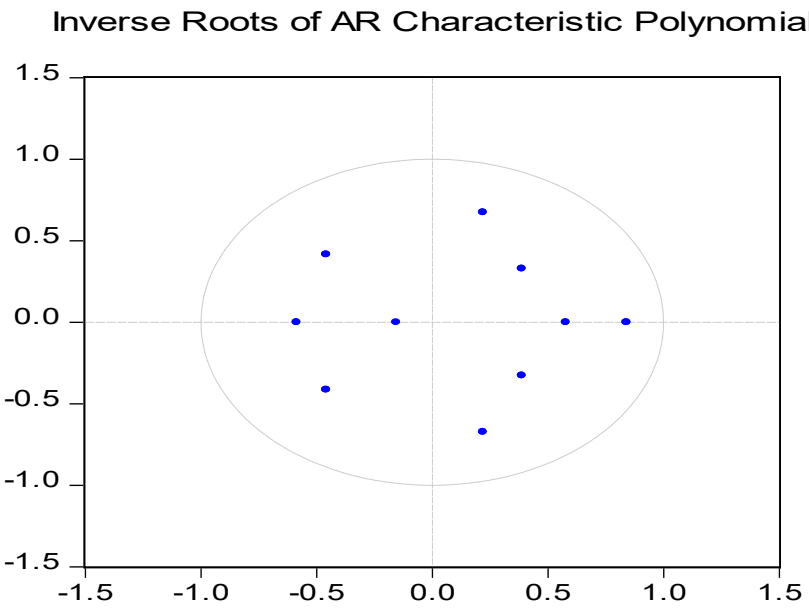
VAR Residual Serial Correlation LM Tests
Date: 11/22/19 Time: 08:41
Sample: 2010Q1 2019Q2
Included observations: 36

Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	14.78358	16	0.5405	0.925879	(16, 61.7)	0.5450
2	15.91579	16	0.4589	1.005339	(16, 61.7)	0.4635
3	12.47213	16	0.7109	0.767666	(16, 61.7)	0.7142

VAR Residual Heteroskedasticity Tests (Levels and Squares)
Date: 11/22/19 Time: 08:50
Sample: 2010Q1 2019Q2
Included observations: 36

Joint test:

Chi-sq	df	Prob.
137.0115	160	0.9057



APPENDIX 2: DIAGNOSTIC TEST RESULTS FOR THE MODEL WITH ASSET QUALITY

VAR Lag Order Selection Criteria
Endogenous variables: EXR REAL_GDP DEF ASSET_QUALITY
Exogenous variables: C
Date: 11/22/19 Time: 09:20
Sample: 2010Q1 2019Q2
Included observations: 35

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-108.9206	NA	0.007455	6.452605	6.630359	6.513966
1	40.25185	255.7242	3.72e-06	-1.157249	-0.268478*	-0.850445
2	60.75610	30.46346*	2.99e-06*	-1.414634*	0.185152	-0.862388*
3	73.27059	15.73249	4.05e-06	-1.215462	1.095341	-0.417773

VAR Residual Serial Correlation LM Tests
Date: 11/22/19 Time: 09:24
Sample: 2003Q1 2019Q2
Included observations: 36

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	18.35086	16	0.3038	1.180735	(16, 61.7)	0.3084
2	12.33780	16	0.7204	0.758634	(16, 61.7)	0.7237
3	9.389081	16	0.8965	0.564751	(16, 61.7)	0.8980

VAR Residual Heteroskedasticity Tests (Levels and Squares)
Date: 11/22/19 Time: 09:24
Sample: 2010Q1 2019Q2
Included observations: 36

Joint test:

Chi-sq	df	Prob.
166.4447	160	0.3473