MACROECONOMIC DETERMINANTS OF NON-PERFORMING LOANS OF DMBS IN SUB-SAHARAN AFRICA COUNTRIES

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Abstract

This study focused on the determinant of macroeconomic variables on the non-performing loans of banks in the sub-Saharan African region using the fixed effect panel regression method. Data from twenty-two SSA countries from 2010 to 2021 were used. The results from the study provide a general indication that the macroeconomic environment matters a lot for non-performing loans within the banking sectors of SSA countries. It is therefore recommended that banks in the SSA sub-region learn to develop adaptive mechanisms to address the effects of macroeconomic shocks on their loan policy. These measures may come in the form of well-diversified portfolio systems that will improve banks' hedging.

Keywords: Macroeconomic variables, Non-Performing Loans, Institutional factors, Deposit Money Banks, Sub-Saharan Africa.
Jel Classification: E02, E44, G21, N27

1. INTRODUCTION

A nation's ability to thrive and flourish economically depends on having a robust and healthy financial system (Adekunle et al., 2013). Effective banking systems aid in national development by increasing access to external finance capital and redistributing resources to economically advantageous sectors of the economy. Banks could perform these functions effectively if they continuously sustain their

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profitability. Loans represent the primary source of bank profitability. However, banks deal with loan defaults from borrowers, which could lead to non-performing loans (NPLs), hindering the effectiveness of bank operations.

NPLs are loans that do not yield income for a considerable amount of time. This implies that the principal and/or interest on these loans have been left unpaid for at least 90 days (Caprio & Klin-Gebiel, 1999). Studies have shown a strong correlation between the large-scale build-up of non-performing loans and banking crises. Indeed, some studies have found that non-performing loans are one of the main reasons for financial institutions' insolvency and ultimately hurt the whole economy (Hou, 2007).

The accumulation of NPLs has the potential to reduce private investment, raise deposit obligations, limit the amount of bank credit available to the private sector, and have a detrimental impact on private consumption, thus causing an economic downturn. The continuous growth of NPL may further intensify the already intense demand on the government to give problem banks financial support in an effort to resolve them.

Non-performing loans have been identified as the major threat to the profitability of banks and, in some cases, the reason for banks' failure (Anisa, 2015). Literature has shown that non-performing loans are the leading cause of financial crises (Akinlo & Emmanuel, 2014). Adamu et al. (2021) examined the effect of NPLs on bank performance in the sub-Saharan African region; the study found that NPLs have a negative and significant impact on bank performance in the region.

Banking crises caused by non-performing loans affected the majority of the Sub-Saharan African nations in the 1990s. Banks' rising non-performing loans ratio has been attributed to macroeconomic factors such as exchange rate, lending rate, economic growth, inflation rate, institutional factors such as firm size and so on (Messai & Jouini, 2013). Shingjergji (2013) revealed that GDP growth, interest rate, and foreign exchange rate have a positive relationship with the non-performing loan ratio, while inflation has a negative relationship with the non-performing loan ratio in the Albanian banking sector. Non-performing loans reduce the earning capacity of the banks, lead to financial crises and bank distress, affect the level of domestic investment, put high pressure on government revenue in an attempt to bail the failed banks, and ultimately hinder the intermediation role of banks (Waweru & Kalani, 2009).

Therefore, this study examined the macroeconomic determinants of non-performing loans in DMBs in Sub-Saharan African countries. It will also consider macroeconomic factors such as exchange rate, lending rate, economic growth, and inflation as determinants of non-performing loans in deposit money banks.

2. LITERATURE REVIEW

The existence of non-performing loans can be felt with the deterioration of the quality of the loan portfolios (Odeke & Odongo, 2014). Non-performing loans have increased in the banking sector, signaling poor health and a lack of good

governance in one of the most vital sectors of the economy (Nkusu, 2011). Many loans become problem loans after defaulting for 90 days, but this can depend on the contract term (Nikolaidou & Vogiazas, 2017).

Chowdhury (2002) states that the non-performing loan is not a "single class" but rather a "multiclass" concept, which means that NPLs can be classified into different varieties, usually based on the "length of overdue" of the loans. NPLs are viewed as a typical byproduct of the financial crisis; they are not a main product of the lending function but rather an accidental occurrence of the lending process. Reinhart and Rogoff (2010) stated that non-performing loans can be marked as the beginning of the banking crisis. In the banking industry, non-performing loans are quite significant; minimization of non-performing loans is indispensable for developing the banking industry and, subsequently, economic development.

The positive developments could be attributed to many factors, most notably to continuous reforms and improved policies, debt relief, vast natural resources, and increased investment (Ncube, 2009). However, the preconditions for social and economic development vary significantly among the countries, contributing to the uneven pace of growth across the continent (Mutebile, 2008).

Consequently, commercial banks' capital bases have strengthened, and their risk management practices have improved; credit to the private sector has risen, albeit from a low base; and most of the sub-Saharan African banking systems have proved resilient to the recent events of global financial stress (Janvisloo & Muhammad, 2013). It should be noted, however, that these developments have also brought about challenges for regional regulators and supervisors (Irungu, 2013). Impediments to the banking sector development include the small national markets, low income levels and weak creditor rights and judicial enforcement mechanisms (Irungu, 2013).

Some of these studies in SSA use the country-aggregate level of NPLs applying cross-country panel analysis with a focus on either macroeconomic determinants only (Mpofu & Nikolaidou, 2018) or both macroeconomic and bank-specific determinants (Fofack, 2005). Others like Nikolaidou and Vogiazas (2017) also use country-aggregate levels of NPLs but focus on individual countries (Kenya, Namibia, South Africa, Uganda and Zambia). However, Andrianova et al. (2015) analyzed why African banks lend so little and found that one of the reasons is that the quality of information about potential borrowers varies from bank to bank. This suggests heterogeneity in bank behavior.

Plamen and Khamis (2009) showed that these countries are part of the SSA economies that have experienced rapid growth of bank credit to the private sector. This credit expansion poses credit risks because it raises questions of whether the banking system appropriately evaluated the quality of these loans granted.

As such, bank risks are detrimental because most economies in this region are developing, and a few are emerging markets where they rely on bank credit for investment (a key component of economic growth). In addition, studies like Kasekende et al. (2010) and EIB (2013) state that although the banking sector in SSA is underdeveloped, it is fast growing relative to other developing regions.

These factors include economic stability, economic growth, the unemployment rate, the cost of servicing debt, the debt burden, the stock market index, exchange rate movements, terms of trade and some other factors that are most likely to have a substantial role in explaining the performance of NPLs of the banking system (Nikolaidou & Vogiazas, 2017).

Wood and Skinner (2018) examined the macroeconomic and bank-specific factors contributing to non-performing loans in Barbados' commercial banks between 1991 and 2015. The empirical findings show that the macroeconomic variables GDP growth, unemployment, and interest rate significantly impact non-performing loans. At the same time, the bank-specific factors return on equity, return on assets, capital adequacy ratio, and loan-to-deposit ratio are important determinants of non-performing loans.

Umar and Sun (2018) used the system-generalized method of moments estimation approach to look at the macroeconomic and banking industry-specific factors that contributed to non-performing loans (NPLs) for Chinese banks between 2005 and 2014. The results indicated that credit quality, bank risk-taking behavior, and GDP are the factors that determine non-performing loans (NPLs) in listed banks. Nonetheless, the GDP, inflation rate, foreign currency rate, bank risk-taking behavior, leverage, and credit quality account for variations in unlisted banks' non-performing loans (NPLs). Using the NARDL technique, Bahruddin and Masih (2018) examine the non-linear asymmetric correlations between lending interest rates and non-performing loans (NPLs) and give a direction of Granger causality between the two. A case study of Malaysia is presented. The results generally suggest an asymmetric link in the short term and a symmetric relationship in the long term between lending interest rates and non-performing loans.

Using the one-step system GMM dynamic model, Saif-Alyousfi, Saha, and Md-Rus (2018) examined the effects of changes in oil and gas prices on bank deposits of commercial and Islamic banks in Qatar from 2000–2016. The findings show that fluctuations in the price of gas and oil directly affect bank deposits in Qatar overall. Using panel system GMM and panel Granger causality test, Goyal, Singhal, and Mishra (2023) examined the reasons for non-performing loans (NPLs) in developed and developing nations between 2010 and 2020. The study demonstrated that during a fast economic expansion, loan defaults often occur at a lesser rate, leading to lower levels of non-performing loans.

Maivald and Teplý (2020) used 823 banks from the Eurozone, Denmark, Japan, Sweden, and Switzerland for the 2011–2017 period, which also includes the period of zero and negative rates, to investigate the effects of a low-interest rate environment on banks' credit risk as measured by the non-performing loan to total loans ratio. This shows that the NPL ratio rises following a year of low interest rates. Frehiwot (2020) used panel data regression analysis to investigate the factors contributing to non-performing loans (NPLs) in Ethiopian private commercial banks between 2016 and 2018. The study's conclusions demonstrate that there is a positive and substantial correlation between Ethiopian NPLs and the exchange rate and loan growth rate of the export sector.

3. METHODOLOGY

Because the variables of interest are secondary data that are historical in character and were gathered from 22 Sub-Saharan African nations between 2010 and 2021, the study is based on a longitudinal research design. The IMF Financial Structure Database and the World Bank Development Indicators were the sources of the data.

Model Specification

This study examines the macroeconomic factors that influence DMB non-performing loans in Sub-Saharan Africa. As a result, the model is functionally represented as:

$$NPL = f(INTR, RGDPG, INFL, EXRT, BSIZE) \qquad (1)$$

In a linear function, it is represented as follows,

$$NPL = \alpha_0 + \alpha_1 INTR + \alpha_2 RGDPG + \alpha_3 INFL + \alpha_4 EXRT + \alpha_5 BSIZE + \mu \quad \ldots\ldots..(2)$$

Where;

INTR = Interest rate

RGDPG = real GDP growth rate (to measure economic growth)

INFL = Inflation rate

EXRT = Exchange rate

BSIZE = Bank size

α_0 = intercept coefficient

$\alpha_1, \alpha_2, \alpha_{3\,\&}\,\alpha_4$ are the parameters

μ = error term

The *apriori* expectation for the parameters are:

$\alpha_2, \alpha_5, < 0, \alpha_3, \alpha_4 > 0, \alpha_1 \lesseqgtr 0$

4.1. PRESENTATION OF DATA (SUMMARY STATISTICS)

The descriptive statistics based on an annualized dataset for the selected SSA countries in the study are presented in Table 1 in order to demonstrate the initial characteristics within the series. The average non-performing loan ratio for the SSA countries is 10.39, suggesting that, on average, 10.4 per cent of loans by deposit money banks across the selected SSA countries are non-performing and lost. This is a huge average NPL value and the largest among the regional groupings across the globe. For instance, Europe has an average non-performing loan ratio of 2.63 per cent, while the US average is 0.89 per cent. Also, only 4.2 per cent of loans are non-performing in South East Asia, while it is 2.77 per cent in Latin America (World Bank, 2022). Thus, there is evidence that the SSA region has the most fragile banking sector with high loan risks. Indeed, some countries recorded up to 55.08 per cent of NPL for some years. The mean value of the NPL is generally positively skewed, indicating that more of the non-performing loans indicated for the countries in our sample are generally less than the reported mean value. This shows that there are banks in the SSA region that have excessive non-performing loan ratios, and this is

quite appalling for these economies. The standard deviation value for the non-performing loan ratio variable is slightly lower than the mean value, which indicates that there are little variations across countries and over time in the pattern of non-performing loan conditions of banks in the SSA region.

Table 1. Descriptive Statistics for Panel Data

Variable	Mean	Max.	Min.	Std. Dev.	Skew.	Kurt.	J-B (Prob)
NPL	10.39	55.08	1.29	8.02	2.25	10.54	847.2 (0.00)
INTR	15.61	60.00	5.25	9.80	2.95	12.43	1360.5(0.00)
GDPG	3.13	14.05	-36.39	4.67	-2.92	22.53	4571.7(0.00)
INFL	5.42	22.02	-4.29	4.20	1.01	4.55	70.9(0.00)
EXRT	633.8	3830.0	1.4	928.8	1.91	5.89	252.6(0.00)
BSIZE	28.17	121.75	2.22	24.27	2.07	7.03	367.4(0.00)

Source: Author's computation

The average interest rate is 15.61 per cent, with a maximum of 60 per cent and a minimum of 9.8 per cent. These indicate generally high interest rates for the SSA countries, which is to be expected given the high loan default rates. Areas with high loan risks are expected to also observe high lending rates in order to cover the lending risks. The average GDP growth for the economies is 3.13 per cent, which is relatively low given that the average population growth in the region is 2.8 per cent. Thus, per capita income growth is seen to be very low for these economies in the sub-Saharan region. The inflation rate is 5.42 per cent on average, and it appears quite low for the countries, although the maximum rate is 22.02 per cent, suggesting that there are some economies with high inflation rates over the period. The average exchange rate in the countries is also high at 633.4 and also suggests some level of macroeconomic instability among the SSA countries.

The averages for each of the variables in each country over the period of the analysis are presented in Table 2. It is seen that the average non-performing loans of deposit morning banks are the largest, on average, in Equatorial Guinea at 26.53 per cent. This shows that over a quarter of loans given by banks in this country are lost and non-recoverable. That is a serious outcome for the economy, and it is a clear indication of the fragility of the banking system in this country. Comoros (20.84 per cent), Central African Republic (19.84 per cent), Chad (18.9 per cent), Ghana (15.36 per cent), Burundi (13.2 per cent), and Cameroun (12.56 per cent) also report quite large average non-performing loan ratios amongst them. There is, therefore, evidence of banking system fragility among most SSA countries, thereby necessitating the current study on the roles of macroeconomic variables in this phenomenon. As expected, interest rates are high for most of the countries, especially those with high loan default risks. This is expected since the cost of borrowing is expected to be larger in economies with high risks to lending. The inflation rate, on

average, is highest for Nigeria and Ghana, suggesting that macroeconomic instability may be greatest in these economies. Moreover, average real GDP growth was negative for two of the countries over the period of the analysis, with Equatorial Guinea reaching -3.19 per cent over the period. This appears to explain the high average loan default rate in the country. Rwanda and Ghana performed best in terms of GDP growth over the study period.

Recall that bank size is measured in terms of the relationship between the asset base of the banking system and the entire economy. Hence, the variable BSIZE measures the strength of the banking sector in the economy. It is seen that Mauritius has the largest banking system with a ratio of 107 per cent of the GDP over the period of the analysis. Next is South Africa with a bank assets ratio of 78.0 percent, while Namibia has a ratio of 54.0 percent. This shows that these countries are the leading financial markets in terms of the banking system in SSA. None of the other countries has a bank size ratio of up to 50 per cent, with Nigeria's ratio at 19.2 per cent being one of the lowest among the SSA countries.

Table 2. *Descriptive Statistics for Individual Countries*

COUNTRY	NPLR	INTR	INFL	EXRT	GDPG	BSIZE
Botswana	3.92	8.22	4.80	9.46	4.16	28.88
Burundi	13.20	14.13	7.16	1625.93	2.03	20.10
Cameroon	12.56	12.54	1.94	541.68	3.89	13.95
CAR	19.84	12.54	4.24	541.68	-0.01	13.13
Chad	18.90	12.54	1.53	541.68	2.62	7.42
Comoros	20.84	10.08	1.95	406.19	2.77	18.60
Eq. Guinea	26.53	12.54	3.15	541.68	-3.19	8.03
Eswatini	8.18	9.19	5.35	11.92	2.74	22.39
Gabon	7.23	12.54	2.03	541.68	3.35	14.59
Gambia	9.06	27.42	6.23	41.74	2.80	22.56
Ghana	15.36	20.01	11.63	3.57	6.13	23.50
Kenya	8.47	14.91	6.86	95.76	4.80	38.31
Madagascar	9.48	54.32	6.88	2894.06	2.23	14.04
Mauritius	5.31	8.33	3.02	33.87	2.22	107.63
Namibia	2.84	9.00	4.81	11.94	2.17	54.04
Nigeria	8.18	16.03	12.35	242.61	3.20	19.42
Rwanda	6.03	16.89	4.32	763.15	6.60	17.90
Seychelles	6.28	11.89	3.19	13.81	3.97	46.86
South Africa	3.96	9.20	4.96	11.92	1.34	78.01
Tanzania	8.16	16.28	6.58	1943.07	5.78	17.03
Uganda	4.79	21.88	5.73	3116.67	4.99	16.59
Zambia	9.38	12.82	10.44	9.71	4.23	16.77

Source: Author's computation

Table 3 displays the correlation matrix used to observe the initial relationships between the variables. The correlations also guide to check for the absence or presence of multicollinearity issues with the models. There is a positive association between firm size and both financial performance indicators, but there is a negative correlation with oil prices. The globalization variables that are independent have the strongest correlation, which is -0.399. This means that less than 70% of the independent variables have correlations with each other. Multicollinearity is, therefore, not a concern in the calculated model.

Table 3. *Descriptive Statistics for Individual Countries*

	NPL	INTR	GDPG	INFL	EXRT	BSIZE
NPL	1					
INTR	-0.022 (0.72)	1				
GDPG	-0.324 (0.00)	0.052 (0.39)	1			
INFL	-0.128 (0.03)	0.202 (0.00)	0.056 (0.36)	1		
EXRT	-0.002 (0.97)	0.600 (0.00)	0.030 (0.63)	-0.008 (0.89)	1	
BSIZE	-0.338 (0.00)	-0.295 (0.00)	-0.050 (0.42)	-0.101 (0.10)	-0.331 (0.00)	1

Note: probability values in parentheses. Source: Author's computation

4.2. TESTS OF PANEL AND TIME SERIES PROPERTIES OF DATA

4.2.1 Cross-section Dependence Test

The cross-sectional dependence tests are carried out prior to testing for the primary time series characteristics of the datasets. These tests enable the important characteristics of the pertinent variables to be separated out while accounting for the problem of cross-section dependence in the data.

Notice that the presence of cross-sectional dependence within the framework of our dataset (which is based on non-performing loans among different banks) is highly likely. In this study, the cross-sectional dependence (CD) test developed by Pesaran (2004) is adopted. This test uses a pair-wise average of a sample correlation to test the existence of cross-sectional dependence. The results of cross-section dependence test are reported in Table 4.

Table 4. *Cross-section Dependence Test Results*

Variables series tested	Pesaran CD	P-value	Abs corr
NPL	8.488	0.000	0.282

Source: Author's computations

The Peseran CD test for the study's equation fails the significance test at the 5 per cent level, as can be seen from the result, meaning that the null hypothesis—that there is no cross-sectional dependency in the relationships—cannot be rejected. As a result, this research demonstrates that the estimation structure is independent of cross-section. The dataset's lack of cross-sectional dependence suggests that the panel data estimation will produce accurate analytical results. So, we continue by looking for the unit root and cointegration between the study's variables.

4.2.2 Unit Root Test

Two dimensions are present in the panel data structure used for the analysis: common (homogenous) and country-specific variables (individual heterogeneity) characteristics. Therefore, in order to verify that the data is stationary, a panel unit root test framework is used. This study used the Levin, Lin, and Chu (LLC) test to investigate the homogenous panel's stationarity qualities. The cointegration vectors between the nations are assumed to be the same for this test. However, the common unit root assumption could not be sufficiently realistic given that many research countries are expected to display variances in their macroeconomic and banking sector features.

Therefore, the Im, Pesaran and Shin (IPS, 2003) and the Augmented Dickey-Fuller tests, which both allow for heterogeneity in the panel's cross-section and assumes a null hypothesis of no cointegration in the panel data, are also adopted in this study. Table 4.5 displays the outcomes of the test. Due to the nature of the dataset (which is entirely in ratios), only the levels tests are performed.

Since each coefficient is greater than the corresponding critical value at the 95 per cent confidence level, it is evident from the unit root results in Table 5 that the test coefficients for the variables in levels are all significant at the 5 per cent level. This suggests that the levels of all the variables are stationary. All of them are integrated of order one, or I[1] for short. This result provides proof that, in terms of the relationships between the variables, the variables remain stable at their values for all forms of estimate (no need to test for long run relationship since the variables are stable).

Table 5. *Panel Data Unit Root Tests Results *in levels)*

Variable	Homogenous Unit Root Process	Heterogeneous Unit Root Process		Remarks
	Intercept and Trend			
	LLC	IPS	ADF-Fisher	
	I(0)	*I(0)*	*I(0)*	

NPL	-2.244	-2.501	43.39	I[0]
INTR	-1.917	1.900	34.98	I[0]
GDPG	-4.279	-2.400	72.19	I[0]
INFL	-7.869	-4.924	91.66	I[0]
EXRT	-2.709	3.854	27.23	I[0]
BSIZE	-6.912	-3.428	39.71	I[0]

Source: Estimated by the Author. *Note: ** and * indicate significant at 1% and 5% levels respectively; IPS = Im, Pesaran & Shin; LLC = Levin, Lin & Chu*

Source: Author's computations

4.2.3 Cointegration Test

The unit root test indicates that the variables are all stable, indicating that a long-run relationship is expected to exist among them. However, we further test this assumption by employing the panel cointegration analysis to determine the pattern of the long-run relationship. The results of the Philip-Peron, ADF and Kao cointegration tests are reported in Table 6. In the result for both within-dimension and between dimensions, at least one of the test statistics indicates that there is cointegration since it is significant at the 5 per cent level. The Kaon test also confirms this outcome since it is also significant. From this result therefore, there is evidence of cointegration and long-run relationship among the variables in the study.

Table 6: Cointegration Test Result

Within-dimension				
Statistic	Unweighted		Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel rho-Statistic	4.058	0.90	3.727	0.99
Panel PP-Statistic	-5.159	0.00	-6.854	0.00
Panel ADF-Statistic	2.421	0.03	-2.404	0.03
between-dimension				
Statistic	Statistic	Prob.		
Group rho-Statistic	5.708	0.76	*Kao Coefficient = -2.946*	
Group PP-Statistic	-9.756	0.00	*(0.00)*	
Group ADF-Statistic	1.429	0.92		

4.3. EMPIRICAL RESULTS ON THE PANEL ANALYSIS

The goal of the regression analysis based on the panel data framework is to determine the effects of the macroeconomic variables on DMBs' non-performing loans for the selected sub-Saharan Africa (SSA) countries. Econometric analysis was conducted to test for the particular roles of macroeconomic variables and policy-based factors in predicting the behavior of non-performing loans in the countries' banking sectors within the panel data analysis framework. Note that the dependent variable in the study is the non-performing loan ratio, indicating that any factor that has a positive coefficient indicates a negative effect on the banking sector. In contrast, a factor with a negative coefficient has a positive effect on the sector. The analysis of the regression results is interested in determining the strength,

significance and direction of effects of non-performing loans on the two dependent variables.

4.3.1 Ordinary Least Squares Estimation

We begin by presenting the general OLS estimation of the relationship for the pooled data. The results from the pooled OLS estimates present a guide to the pattern of relationship that may be observed when more appropriate estimation techniques are employed. Table 7 reports the coefficient estimates for the impact of the macroeconomic variables on non-performing. The adjusted R squared value for the estimate is very low at 0.169. This shows that based on the pooled OLS estimates, the explanatory variables only explained less than 20 per cent of the variations NPL. It should, however, be noted that the values for the coefficient of determination in models with panel data do not usually possess strong values since a short time series, in addition to cross sections, are used in the estimation . The F-statistic value for the estimate is however highly significant at the 1 per cent level, suggesting that all the explanatory variables in significantly affect the dependent variable together.

Table 7. *Pooled OLS Result for NPL estimation*

Variable	Coefficient	t-Statistic	Prob.
Constant	21.12	16.62	0.00
RGDP	-0.865	-3.84	0.00
INFL	-0.087	-0.69	0.49
EXRT	0.539	2.67	0.01
INTR	-0.126	-2.49	0.01
BSIZE	-0.096	-5.61	0.00
Adj. R-squared	0.169		
F-statistic	11.71 (0.00)		

*Note: * and ** indicate significance at 5% and 1% respectively*
Source: Author's computations

In particular, the focus is placed on the individual coefficients of the explanatory variables in the model. The coefficient of real GDP is significant at the 1 per cent level and is negative. This shows that economic growth has a negative impact on non-performing loans of banks in SSA region. The coefficients of interest rate and bank size are also significant at the 1 per cent level and also negative. This also indicates that interest rate and the size of banks significantly reduces non-performing loans of banks in the sub-region. On the other hand, exchange rate has a significant and positive coefficient. This indicates that exchange rate has a positive

impact on non-performing loans. The higher the exchange rate for the individual country, the higher will be the non-performing loans in the banking sector. The coefficient t of inflation rate fails the significance test at the 5 per cent level. The results of the pooled OLS estimates are however not reliable since heterogeneity issues have been noted in the J-B statistics test above. Table 8 presents the results of the Hausman test, which show that the null hypothesis is rejected at the 1 per cent level. This suggests that the process for estimating the random effects is not highly effective at estimating the relationships. Therefore, the fixed effects estimation process is the best suitable panel data regression approach in this particular scenario.

Table 8. *Hausman Test for Cross-Section Random Effects*

Model	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
NPL	22.611	5	0.00

Source: Author's computations

4.3.2 Panel Estimation Analysis

As noted in the Hausman test results, misspecification can only occur when the random effects procedures are employed in the estimation. Therefore, the Fixed-effect strategy is the most appropriate approach to use when assessing the correlation between macroeconomic factors and non-performing loans across SSA nations. We present the fixed effects estimates in this study and base our conclusions on the findings. But in order to strengthen the results' robustness, the estimates of the random effects are also provided. This aids in improving the robustness of the estimates.

The panel data-based estimates of the relationships for the study are presented in Table 9. It is clear from the adjusted R-squared values that the fixed effect estimates have the best predictive power, just as it was suggested by the Hausman test result. The focus is on the particular contribution of the individual variables to non-performing loans. A closer look at the results of both estimates indicates that the coefficients possess similar signs. This is an indication that the estimates for this study are robust to estimation technique. From the fixed effects result, the coefficient real GDP growth is significant at the 1 per cent level and is also negative. This shows that as economic growth improves, non-performing loans of the banks decline. A one per cent rise in real GDP leads to a 0.945 percent reduction in non-performing loans of the banks. This coefficient is close to one, suggesting that economic growth has an almost one-to-one relationship with non-performing loans among the banks in the economies.

Table 9. *Panel Regression results*

Variable	Fixed effects			Random effects		
	Coeff.	**t-Stat.**	**Prob.**	**Coeff.**	**t-Stat.**	**Prob.**
C	22.724	18.74	0.00	21.124	16.62	0.00
RGDP	-0.945	-4.13	0.00	-0.865	-3.84	0.00
INFL	-0.048	-0.39	0.70	-0.087	-0.69	0.49
EXRT	0.377	2.16	0.04	0.539	2.67	0.01
INTR	-0.117	-2.25	0.03	-0.126	-2.49	0.01
BSIZE	-0.110	-7.37	0.00	-0.096	-5.61	0.00
Adj. R-squared	0.207			0.169		
F-statistic	5.30			11.711		

Source: Author's computations

The coefficient of interest rate is also significant at the 5 per cent level and negative. Thus, an increase in interest rate leads to a decline in non-performing loan ratio of the banks in SSA region. Rising interest rate does not appear to effectively influence the capacity to pay back loans. In the same vein, the size of the banks has a significant negative impact on non-performing loans among the countries. This shows that the larger the banking sector, the lower the tendency of banks to incur non-performing loans in SSA countries. A large banking sector, therefore, appears to act as a stability factor in the banking system in terms of loan performance. Exchange rate however has a significant positive impact on non-performing loans among the SSA countries. This shows that the higher the interest rate, the higher the proportion of non-performing loans for the banking sectors among the countries. A one per cent rise (depreciation) of the exchange rate leads to a 0.377 per cent increase in the proportion of non-performing loans among the countries. Thus, the study shows that exchange rate is one of the most critical macroeconomic factors that drive non-performing loans among the banks in the economies. The coefficient of inflation fails the significance test in the estimates. This shows that inflation rate has no significant impact on non-performing loans in Nigeria. Thus, changes in the price level does not effectively influence loan failure, rather it is the exchange rate and the level of economic performance that influence loan failure among SSA countries.

Finally, the GMM estimates of the relationships are also presented in order to improve on the robustness of the study. Recall that the GMM estimates take into cognizance the endogeneity between macroeconomic factors and loan performance. These variables have been known to be endogenous to each other. In the result shown in Table 10, the coefficients of all the variables possess similar signs as those of the fixed effects estimates. This helps to confirm that the fixed effects results are robust. Moreover, the GMM result confirms that inflation rate is a significant factor in explaining the behavior of non-performing loans for the banks in the selected

countries. Inflation is shown to possess the capacity of increasing non-performing loans in the SSA countries.

Table 10. Robustness Check: The System GMM Estimates

Variable	Coefficient	t-Statistic	Prob.
NPL_{t-1}	0.257	7.89	0.00
RGDPG	-0.963	-17.58	0.00
INFL	0.107	4.78	0.00
EXRT	1.053	7.69	0.00
INTR	-0.415	-2.66	0.01
BSIZE	-0.501	-10.46	0.00
J-stat (prob)	18.55 (0.355)		
AR(1)	-1.04(0.31)		
AR(2)	3.83(0.00)		

4.4. DISCUSSION OF RESULTS

The result obtained from the analysis in the study provides relevant grounds for obtaining certain issues for discussion. First, the study found that economic growth is the most potent factor that explains non-performing loans among DMBs in SSA countries. This implies that growth in the economy has the capacity to reduce the rate of non-performing loans in the banking sectors of the SSA economies. In particular, the result suggests that a growing economy can almost completely minimize the outcomes of non-performing loans in the countries. Thus, there is evidence that poor economic performance has largely driven the rate of loan failures among SSA countries. The result therefore tends to confirm the argument that the pattern of economic movements is critical for bank failure or sustainability (Wood & Skinner, 2018). As Fofack (2005) has noted, risk is built up in a boom since economic boom is associated with rapid credit growth, large increase in asset prices, a high level of investment, export growth and excessive capital accumulation. These built-up risks, however, materialize in period of economic downturn.

The study also found that interest rate in the economy (especially the lending rate) has significant capacity to lead to lower non-performing loans in the banking sectors. In particular, the result reveals that increasing the interest rate generally leads to a decline in non-performing loan ratio of the banks in SSA region. This outcome is interesting since it shows that loan demand and performance are likely inelastic within these countries. Rising interest rate does not appear to effectively influence the capacity to pay back loans. Thus, interest rate does not contribute to the binding constraints of credit activities within these countries. Similar negative effects of interest rates on non-performing loans were also found by Bahruddin and

Masih (2018), and Maivald et al (2020). The results do not however appear to be in line with studies like those of Siddiqui et al. (2012) and Ahmed et al (2021).

Moreover, exchange rate was found to exert significant positive impact on non-performing loans, suggesting that depreciation of the exchange rate intensifies the problem of loan losses among the banks. There is therefore evidence that exchange rate plays a critical role in explaining non-performing loans. This also reveals a deleterious impact of exchange rate on non-performing loans among the banking sectors in SSA countries. This is in line previous findings by Umar and Sun (2018), and Frehiwot (2020). Thus, the external sector factor is shown to be strong in influencing loan performance within these countries. In particular, exchange rate depreciation often generates currency mismatches (Eberhardt & Presbitero, 2018). The possibility of imbalanced currency situations, such as dollar liabilities compared to naira assets, arises from currency mismatch. This can result in a sizable increase in systemic risk for loans made by the banking industry in the SSA nations. In this instance, exchange rate depreciation tends to raise the value of the banks' dollar-denominated liabilities measured in local currency, exposing the banks to losses from growing unhedged borrowers' debt payment obligations. In addition, banks may encounter broad currency mismatches (Saif-Alyousfi et al., 2018).

The study also demonstrated the ineffectiveness of the price level in influencing loan default. Thus, it is seen that price changes play lesser roles in creating non-performing loans among SSA countries. This finding is in line with studies by Guo and Bruneau (2014) and Goodhart et al (2023). In general, the study has provided evidence that the macroeconomic environment plays important roles in driving non-performing loans and overall banking sector soundness among SSA countries.

5. CONCLUSION

The banking sector among SSA countries are often considered as emerging financial systems. A sound banking sector is indispensable for a healthy, vibrant and sustainable economy. Thus, the success of finance system (and economic growth) in the country is largely dependent on the performance of banks. In the same vein, large-scale loan failure is often a precursor for banking and financial sector collapse in any economy. Though banks offer many services, most of them are related to credit and cash management which are critical aspects of liquidity among the banks. Thus, appropriate strategies for the management of lending activities contributes greatly to bank performance, productivity and long run stability of the system. This study has shown that macroeconomic variables are critical in explaining the occurrences of non-performing loans among SSA countries. In particular, macroeconomic performance, especially in the area of stable growth rates and currency rates, along with adequate policy repositioning of interest rates, play strong roles in enhance the loan systems within the banking sectors of SSA countries.

REFERENCES

Ahmed, S., Majeed, M. E., Thalassinos, E., & Thalassinos, Y. (2021). The impact of bank specific and macroeconomic factors on non-performing loans in the banking sector: Evidence from an emerging economy. *Journal of Risk and Financial Management,1*4(5), 217. https://doi.org/10.3390/jrfm14050217

Akinlo, O. & Emmanuel, M. (2014). Determinants of non-performing loans in Nigeria. *Accounting and Taxation,* 6(2), pp. 21-28.

Adamu Y, Ahmed B, & Olakunle J, (2021) Non-performing loans, interest effect and bank performance in Sub-Saharan African Economies. *Nigeria Journal of Business Administration* 19(1), 46-59

Adekunle O., Salami G, O; Adedipe O. A (2013). Impact of financial sector development on the Nigerian economic growth, *American Journal of Business and Management, 2*(4) 347-356, DOI:10.11634/ 216796061706361

Andrianova, S, Baltagi, B, Demetriades, P., & Fielding, D. (2015). Why do African banks lend so little?. *Oxford Bulletin of Economics and Statistics, 77*(3), 339-359.

Caprio, G., & Klingebiel, D. (1996). Bank insolvencies: Cross country experience. *World Bank Policy and Research Working Papers, 1*((2), 13 - 19.

EIB (2013). Banking in Sub-Saharan Africa: Challenges and opportunities. *European Investment Bank Report*, 2(4), 13 – 19.

Fofack, H. (2005). Non-performing loans in Sub-Saharan Africa: Causal analysis and macroeconomic implication. *World Bank Policy Research Working Paper*, 37(69), 19-20.

Bahruddin, W. & Masih, M. (2019). Is the relation between lending interest rate and non-performing loans symmetric or asymmetric ? Evidence from ARDL and NARDL. 1-29

Frehiwot, H. (2020). Determinants of non- performing loans in Ethiopia private commercial banks: With emphasis on domestic trade and service and export sectors. A thesis submitted in Partial fulfillment of the requirements of the award of the Degree of Master of Science in Accounting & Finance.Addis Ababa University Institutional Repository

Maivald M., Teplý P. (2020). The impact of low interest rates on banks' non-performing loans. FFA Working Paper 2/2020, FFA, University of Economics, Prague.

Goyal, S., Singhal, N., Mishra, N. et al. (2023), The impact of macroeconomic and institutional environment on NPL of developing and developed countries. *Future Business Journal*, 9(45), 1-15. https://doi.org/10.1186/s43093-023-00216-1

Goodhart, C.A.E., Tsomocos, D. P., Wang, X. (2023). Support for small businesses amid COVID-19. *Economica*. 90(358), 612-652. https://doi.org/10.1111/ecca.12460

Irungu, P. (2013). The effect of interest rate spread on financial performance of commercial banks in Kenya. Nairobi, Kenya. *World Bank Policy Research Working Paper*, 5(9), 13 - 16.

Janvisloo, M, A., & Muhammad, J. (2013). Non-performing loans sensitivity to macro variables: Panel evidence from Malaysian commercial banks. American Journal of *Economics*, 3(3), 16 – 21, DOI: 10.5923/c.economics.201301.04.

Kasekende, L, Brixova, Z., & Ndikumana, L. (2010). Africa's counter-cyclical policy responses to the crisis. *Journal of Globalization and Development*, *1*(1), 14 - 17.

Mpofu, T. R., & Nikolaidou (2018). Determinants of credit risk in the banking system in Sub-Saharan Africa. *Review of Developing Finance*, *8*(2), 141 - 153.

Mutebile, E. T. (2011). How did Uganda address economic and budgetary reforms? Lessons for South Sudan. Uganda: Bank of Uganda.

Ncube, M. (2009). Efficiency *of the banking sector in South Africa*. Paper presented at the African Economic Conference on fostering development in an era of financial and economic crises, Addis Ababa.

Nikolaidou, E., & Vogiazas, S. (2017). Credit risk determinants in Sub-Saharan banking systems: Evidence from five countries and lessons learnt from Central East and South East European countries**.** *Review of Development Finance,* 7(3), 52 – 63, DOI:10.1016/ J.RDF.2017.01.003.

Nkusu, M. (2011)**.** Non-performing loans and macro-financial vulnerabilities in advanced economies. *IMF. Working Paper, 11*(161)*, 23 – 29.*

Odeke, S., & Odongo, J. (2014). Interest rate risk exposure and financial performance of commercial banks in Ugandan. *Research Journal of Finance and Accounting*, 5(2), 167 – 180.

Messai, A. S., & Jouini, F. (2013). Micro and macro determinants of non-performing loans. International *Journal of Economics and Financial Issues*, 3(4), 852–860. https://doi.org/10.1300/

Plamen, K., & Khamis, A. (2009). Credit growth in Sub-Saharan Africa: Sources, risks and policy response. *IMF Working Paper*, *180*(9), 13 – 19.

Saif-Alyousfi, A. Y. H., Saha, A., & Md-Rus, R. (2018). Impact of oil and gas price shocks on the non-performing loans of banks in an oil and gas-rich economy. *International Journal of Bank Marketing*, 36(3), 529–556. DOI:10.1108/IJOEM-07-2017-0266

Shingjergji, A. (2013). The impact of macroeconomic variables on the non-performing loans in the Albanian banking system during 2005-2012. *Academic Journal of Interdisciplinary Studies, 2*(9), pp. 335- 339, DOI: 10.5901/ajis.2013.v2n9p335

Siddiqui, S., Malik, S. K., & Shah, S. Z. (2012). Impact of interest rate volatility on non-performing loans in Pakistan. *International Research Journal of Finance and Economics,* 8*4*(1), 66–75.

Umar, M. and Sun, G. (2018). Determinants of non-performing loans in Chinese banks, *Journal of Asia Business Studies*, 12(3), 273-289. https://doi.org/10.1108/JABS-01-2016-0005

Wood, A., & Skinner N. (2018). Determinants of non-performing loans: Evidence from commercial banks in Barbados. *The Business and Management Review*, 9 (3), 44-64.