**FEEDBACK EFFECT OF INSTABILITIES IN THE BANKING SYSTEMS ON THE REAL ECONOMY**

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**Abstract**

The relationship between the banking sector and the real sector is not new in the literature. The resilience of banking systems does not just affect the financial system but also extends to the broader macroeconomy. Over the last few decades, the inherent instability and volatility of the banking systems have been more apparent, prompting a reassessment of their influence on the real economy. Most studies that consider the nexus between these variables focus on the determinants of banking stability and the impact of a shock in the real sector on the dynamic nature of the banking sector. However, studies that examine the feedback effect of a shock to the banking sector on the real sector are rare in the literature, especially in the case of developing economies. Consequently, this paper examines the impact of a shock to banking stability on the real sector in SSA where most banks are characterised by high non-performing loans and low liquidity. This study looked at the impacts of shock to banking stability on the macroeconomic variables in the context of SSA using the Panel VAR model, and its associated impulse response function and variance decomposition. The study employed data on seventy-five banks across six SSA economies spanning from 2012 to 2021.

The results reveal that a shock to the NPL leads to a reduction of approximately 3.8%, 4%, and 7.8% in credit growth, GDP growth rate, and real interest rate respectively, and an increase in inflation to approximately 5.8% point in the first period. Also, a shock to credit growth was found to have positive impacts on NPL and inflation in the first period while it was documented to have negative impacts on GDP growth and real interest rate in the first period. The results showed an erratic response of the macroeconomic variables to a shock in the banking industry, but these shocks die off gradually. The variance decomposition results showed that a larger portion of the variation in the NPLs can be explained by shocks in NPLs while a larger portion of the variation in credit growth can be explained by a shock in real interest rate. The findings are vital to policymakers and central banks in SSA as they demonstrate the impact of bank instability on the real sector of SSA economies.

*Keywords: banking instability, feedback effects, impulse response, panel VAR, real economy.*

JEL classification codes: C33, E44, G21, O11

**1. Introduction**

The banking system is the backbone of economic stability, and the global financial landscape is a complex network of interconnected markets and organisations. As the backbone of the economy, the banking system is essential for directing capital to the various sectors of the economy, enabling investment, and preserving monetary stability. However, this very mechanism is vulnerable to both internal and external shocks (emanating from macro-economic variables or other sources like pandemic), that might subsequently lead to financial instability. Nevertheless, the resilience of banking systems does not just affect the financial system but also extends to the broader macroeconomy. Over the last few decades, the inherent instability and volatility of the banking systems have been more apparent, prompting a reassessment of their influence on the real economy. The global financial crisis of 2007–2009, which resulted in a global recession because of the failure of large financial institutions, serves as a clear reminder of the significant impact that instability in the banking sector may have on the real economy.

The global financial crises (2007 - 2009) generated interest in the reciprocal linkages between financial system stability and macroeconomic performance (Alodayni, 2016). This is because the 2007-2009 financial crises brought to bear that, instabilities in macroeconomic variables affect financial system stability while instabilities in the financial systems also affect the real economy. Given this, issues of financial stability have become a key concern for policymakers particularly central banks, because the failure or collapse of the financial system results in enormous economic and social costs (Singh et al., 2015). Understanding these feedback effects is important for financial institutions, scholarly discourse as well as policymakers, and regulators who are responsible for maintaining economic stability to appreciate these feedback consequences. The effects of banking sector instability are felt globally as economies get more interconnected, hence the need for a thorough analysis of the mechanisms at work is required.

Over the years, most researchers have focused on how macroeconomic shocks can impact the stability of the financial systems through the implementation of stress testing of the banking sector/financial system to macroeconomic shocks. These include studies on system-wide financial stress testing such as system-wide stress test for the European financial system (Farmer et al., 2020), macro-financial shocks and expected default frequencies in the euro area (Castren et al., 2008), financial sector health since 2007 in the United States, Europe, and Asia, (Acharya, 2017), stress testing exposure of banks to sectors of the Ghanaian economy (Aboagye & Ahenkora, 2018), and the relationship between financial soundness indicators and financial stability in Nigeria (Udom et al., 2015). These empirical works have assessed how macroeconomic shocks can contribute to banking /financial system instability. Hence, some effort has gone into improving the risk management measures for the banking/financial industry, which has brought about stress testing becoming part of banking system assessment. Given the basis that Sub-Saharan African economies are forming their path in the global financial sphere, a deeper understanding of banking resilience is a vital tool for promoting economic stability and sustainable development.

The banking systems found in Sub-Saharan Africa are integral to the operation of the economies in the sub-region. The sub-region is characterised by a varied and dynamic economic landscape (Pattillo et al., 2006). However, the region’s sustained economic progress is limited by the banking institutions’ vulnerabilities to instability. Sub-Saharan African banking systems frequently encounter difficulties linked to sensitivity to external economic shocks, insufficient risk management techniques, and weak regulatory frameworks (Pattillo et al., 2006). These weaknesses have the potential to intensify the effects of instability in the banking industry. The economies of Sub-Saharan Africa are not immune to current turbulence in the world financial system. The potential for financial sector instability to have spillover effects, whether originating locally or globally, makes it necessary to investigate how these dynamics impact local real economies.

Though the global financial crises (2007-2009) brought to light the reciprocal linkages between financial system stability and macroeconomic performance as indicated above, only one side of the coin has been dealt with by most researchers. That is, examining the instabilities in the financial/banking system because of macroeconomic shocks without looking at the possible feedback effect of the instabilities in the banking/financial system on the real economy. Though stress testing has become one of the popular tools for assessing the resilience of banks/banking systems to shocks, research in this area usually ends at stage one (assessing the resilience of the banking sector to macroeconomic shocks). All the empirical work on financial/banking stability stated above did not consider the reciprocal linkages (feedback effect) on the real economy. The literature points to the fact that most stress testers of the banking/financial systems do not go further to consider the feedback effect of instabilities in the banking systems on the real economy. Hence, little has been done in this regard.

Therefore, exploring the dynamics of macroeconomic feedback effects resulting from sub-Saharan African banking sector instability is worth considering. Providing a comprehensive knowledge of the connectivity between the macroeconomic and financial domains by evaluating how disruptions in the banking sector transmit through the broader economic environment, is key for economic growth and macroeconomic stability.

There is still much to learn about how banking system instability in sub-Saharan Africa affects real economic factors like employment, inflation, real interest rate, investment, GDP growth, and overall economic growth in the sub-region (Aluko & Ajayi, 2018). It is essential to understand these processes to develop interventions and policy responses that work. This is because the banking industry in sub-Saharan Africa faces a distinct set of difficulties, such as the predominance of informal financial practices, low levels of financial inclusion, and vulnerability to external shocks. Considering this, policymakers, financial institutions, and other stakeholders seeking to strengthen the resilience of African economies must understand how the instability of these banking systems affects the larger economy.

In this context, an investigation of the feedback effects produced by banking system instability on the real economy is necessary due to the unique features of the economies of Africa and the global interconnection of financial systems. This study therefore undertakes the feedback effect of instabilities in the banking system on the real economy to contribute to knowledge on reciprocal linkages between banking system instability and the macroeconomy. Through a review of theoretical frameworks, empirical evidence, and historical events, we seek to identify the mechanisms by which the instability in the banking sector affects important economic indicators like inflation, real interest rate, and gross domestic product (GDP) growth rate. The assessment of these linkages may bring to bear the macro-financial vulnerabilities that are linked to the current surge of non-performing loans (NPLs) in the banking systems of the African sub-region. Therefore, the main question to be addressed here is:

What is the feedback effect of disturbances in the banking system on the macroeconomy? The subsidiary questions to be addressed are:

1. What is the feedback effect of credit risk (non-performing loans (NPL)) shock on the macroeconomy?
2. What is the feedback effect of credit growth shock of the banking system on the macroeconomy?

Consequently, the main objective is to examine the feedback effect of disturbances in the banking system on the macroeconomy. Hence, the sub-objectives are to:

1. Assess the feedback effect of credit risk shock on the macroeconomy.
2. Assess the feedback effect of credit growth shock of the banking system on the macroeconomy.

The organisation of the remaining sections of the study is as follows. The significance of this empirical paper is stated in section 1.1. Section three provides a discussion on the empirical review of the study. The methodological issues are presented in section four, which details the data, variables, empirical model, and estimation strategy employed for the study. The results and discussions are presented in section five. Section six covers the conclusion, recommendations, and summary of the study.

* 1. **Significance of Study**

This study contributes to knowledge in many ways, such as theoretical, empirical, methodological, and managerial contributions. This study contributes to theoretical knowledge by showing that changes in the banking system (credit risk shock, credit growth shock) affect the real economy. That is, it has shown that variations in banking stability (instability) can intensify economic downturns in the context of sub-Saharan Africa, where banking systems frequently struggle with vulnerabilities hence confirming the monetary transmission theory which posits that changes in the financial system can affect the real economy (Mishkin, 1996). The study contributes to empirical knowledge by providing empirical evidence on the feedback effect of credit risk (non-performing loans) shock on the macroeconomy. Additionally, it provides empirical evidence on the feedback effect of credit growth shock of the banking system on the macroeconomy.

Extant literature has examined the ability of banking systems to withstand potential macro shocks without assessing the feedback effect that banking instability will transmit to the macroeconomy. The feedback effect of banking instability on the macro economy has been marginalised in the literature. This study contributes to methodological knowledge by employing bank-level data (from balance sheet data). Extant studies on feedback effects have relied on country-level data and stock market data. The study also contributes to managerial knowledge by providing a better understanding of how variations in banking stability (instability) can intensify economic downturns in the African sub-region all things being equal. Also, the study contributes to managerial knowledge by offering policymakers and regulatory authourities insight into the feedback loops that can either mitigate or intensify the effects of financial instability. Additionally, given diverse economic, political, and social contexts, this study contributes to managerial knowledge by bringing to bear how macroeconomic factors (GDP growth rate, inflation, real interest rate) respond to variations in credit risk and credit growth of banks in the African sub-region.

**2. Literature Review**

**2.1 Theoretical Review**

**The Dynamics of the Banking System and Financial Fragility**

The financial stability theory suggests that the stability of the financial system is important for the overall health of the economy (Borio & Drehmann, 2009). Likewise, the monetary transmission theory explains how changes in the financial system can affect the real economy (Mishkin, 1996). This theory suggests that changes in the financial system, such as changes in interest rates or credit availability, can affect the behaviour of households and businesses (Cecchetti & Kharroubi, 2019). These changes can then have an impact on the real economy, such as changes in consumption, investment, and employment. Furthermore, the credit channel theory suggests that changes in the financial system can affect the availability of credit to households and businesses. Changes in credit availability can then have an impact on the real economy, such as changes in consumption, investment, and employment (Klein, 2013).

 The concept of financial fragility serves as a crucial foundation of this theoretical framework. According to Minsky’s (1982) theory of financial instability, stable financial systems tend to become complacent, which encourages financial institutions to take more risks. In turn, this increased risk exposure may lead to financial crises that have an impact on the actual economy. Following Minsky’s paradigm, one can gain insight into how variations in financial stability might intensify economic downturns in the context of sub-Saharan Africa, where banking systems frequently struggle with vulnerabilities. In addition to external shocks, the region's banking systems’ tendency to go through unstable periods could worsen the effects on the actual economy.

**Theories that underpin Non-Performing Loans/Credit Risk**

The theory of asymmetric information is one of the theories that affect non-performing loans. The asymmetric information theory postulates that it could be difficult to differentiate between good and poor debtors, and that may lead to undesirable selection and consideration (Levin, 2001). When one party has information that the other side does not, asymmetric information is created (Levin, 2001). According to the theory of asymmetric information, market imperfections may occur if an advantaged party uses the information to their advantage.

 The role of credit information sharing (CIS) in preventing adverse selection in the credit market was examined by Pagano and Jappelli (1993). According to their research, loan rationing is fostered by information asymmetry between borrowers and lenders. Every institution possesses information about its clients but lacks information about fresh applicants. Credit providers have the potential to drastically reduce NPLs if they can exchange information about their client's financial performance. This is because only credit-worthy clients will be admitted. Akerlof’s (1970) research revealed that asymmetry can entirely impede efficient credit allocation. Nonetheless, a prudent bank would endeavour to decrease asymmetry by paying for search costs to obtain trustworthy data about the borrower applying for a loan.

Another theory influencing non-performing loans/credit risk is adverse selection theory. High-risk borrowers are usually ready to pay higher interest rates for loans. Banks are exposed to adverse selection risk when they lend high-risk borrowers because they usually do not know the risk-taking level of these borrowers (Pourebadollahan Covich et al., 2021). Consequently, the level of non-performing loans increases.

In addition, credit risk is affected by the mora hazard theory. Moral hazard arises when bank managers take on more risk and lend money without properly verifying the credit of their clients because they believe that their actions may be transferred to bank shareholders or depositors. That is, bank managers choose clients carelessly because they do not bear the consequences of taking on more risk. Thus, the possibility of lending to high-risk consumers rises, and consequently non-performing loans increase (Pourebadollahan Covich et al., 2021). NPLs of banks have significantly increased due to moral risk and unfavourable selection.

Also, the principal-agent theory talks about the ‘conflicts of interest’ that exist between the principal (shareholder) and the agent (bank manager). Ideally bank managers are to act in the best interest of shareholders but they end up pursuing their personal interest at the expense of their principal (shareholder). Therefore, bank managers pursue higher returns without critically assessing the risk since they do not bear the cost. Hence, they end up giving loans to high-risk customers which may translates to higher non-performing loans.

**Theories on the regulatory environment and banking crises**

The banking sector is unique when it comes to regulation since experience has demonstrated that failure (bankruptcy) in this sector has external repercussions. Because financial failures had large external impacts that extended beyond the depositors and owners of the financial institution, there is a need to protect the viability of the banking sector (Ugochukwu Uche, 2001).As vulnerable financial intermediaries, banks can experience a decline in the value of their assets due to credit risk (borrowers' inability to service their debt), which can lead to insolvency. If loan losses exceed a bank's reserves and equity cushion, the bank becomes insolvent and may trigger a systemic crisis because of spillover effects (Zarrouk & Ayachi, 2009).According to Zarrouk and Ayachi (2009), two theories of government regulation exist in the literature and these are the helping hand view and the grabbing hand theory, with externalities, monopoly power, and informational asymmetries providing constructive support for the strong helping hand of government.

The helping hand argument states that activity constraints, official supervision of banks, and barriers to bank entry are all appropriate ways to increase bank stability. Also, there are theoretical justifications for limiting the extent to which banks can participate in the securities, insurance, real estate, or ownership of non-financial enterprises (Zarrouk & Ayachi, 2009). Banks are more likely to take on more risk and create conflicts of interest if given the freedom to engage in all manner of activities. Additionally, the blending of banking and business could result in the creation of incredibly large, complicated entities that would be challenging to monitor and might grow “too big to discipline,” which would diminish efficiency and competitiveness in the banking industry (Zarrouk & Ayachi, 2009). The helping hand argument holds that since bank failures cause economic instability, the government can help vet newcomers. On the issue of supervision, they emphasised the significance of official regulators and supervisors intervening to correct this market failure since monitoring banks is costly and challenging, and private agents might not be motivated to do so but instead try to free-ride.

Furthermore, the existence of a deposit insurance scheme incentivises banks to take greater risks while decreasing the incentive for depositors to keep an eye on them. For these reasons, robust government oversight will keep banks from taking on excessive risk and enhance stability (Zarrouk & Ayachi, 2009). Proponents of the helping hand contend that official supervisors, who will provide depositors with greater trust than private sector monitoring, will be more beneficial to nations with underdeveloped capital markets, legal systems, and accounting standards.

The grasping hand theory states that governments are more likely to support bank stability if they support private sector management of banks. They also anticipated that nations with robust regulatory oversight, banking industry limitations, and entrance barriers would have greater rates of corruption. According to the grabbing hand argument, limitations impede bank stability by increasing government power and giving corruption a larger platform. On controlling entry, they argue that regulators employ entry limitations as a means of rewarding allies and gathering bribes.

Also, the grabbing hand supporters contend that powerful supervision would not enhance bank performance or stability since strong supervisors will be more focused on securing political support and achieving their own goals. According to the grabbing hand theory, banks will exert pressure on politicians, who can then sway supervisors (Zarrouk & Ayachi, 2009).

However, as stated in Zarrouk and Ayachi (2009), researchers contend that widespread looting may be the root cause of banking crises in nations with weak bank supervision and easily evaded legal remedies for fraud. In addition, bank managers may choose to invest in both risky and sure-to-fail ventures, using the proceeds to fund their expenses. Therefore, the likelihood of a banking crisis occurring rises with a weak legal framework. Hence, banks functioning in a strong legal environment are likely to be more stable than banks that operate in a weak legal environment.

**2.2 Empirical Review**

Previous studies such as Klein (2013), investigated the feedback effects of non-performing loans on the real economy of Central, Eastern, and Southeastern Europe by employing panel VAR. He assessed the dynamic behaviour of the model by using impulse response functions (IRFs) and the forecast error variance decomposition. Data for the analysis was obtained from banks’ balance sheets from Bankscope and World Economic Outlook (WEO) datasets for the period 1998 to 2011.

 Likewise, Petkovski et al. (2018), assessed the impact of non-performing loans on the real economy of the Czech Republic using the panel VAR model. The empirical analysis was done with data obtained from Bankscope database of Bureau van Dijk and the World Development Indicators database for the period 2005 to 2014. They used the impulse-response function of the model to analyse the impact, focusing specifically on the orthogonalised IRF, which indicates how one variable of interest responds to an orthogonal shock in another variable of interest. Also, Alodayni (2016), implemented the panel VAR (PVAR) to assess the negative feedback effects between the banking systems and the real economy of the GCC (Gulf Cooperation Council) region. His analysis focused on the impulse responses to credit (NPLs) risk shock and macroeconomic shocks and on the forecast error variance decomposition of the variables.

There are strands of the literature that focus on the negative impact of credit risk on banking/financial system stability. For instance, Chaibi and Ftiti (2015), identified the most significant bank-specific and macroeconomic environmental factors that influenced different credit risk intensities in both French (market-based financial system) and Germany (bank-based systems). They employed a dynamic panel data approach to examine the determinants of NPLs in both banking systems for the period 2005–2011. Also, they applied the enlarged set of moment conditions, to generate consistent and efficient parameter estimates. However, they indicated that the consistency of their generalised method of moment (GMM) estimator hinges on the validity of some moment conditions, which are also dependent on the maintained assumptions that; the error terms do not exhibit serial correlation, and that the instruments are valid.

Their findings showed that NPLs are affected by GDP growth, interest rates, unemployment, and exchange rates in both economies. However, their results showed that the inflation rate has a significantly negative impact on credit risk in Germany but has no significant impact on credit risk in France. Also, only two of the bank-specific determinants of credit risk were common to both banking systems, which are the size and profitability of banks. This implies that credit risk determinants may vary across economies with different structures. Hence, their findings concluded that NPLs for market and bank-based economies depend on different drivers. Nevertheless, their study did not assess the adverse feedback effect of NPLs on the macroeconomy.

 Likewise, Ha et al. (2014) investigated the relationship between several macroeconomic factors and the NPL ratio in the Vietnamese banking system. Quarterly data for non-performing loans (NPLs) were obtained from banks’ financial statements from 2008 (Q4) to 2013 (Q2). The macroeconomic variables were obtained from General Statistics Offices, the State Bank of Vietnam, and the World Bank from 2005 (Q1) to 2013 (Q2). The study employed a panel regression model with Pooled OLS as their best alternative regression method of Panel data to assess the determinants of NPL. Their findings show that macro factors, such as the GDP growth rate and the lending rate have significant impacts on the level of NPL. However, they also found that inflation and exchange rates do not have a statistically significant impact on nonperforming loans for Vietnamese commercial banks. Their findings on inflation have been confirmed by Chaibi and Ftiti (2015) for France's banking system. They also conducted macro stress testing to enable the prediction of the levels of NPLs and the expected losses that banks are likely to suffer; by using the credit risk model and a value-at-risk (VaR) approach. Their forecast results revealed that the minimum capital requirement for banks to survive the shocks is about 6%, which is lower than the typical Basel I 8% figure. They also did not examine the feedback effects of NPLs on the macroeconomy.

Furthermore, Adegoke and Oyedeko (2018), conducted macro-stress testing in Nigeria to examine the impact of macroeconomic variables on the Nigerian banking sector liquidity position before, during, and post global financial crisis eras. Using time series data, they modified Wilson’s (1997) credit risk model (which is rooted in the simplicity of the logistic equation usually applied when analysing ordinary Least Square regression) and applied it to determine the relationships between a set of macroeconomic variables and liquidity risk in Nigeria for the period of 1981 to 2016. They found that interest rate, unemployment, financial deepening and inflation rate influenced the liquidity position of the Nigerian banking sector. The study indicated that with or without the occurrence of the global financial crisis, the liquidity position of the Nigerian banking sector is influenced by interest rate, inflation rate and unemployment rate and that these three macroeconomic variables have constant magnitude before, during and after the global financial crisis. They also employed the forecast error variance decomposition and impulse response functions (IRF) from the moving average (MA) of the vector error correction model (VECM) to analyse the breakdown effect of the system.

Their results of the variance decomposition reveal that about 100 per cent of the forecast error of the Nigerian banking sector liquidity risk is explained by its innovations and that its shocks fluctuate consistently over time. Specifically, their results revealed that shocks of economic growth rate, inflation rate, interest rate, financial deepening and unemployment rate explain about 17.66, 3.78, 9.83, 0.48, 3.80 and 8.94 per cents of variations in liquidity risk respectively. Nonetheless, the feedback effect of the adverse impact on the liquidity position of the banking sector on the macroeconomy or real economy was not assessed.

That notwithstanding, Alodayni (2016), examined the impact of oil price fluctuations on Gulf Cooperation Council (GCC) economies banks’ balance sheets and examined possible adverse feedback effects between the GCC banking systems and the macroeconomy. The paper employed panel dynamic system GMM and Fixed Effect models to ascertain how nonperforming loans respond to different macroeconomic shocks, specifically to fluctuations in oil prices for the oil-exporting economies GCC. The study also employed a Panel Vector Auto Regressions (PVAR) model to examine the feedback effects of the banking systems on the real economy of GCC, with the analysis focused on the impulse response function and the forecast error variance decomposition. Results of the study revealed that the oil price, non-oil GDP, interest rate, stock prices, and housing prices (macroeconomic variables) constitute the main determinants of NPLs across GCC banks and hence of financial stability in the region. Also, the paper indicated that credit risk (NPLs) shock negatively influences non-oil GDP, and credit growth across GCC economies and that a higher level of NPLs limits banks’ credit growth and hence could dampen economic recovery in GCC economies. Confirming the notion that instability in the banking system adversely affects the real economy. Though Alodayni (2016), looked at the possible feedback effects of instabilities in the banking system on the macroeconomy, he focused on how oil price fluctuations affect the stabilities of the banking systems of oil-exporting economies and the corresponding feedback effect on the macroeconomy.

Petkovski et al. (2018), also examined the macroeconomic and bank-specific determinants of non-performing loans (NPLs) in the Czech Republic. They employed panel data analysis on a sample of 22 banks from 2005 to 2016, implementing the difference GMM estimation to analyse the determinants of NPLs. They found that growth of GDP, inflation, and unemployment are the macroeconomic determinants that have the strongest influence on NPLs, while bank-specific determinants constitute return on assets, growth of gross loans, size of the banks, foreign ownership and equity to total assets ratio. They also assessed the impact of NPLs on the real economy in the Czech Republic by applying VAR methodology, with the dynamic behaviour of the model being assessed by focusing on the impulse-response functions (IRFs). The assessment of the feedback effect of NPLs on the real economy revealed that an increase in NPLs has a significant impact on GDP growth, inflation, private credit, and unemployment, which supports the notion that a sound and resilient banking sector is the backbone of healthy and sustainable growth.

Klein (2013) investigated determinants of NPLs and the feedback effects of non-performing loans on the real economy of Central, Eastern and Southeastern Europe by employing dynamic panel regression and panel VAR respectively. He assessed the dynamic behaviour of the panel VAR model by using impulse response functions (IRFs) and the forecast error variance decomposition. The paper found that higher equity-to-assets ratio, and profitability (ROE) lead to lower NPLs while excessive lending (loans-to-assets ratio) and past excess lending (lagged lending growth) lead to higher NPLs hence these constitute the bank-specific determinant of non-performing loans. On the macroeconomic level, the study found unemployment, inflation, depreciation of currency, higher volatility index and lower Euro area growth to be determinants of NPLs among CESEE banks. Results of feedback effects analysis showed that an increase in NPLs has a negative and significant effect on credit, inflation, and real GDP growth while contributing to higher unemployment. Specifically, the results revealed that a one percentage point increase in NPLs results in a decline of 1.7% points in the credit-to-GDP ratio, an increase of 0.5% point in unemployment, a contraction of about one percentage point in real GDP, and a decline in inflation of 0.6% points.

Our study differs from that of Petkovski et al. (2018) and Klein (2013) as follows. Petkovski et al. (2018) and Klein (2013) studies examined specifically the feedback effect of non-performing loans on the real economy, while our study examined the feedback effect of instabilities in the banking sector on the real economy using two indicators for banking instabilities: non-performing loans and credit growth. That is, while Petkovski et al. (2018) and Klein (2013) only focused on the feedback effect of non-performing loans our study considered the feedback effect of non-performing loans and credit growth on the real economy.

Also, while Petkovski et al. (2018) and Klein (2013) used the aggregate of non-performing loans for the entire banking system of a country our study used non-performing loans at the bank level. Besides, Klein (2013) assessed the feedback effects of non-performing loans on changes in credit-to-GDP ratio, real GDP growth, unemployment rate and inflation rate as indicators for the real economy. Similarly, Petkovski et al. (2018) examined the feedback effect of non-performing loans on domestic credit to the private sector, real GDP growth, unemployment rate, and inflation rate. On the other hand, our study examined the feedback effect of non-performing loans and credit growth rate on the real interest rate, inflation rate and GDP growth rate as indicators for the real economy. Furthermore, Klein (2013) focused on Central, Eastern and South-Eastern Europe (CESEE), Petkovski et al. (2018) focused on the Czech Republic while our study focused on sub-Saharan Africa.

**2.3 Literature Synthesis**

According to Minsky (1982) 's theory of financial instability, financial systems that are stable tend to become complacent, which encourages financial institutions to take more risks which may lead to financial crises that can have an impact on the actual economy.

The monetary transmission theory explains how changes in the financial system can affect the real economy (Mishkin, 1996). Likewise, the financial stability theory suggests that the stability of the financial system is important for the overall health of the economy (Borio & Drehmann, 2009). Furthermore, the credit channel theory suggests that changes in the financial system can affect the availability of credit to households and businesses which can then have an impact on the real economy (Klein, 2013). All these theories suggest that instability of the banking system can negatively affect the real economy.

On theories relating to NPLs, the asymmetric information theory postulates that it could be difficult to differentiate between good and poor debtors, and that may lead to the selection of poor debtors (adverse selection) which can translate to high non-performing loans (Levin, 2001). Akerlof’s (1970) research revealed that asymmetry can entirely impede efficient credit allocation. The role of credit information sharing (CIS) in preventing adverse selection in the credit market was examined by Pagano and Jappelli (1993). They indicated that credit providers have the potential to drastically reduce NPLs if they could exchange information about their client's financial performance. High NPLs can cause instability in the banking sector which can affect the real economy negatively, all things being equal. However, the literature is malnourished concerning empirical findings on the specific macro factors that are being affected negatively by banking instability and the extent of the impact (how long the impact lasts in the system).

Some researchers have made efforts to fill this gap in diverse ways. Klein (2013) investigated determinants of NPLs and the feedback effects of non-performing loans on the real economy of Central, Eastern and Southeastern Europe. Though he assessed the feedback effect on the real economy, the study considered only developed economies. Ha et al. (2014) investigated the relationship between several macroeconomic factors and the NPL ratio in the Vietnamese banking system. They also conducted macro stress testing to enable the prediction of the levels of NPLs and the expected losses that banks are likely to suffer. However, they did not examine the feedback effects of NPLs on the macroeconomy. Chaibi and Ftiti (2015) in their study identified the most significant bank-specific and macroeconomic environmental factors that influenced different credit risk intensities in both French (market-based financial system) and Germany (bank-based systems). Though they examined macro factors that can influence NPLs, they did not assess the adverse feedback effect of NPLs on the macro economy but rather focused on comparative analysis for market-based economy and bank-based economy.

Alodayni (2016) also contributed to filling this gap by examining the impact of oil price fluctuations on Gulf Cooperation Council (GCC) economies banks’ balance sheets and examining possible adverse feedback effects between the GCC banking systems and the macroeconomy. Though Alodayni (2016) looked at the possible feedback effects of instabilities in the banking system on the macroeconomy, he focused on how oil price fluctuations affect the stabilities of the banking systems of oil-exporting economies and the corresponding feedback effect on the macroeconomy hence his study was limited to oil exporting economies.

Adegoke and Oyedeko (2018) in their research conducted macro-stress testing in Nigeria to examine the impact of macroeconomic variables on the Nigerian banking sector liquidity position before, during, and after the global financial crisis eras. Nonetheless, the feedback effect of the adverse impact on the liquidity position of the banking sector on the macroeconomy or real economy was not assessed. Also, Petkovski et al. (2018) in their empirical research examined the macroeconomic and bank-specific determinants of non-performing loans (NPLs) in the Czech Republic. Though they also assessed the impact of NPLs on the real economy they focused on the Czech Republic which is an advanced economy. The feedback effect of banking instability on the real economy is marginalised in the literature, particularly in respect of developing economies like sub-Saharan African nations.

**3. Methodology**

This section examines the feedback effects of the instabilities in the banking system on the real economy (macroeconomy).Specifically, the linkages between NPLs and the credit growth rate of the banking system, real interest rate, inflation rate, and GDP growth rate**.** The impact on the real economy can be assessed through key macroeconomic variables such as employment, inflation, real interest rate, investment, and gross domestic product (GDP) growth rate. Instability in the banking sector may have both direct and indirect consequences on employment. A decline in economic activity can have an impact on people’s lives and social stability. The wider impact on total economic growth can be assessed by considering how changes in the banking sector affect inflation, real interest rate and the GDP growth rates of nations in sub-Saharan Africa.

In the literature, the Panel Vector Auto Regressions (PVAR) model is usually applied to investigate the impact of shock on the real economy. However, the dynamic behaviour of the model is often evaluated using the impulse-response functions (IRFs) and forecast error variance decomposition of the panel VAR model. The IRF describes the response of one variable in the system to changes in another variable in the system with all other shocks held constant. The variance decomposition as it is also used to assess the dynamics of the panel VAR, describes the extent to which variation in one variable in the system is explained by shock to other variables in the system. Our study employed panel VAR methodologies. As seen in Klein (2013), when it comes to evaluating the magnitude and duration of effects, panel VAR remains a valuable tool. The panel VAR technique treats all the variables in the system as endogenous and allows for unobserved individual heterogeneity as associated with the traditional VAR approach and a panel data approach respectively. The panel VAR technique does not require any a priori assumptions on the direction of the feedback between variables in the model, and this is an advantage over other techniques (Klein, 2013). Consequently, this study implemented a Panel Vector Auto Regressions (PVAR) model.

Following Alodayni (2016), the analysis focused on the impulse responses and the variance decomposition of the variables. Specifically, impulse responses of the macroeconomic variables to credit risk (NPLs) shock and credit growth shock to assess the feedback effects of instabilities in the banking system. The impulse-response functions (IRFs), which defined how one variable in the system responded to innovations in another variable while holding all other shocks constant, were used to evaluate the dynamic behaviour of the model. Cholesky decomposition was used to orthogonalise the shocks in the VAR, indicating variables that show forth earlier in the ordering were deemed more exogenous, and variables that appeared later in the ordering were deemed more endogenous.

Our attention was specifically focused on the orthogonalised IRF, which shows the reaction of one variable of interest (macroeconomic variables) to an orthogonal shock in another variable of interest (NPLs/credit growth rate). We were able to determine the impact of each shock separately while maintaining other shocks at zero by orthogonalising the response. The variance decomposition, which indicates the degree to which the forecast error variance of one variable in the system is connected to an exogenous shock to another endogenous variable, was also used to evaluate the panel VAR dynamics. That is, it describes the extent to which variation in one variable in the system is explained by shock to other variables in the system. Following the Panel VAR employed by Alodayni (2016), our panel VAR model is specified as:

 $Y\_{i,t = }Y\_{i,t-1 }A+X\_{i,t}B$$+ λ\_{i}+ v\_{t}+e\_{i,t}$,

where

the subscripts$ i $and$ t$ denote $i$th bank, and time dimension of the panel, respectively; $Y\_{i,t }$is a $(1×k)$ vector of five endogenous variables; $X\_{i,t} $is a ($1×l)$ exogenous variables for each $i$th bank at time $t; λ\_{i}$ is the ($1×k)$ panel-level fixed effect; $v\_{t}$ is the ($1×k)$ time effect; $e\_{i,t}$ are ($1×k)$ i.i.d residuals; $A $is a $\left(k×k\right) $and $B$ is $(l×k)$ vector of parameters to be estimated.

The five endogenous variables used to represent $Y\_{i,t }$are real interest rate, inflation rate, GDP growth rates, credit growth rates, and non-performing loans (NPLs), while oil prices are modeled strictly as an exogenous variable. The macro variables and the bank-specific variables constitute domestic variables. The macro variables are made up of the real interest rate, inflation rate, and the GDP growth rate, which are used to represent the macroeconomy. The credit growth rate and the non-performing loans are the bank-specific variables used to indicate banking system instabilities. The analysis focuses on the impulse responses to various shocks such as credit risk shock (non-performing loans), credit growth shock, and macroeconomic shocks.

* 1. **Relationship Involving Credit Growth and Other Economic Indicators**

The various aspects of an economy are significantly shaped by the dynamics of loan development (credit growth). The linkages between credit growth and some important economic indicators like the real interest rate, inflation rate, and GDP growth rate are considered in this section. Policymakers, financial institutions, and investors looking for insights into the overall state of the economy must understand these relationships. The credit growth and real interest rate have a significant relationship (Alodayni, 2016). Generally, a higher credit growth rate will reduce interest rates while a decrease in credit growth will increase interest rate and for that matter real interest rate (Alodayni, 2016). Credit growth and inflation are closely related since inflation is a measure of growing prices. Increased credit growth may bring about increased spending, which could cause demand-pull inflation. On the other hand, when people and companies borrow to protect themselves against price increases, credit expansion may also react to inflationary pressures.

Credit facilitates investment and consumption, acting as a lubricant for economic activity. It has been known from the literature that for economies to flourish, there should be a deep and broad financial system (Cecchetti & Kharroubi, 2019). However, according to Cecchetti and Kharroubi (2019), the story of developing economies may not necessarily be true for developed economies. Credit growth could be a two-edged sword.  That is an increase in credit growth leads to an increase in GDP growth (Alodayni, 2016), but beyond a certain threshold the increase in credit drags GDP growth (Cecchetti & Kharroubi, 2019). According to Cecchetti and Kharroubi (2019), there is evidence that when a country’s government, corporate or household debt exceeds 100 percent of GDP, productivity grows more slowly. Hence the relationship between credit and real growth in modern economic systems needs to be reassessed (Cecchetti & Kharroubi, 2019). Also, higher credit growth will lead to lower NPLs across the GCC region (Alodayni, 2016). There exists a dynamic and connected link between the increase of credit and the real interest rate, inflation rate, and GDP growth rate.

* 1. **Relationships Involving Non-Performing Loans (Credit Risk)**

One of the most important measures of credit risk in a financial system is the amount of non-performing loans (NPLs). To evaluate the total economic impact of credit risk, it is essential to consider the relationship between non-performing loans, credit growth, the GDP growth rate, and inflation. A high percentage of non-performing loans has the potential to limit lending, which could have an impact on investment, consumption, and GDP growth (Klein, 2013).

From the literature, an increase in NPL reduces credit growth and GDP growth (Espinoza & Prasad, 2010; Nkusu, 2011; De Bock & Demyanets, 2012; Klein, 2013). When NPLs are high, it increases the uncertainty regarding the capital position of the banks which places a limit on their access to financing. Consequently, the banks’ lending rates increase and eventually lead to lower credit growth. This implies a higher NPL will lead to a higher lending rate which translates into a higher real interest rate. On the other hand, it has been indicated that high levels of NPLs have a negative relationship with inflation, which is said to be because of weaker economic activities associated with high NPLs (Klein, 2013).

* 1. **Data**

The data used is secondary and it was obtained from World Development Indicators (WDI) and Bankscope data for seventy-five banks from six African countries for the period 2012 to 2021 due to the availability of data, economic and financial development, disclosure, and the use of IFRS (International Financial Reporting Standard). Six countries representing three sub-regions in sub-Saharan Africa were selected, which are Ghana, and Nigeria (West Africa), Kenya, and Uganda (East Africa), South Africa, and Mauritius (Southern Africa). These countries were selected due to the availability of data, economic and financial development, disclosure, and the use of IFRS (International Financial Reporting Standard) and they are true representatives of their sub-regions. The 75 banks are made up of 12 banks from Ghana, 15 banks from Nigeria, 10 banks from Kenya, 11 banks from Uganda, 12 banks from South Africa, and 15 banks from Mauritius. These banks were selected based on size (i.e., the top 12, 15, 10, 11, 12, 15 biggest banks in each country were selected). The macro variables were obtained from world development indicators while the bank-specific variables were obtained from Bankscope data. The macro variables which constitute the endogenous variables include the real interest rate (realir), inflation rate (inflcpi), and the GDP growth rate (gdpgrowthrate). Likewise, the bank-specific variables that formed parts of the endogenous variables are credit growth rate (creditgrowth) and non-performing loans (npl). The growth of gross loans has been used as a proxy for credit growth. NPL (npl) is the ratio of non-performing loans to gross loans. The international crude oil price (oilprices) is modeled as an exogenous variable. The annual average closing price for each year was used as a proxy for each year’s oil price which is quoted in US Dollars ($). Although these economies under study are not oil exporting economies (except for Nigeria) as in the case of Alodayni, (2016) for GCC economies, variation in oil prices eventually affects every aspect of these economies under study hence the rationale for including it as an exogenous variable as well.

The optimal lag selection for the panel VAR was conducted and lag one (1) came out as the optimum. How lag 1 was chosen has been explained in section 4.2.1 with supporting results in table 4.1. Lag 1 was used to conduct the unit root test to assess if the variables are stationary.

* 1. **Limitations to the Methodology**

The researcher could not obtain real interest rate data for Ghana hence the analysis for the real interest rate excludes Ghana. However, the results of the study are not affected by this limitation because Ghana shares similar characteristics (i.e. high-interest margins and fees, high inflation, high NPLs, unstable macroeconomic conditions) with the other five countries used for the study, hence the findings of the real interest rate apply to Ghana.

**4. Results**

This section presents graphs of the macro variables of interest and discusses the optimal lag selection, descriptive statistics, model diagnostics, and the results of the Panel Vector Auto Regressions.

* 1. **The Graph of The Macro Variables**

The graphs in Figures 4.1, 4.2, and 4.3 below are pictorial presentations of the macro variables of interest, specifically inflation, real interest rate, and GDP growth rate. Reading from the graph in Figure 4.1 below, inflation has been erratic for the period under study. Inflation for most of the countries under study reached its peak within the 2016-2017 period. However, it reduced to its minimum value within the 2019-2020 period due to weak economic activities because of Covid-19. Confirming that, weak economic activities are associated with low inflation. Also, inflation started to increase again in the 2021 period, which may be because of an expansion in economic activities in 2021.

**Figure 4.1** **Inflation graph of selected African countries**



 Considering Figure 4.2 below, the real interest rate was not very erratic as compared to inflation for the period under study. It was able to revert to its mean quickly. The real interest rate was low for most of the countries between 2016-2017 but increased between 2018-2019 and eventually fell between 2020- 2021 period. There was no real interest rate data for Ghana, hence no graph was depicted for Ghana. However, the sample countries are a good representative of the sub-region hence the outcomes apply to Ghana as well.

**Figure 4.2 Real Interest rate graph of selected African countries**



Focusing on Figure 4.3, the GDP growth rate was not erratic but reduced drastically in 2020 for all the countries understudy which may be the impact of Covid-19. It, however, increased afterward.

**Figure 4.3 GDP growth rate graph of selected African countries**



* + 1. **Selection Order Criteria for Optimal Lag**

Modified Bayesian Information Criterion (MBIC), Modified Akaike Information Criterion (MAIC), and Modified Quinn Information Criterion MQIC are analogous to commonly used maximum likelihood-based model-selection criteria, which are the Bayesian information criteria (BIC), Akaike information criteria (AIC), and the Hannan–Quinn information criteria (HQIC). Given that MAIC has smaller penalties than the typical AIC, it offers more information overall (Hossain, 2002). Because there is less chance of increasing the maximised log-likelihood function in a restricted scenario than in an unconstrained one, MAIC imposes the appropriate penalty when an extraneous but restricted parameter is added. Put differently, the MAIC acknowledges that the loss resulting from the inclusion of a restricted parameter is lower than the standard AIC when the parameter is uncontrolled (Hossain, 2002).

 To determine the optimal lag length, the lag with minimum value for these three information criteria is selected. Table 4.1 shows the optimal lag selection result. Lag 1 was selected because it has the minimum value for MBIC, MAIC and MQIC. Hence lag 1 was used to conduct the unit root test.

**Table 4.1 Optimal Lag Selection**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Lag | CD | J | J pvalue | MBIC | MAIC | MQIC |
| 1 | .998 | 195.247 | 2.58e-13 | -217.554 | 51.247 | -56.220 |
| 2 | .998 | 175.600 | 2.81e-20 | -30.800 | 103.600 | 49.866 |

Source: Author’s Computation \*In Table 4.1 CD stand for the coefficient of determination which represents the proportion of variation that the model explains, J stands for Hansen’s J statistics, J pvalue stands for p-values for Hansen’s J statistics. \*

**4.2.2 Descriptive Statistics**

Table 4.2 provides descriptive statistics of the variables. The descriptive analysis shows the mean and the standard deviation of the various variables used. Besides, it also shows the maximum and minimum values for each variable, which helps to identify the maximum and the minimum value attained by each variable. Table 4.2 presents descriptive statistics for 75 banks from six countries in sub-Saharan Africa for a period of ten years, from 2012 to 2021. The mean value of the credit growth rate is 12.28%, which is higher than the 0.13% (quarterly) reported by De Moraes and Costa (2022) for emerging economies like Brazil, and a standard deviation of 30.96%. This means that the value of the credit growth rate can deviate from the mean to both sides by 30.96%. The minimum value for credit growth rate is -100% while the maximum value is 607.3%. There is a high disparity between the maximum and the minimum values of credit growth rate. The non-performing loan rate has a mean of 9.43%, which is greater than the average of 6.665 revealed by Petkovski et al. (2018) for the Czech Republic, and a standard deviation of 10.54%. The minimum and maximum values for the non-performing loan rate are 0 and 79.69% respectively.

Also, the mean value for GDP growth rate is 3.08% with a standard deviation of 3.62%. -14.89% and 9.29% are the minimum and maximum values of GDP growth rate respectively. The disparity between the minimum and maximum range is high, likewise, the average real GDP growth is higher than the 1.90% reported by Kok et al. (2019) for Euro area banks. The average inflation rate is 7.59%, which is higher than the 2.008% reported by Petkovski et al. (2018) for the Czech Republic, and a standard deviation of 4.53% while the minimum and maximum values are .405% and 17.45% respectively. Also, the average real interest rate is 7.59%, which is higher than 3.5% reported by Vlieghe (2017) for developed economies like the UK, and a standard deviation of 4.63% while .77% and 17.45% are the minimum and maximum values respectively. The international average oil closing price (OilPrices) has a mean of 65.802 (US$) and a standard deviation of 2092.8%. The maximum and minimum values are 97.98 (US$) and 39.68 (US$) respectively. There is a significant disparity between maximum and minimum oil prices.

**Table 4.2: Descriptive Statistics of the Variables**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Creditgrowth | NPL | GDPgrowthrate | Inflcpi | Realir | Oilprice |
| Mean | 12.279 | 9.428 | 3.077 | 7.301 | 7.587 | 65.802 |
| Std. Dev | 30.962 | 10.538 | 3.622 | 4.535 | 4.631 | 20.928 |
| Min | -100 | 0 | -14.895 | .406 | .775 | 39.68 |
| Max | 607.3 | 79.69 | 9.293 | 17.455 | 21.488 | 97.98 |
| N | 682 | 675 | 750 | 750 | 597 | 750 |

Source: Author’s Computation

* + 1. **Model Diagnostics**

The unit root test was conducted using the Fisher-ADF and Fisher-PP regressions with lag 1 and the results indicated that all the variables are stationary which are shown in Table 4.3. The test results indicated that all the variables are stationary at level, hence the null hypothesis of a unit root in all panels can be rejected.

**Table 4.3: Panel Units Root Test results**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Stationarity | ADF-FisherChi square | PP-FisherChi square | Comment |
| Creditgrowth | Level | 433\*\*\* | 474\*\*\* | stationary |
| NPL | Level | 176\*\* | 173\*\* | stationary |
| GDPgrowthrate | Level | 413\*\*\* | 396\*\*\* | stationary |
| Inflcpi | Level | 226\*\*\* | 228\*\*\* | stationary |
| Realir | Level | 174\*\*\* | 208\*\*\* | stationary |
| Oilprice | Level | 187\*\* | 230\*\*\* | stationary |

Note: \*\*\*, \*\*, denote statistical significance at 1, and 5, percent level respectively.

* + 1. **Eigenvalue sta****bility condition**

The stability of the model indicates that the model is suitable for ascertaining short-run impulse-response functions and variance decomposition analysis. The panel VAR is said to be stable when it is invertible and has an infinite-order vector moving-average representation, which enables the estimated impulse response functions (IRFs) and forecast error variance decompositions to be given a known interpretation. That is IRFs and forecast error variance decompositions (FEVDs) are given a known interpretation when the panel VAR model is stable. The model is said to be stable when all the moduli of the companion matrix are smaller than one. The matrix is generated by using pvarstable (Stata command), which is based on the parameters estimated. The companion matrix is shown in Table 4.4 below. Since all the moduli are less than one as depicted by Table 4.4, we conclude that the model is stable.

**Table 4.4: Companion matrix**

|  |  |
| --- | --- |
| **Eigenvalue** |  |
| **Real** | **Imaginary** | **Modulus** |
| .806 | 0 | .806 |
| -.684 | 0 | .684 |
| .232 | -.327 | .401 |
| .232 | 0.327 | .401 |
| -.196 | 0 | .196 |

Source: Author’s Computation

Also, the stability test can be shown by a graph of the roots of the companion matrix. The model is said to be stable when the roots of the companion matrix are all inside the unit circle. From figure 4.4, all the eigenvalues (the five dots inside the circle are the roots of the companion matrix (in Table 4.4)) lie inside the unit circle hence PVAR satisfies the stability condition.

**Figure 4.4: Stability graph**



Source: Author’s Computation

* 1. **Results (Dynamic Behavior of the Panel Vector Auto Regressions (PVAR)) Model**

The IRF which shows the dynamic response of the system to a one-standard deviation shock to the credit risk (NPL and credit growth) in the panel VAR model are presented in Figure 4.5 and 4.6. Figure 4.5 shows the IRFs to credit risk shock, which depicts how the system responded to NPL shock (credit risk shock).

**Figure 4.5: Impulse Response to credit risk shock (NPL)**



Source: Author’s Computation

Credit growth, GDP growth rate, and real interest rate responded negatively initially to credit risk (NPL) shock. Specifically, within the first two periods, credit growth was negative and GDP growth rate was negative in the first period. Though the responses were erratic afterward, the shock died off getting to the tenth period. Thus, credit risk shock limits credit growth which hinders economic growth (GDP growth) and translates to low real interest rates. Inflation responded positively to credit risk shock initially, but the shock gradually died off. The result is similar to Alodayni (2016), confirming the notion of negative feedback effect between the banking system instabilities and the macroeconomy. From Figure 4.6, it is observed that a shock to credit growth resulted in erratic movement in the macroeconomic variables. However, the magnitude of the responses varies. Non-performing loans responded positively to credit growth shock and inflation rate initially responded positively to a shock in credit growth indicating that a shock in credit growth leads to an increase in non-performing loans and inflation rate. The GDP growth rate and real interest rate responded negatively to credit growth shock in the first period implying that a one standard deviation shock in credit growth initially leads to a reduction in GDP growth rate and real interest rate. This supports the credit channel theory and the findings of Alodayni (2016).

**Figure 4.6: Impulse Response to Credit Growth Shock**



Source: Author’s Computation

Table 4.5 depicts the variance decomposition of the variables. The variance decomposition indicates that variation in credit growth is explained by shocks in the variables as follows. Real interest rate shock accounted for 50.19%, inflationary shock accounted for 13.39% of the variations in the credit growth respectively.

**Table 4. 5: The** **forecast error variance decomposition of the variables**





 Response realir inflcpi gdpgrowthrate creditgrowth npl



Shock in GDP growth accounted for 9.38%, and credit risk shock (NPL) accounted for 13.94% of the variations in the credit growth respectively. Focusing on NPL, variations in non-performing loans are explained by shocks in the variables as follows. Real interest rate shock explained 4.73%, inflationary shock explained 1.88%, shock in GDP growth rate explained 0.58%, and credit growth shock explained 2.92% of the variations in non-performing loans respectively. However, shock in NPLs accounted for 89.90% of the variations in non-performing loans. This implies variations in non-performing loans are mostly explained by shock in non-performing loans.

* 1. **Discussion of the results**

This study focuses on the effect of banking instabilities (proxied by shock to non-performing loans and credit growth) on the real economy (represented by inflation, real interest rate, and GDP growth rate) in sub-Saharan Africa. We based on the dynamic behaviour of the panel VAR model, specifically, the impulse response function and the forecast error variance decomposition of the variables for the analysis. The IRF as reported in Figure 4.5, showed that if non-performing loans (credit risk) are shocked by one standard deviation, it initially leads to a reduction of approximately 3.8, 4, and 7.8 percentage points in credit growth, GDP growth rate, and real interest rate respectively. The same shock to NPLs leads to an increase in inflation to approximately 5.8 percentage points in the first period. The adverse effect of non-performing loans (credit risk) on the real economy is rationalised by the fact that an increase in NPLs limits credit (reduces credit) which in turn reduces economic activities and eventually reduces real interest rates. These results confirm what has been reported in the literature as seen in Klein (2013), Petkovski et al. (2018), and Alodayni (2016).

Though our results are similar to these studies, the magnitude of the responses of our study is on average bigger than what was reported by these studies. Also, based on the IRF depicted by Figure 4.6, one standard deviation shock to credit growth initially leads to a reduction of approximately .04 basis points in both GDP growth rate and real interest rate but an increase in inflation and NPL of approximately .04 and .02 basis points respectively. As has been shown, our results support the fact that the instability in the banking sector has adverse feedback effects on the real economy. Contrary to other studies such as Alodayni (2016), our results showed minimal response of the system to credit growth shock as the magnitude of the responses is very small. This may be because economies in sub-Saharan Africa are predominantly in informal financial activities.

This empirical study investigated the feedback effects of banking instability on the macroeconomy. The study used a panel of 75 banks from six countries in sub-Saharan Africa, specifically from West Africa, East Africa, and Southern Africa. We applied the panel VAR methodologies with its impulse response function and variance decomposition techniques to examine the response of the real economy to banking instability. The literature is skewed towards assessing the effects of macroeconomy on banking stability hence malnourished on the feedback effects of banking instability on the economy especially for the African sub-region.

The results showed an erratic response of the macroeconomic variables to a shock in the banking industry but these shocks die off gradually. The findings of the study revealed that credit risk (non-performing loans ratio) shock adversely affects credit growth, and economic growth, and increases inflation. That is, higher values of NPLs limit the credit growth of banks and cause a reduction in GDP growth as well as an increase in inflation. Surprisingly, the system exhibited a minimal response to credit growth shock, which is contrary to the findings of Alodayni (2016) which showed a bigger magnitude. Hence the shock to credit growth does not pose serious repercussions on the system. The variance decomposition results showed that a larger portion of the variation in the NPLs can be explained by shocks in NPLs while a larger portion of the variation in credit growth can be explained by a shock in real interest rate. Therefore, we conclude that banking instability has an adverse feedback effect on the macroeconomy.

**5. Summary, Conclusion, and Recommendations**

This study is titled “Feedback Effect of Instabilities in the Banking Systems on the Real Economy”. In this study, we examined the impacts of a shock to the banking stability on the macroeconomic variables in the context of SSA using the panel VAR model and its associated impulse response function and variance decomposition. We employed a panel of seventy-five banks across six SSA economies spanning from 2012 to 2021.

The key points from this study are; a shock to the non-performing loans leads to a reduction of approximately 3.8%, 4%, and 7.8% in credit growth, GDP growth rate and real interest rate respectively and an increase in inflation to approximately 5.8% point in the first period. Therefore, instabilities in the banking sectors have significant feedback effect on the real economy of SSA nations.

In this study, we have presented an empirical panel VAR model to estimate the impulse response of macroeconomic variables specifically real interest rate, inflation, and GDP growth rate to credit risk shock (NPLs) and credit growth shock to assess the feedback effects of instability in the banking system on the real economy. We also estimated the forecast error variance decomposition of the panel VAR model to describe the extent to which variation in one variable in the system is explained by shock to other variables in the system. We first showed the graphical presentation of the macro variables used in this study to depict the trends over the years.

After that, we selected the optimal lag using maximum likelihood-based model selection criteria. The unit root test was then conducted and the results showed that all the variables were stationary at level one. We then conducted a stability test of the model, and the result indicated that our model is stable and hence suitable for ascertaining short-run impulse response functions and variance decomposition analysis. Using our panel VAR techniques, we find that credit risk shock limits credit growth which hinders economic growth (GDP growth) and translates to a low real interest rate. Credit risk shock yielded a positive response (an increase) from inflation. Also, we found that a shock to credit growth will lead to an increase in NPLs and inflation but a decrease in GDP growth rate and real interest rate. Finally, we presented the forecast error variance decomposition of the variables, which indicated that variation in credit growth is explained by shocks in real interest rate, inflation, GDP growth, and NPLs. However, we found that variation in non-performing loans is mostly explained by shock in NPLs. These findings suggest that instability in the banking sector has a negative feedback effect on the real economy and hence should not be taken lightly or ignored especially instability emanating from NPLs. We, therefore, recommend that policymakers and regulators pay particular attention to the NPLs of banks.

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