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DYNAMICS OF MACROECONOMIC ENVIRONMENT AND NON-PERFORMING LOANS IN THE SUB-SAHARAN AFRICAN BANKING SYSTEM: DO GOVERNMENTAL INSTITUTIONS MATTER?

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Abstract

This paper examines the role of governmental institutions in the macroeconomic environment—the nonperforming loan (NPL) relationship. By applying a dynamic specification to panel data consisting of 28 SSA countries for a period spanning 2010–2020, we find that the GDP per capita growth rate consistently contributed significantly to a reduction in the NPL ratio. On the other hand, domestic credit expansion is found to be associated with a significant increase in NPLs. Further, without interaction terms, the four governance variables, namely the economic index, institutional quality index, political index, and aggregate governance indicator, have a negative and statistically significant impact on the NPL ratio, meaning that these facets of governance institutions contribute to decreasing NPL levels. Moreover, the contingency effect estimations show that the interaction terms between GDP per capita growth and the four facets of governance are significant. This implies that the impact of the macroeconomic environment on the NPL ratio is determined by the quality of the governmental institutions. However, the positive sign of the parameters suggests that a 1% increase in the interaction terms correlates with a 0.01% to 0.02% increase in NPLs.

Keywords: Macroeconomic environment; Governance; Nonperforming loans; Contingency effect; Sub-Saharan Africa

1. INTRODUCTION

For monetary authorities and other macroprudential policy institutions, understanding how commercial bank lending and nonperforming loans (NPLs) respond to macroeconomic conditions is critical (Catalan, Hoffmaister & Harun, 2020). Because loans are the riskiest part of a bank's assets, their quality is one of the most critical determinants of business stability and success. Although there is no universally accepted definition of a bad loan, the Basel Committee on Banking Supervision, the International Monetary Fund, and the Institute of International Finance offer the most commonly accepted definitions. The Basel Committee on Risk Management defines non-performing loans as all loans that are not repaid within 90 days from the due date. Therefore, if we consider the fact that one of the primary businesses of banks globally is the granting of

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loans, then the implications of banks' exposure to credit risk as well as its management become a lot clearer (Žunić, Kozarić & Dželihodžić, 2021).

Castro (2013) points out that a banking crisis may arise due to insolvency and/or liquidity problems prompted by the rising level of bad or non-performing loans on the banks' balance sheets. While it is in the interest of any financial system to explore the causes of a banking crisis, it is even more pertinent to analyse the underlying determinants of NPLs. Numerous studies have carried out extensive analysis of this phenomenon and have come to the conclusion that the macroeconomic environment is the leading factor that influences NPLs (see, e.g., Tanasković & Jandrić, 2014; Bayar, 2019; Al Masud, & Hossain, 2020).

With particular emphasis on these macroeconomic factors, the ECB (2011) points out that real GDP growth has been the leading driver of non-performing loans (NPLs) for decades. Exchange rate depreciations are also considered to be associated with an increase in NPLs in economies with a high degree of lending in foreign currencies, particularly to unhedged borrowers. In addition to these two factors, recent empirical studies highlight that equity prices, inflation, exchange rate, unemployment rate, and interest rates also tend to affect loan quality (Khumalo, Ferreira-Schenk, Rensburg & Mokatsanyane, 2021; Al Masud & Hossain, 2020; Jakubik & Kadioglu, 2021).

Although different macroeconomic factors may produce different multipliers, the question this paper attempts to answer is whether the NPL ratio responds differently to the macroeconomic environment when governance and institutional quality are taken into account in the Sub-Saharan African (SSA) context. In general, there are a limited number of empirical studies that explore the macroeconomic determinants of NPLs in the SSA. To the best of our knowledge, only Fofack (2005), Olarewaju (2020), Mpofu and Nikolaidou (2018), and the IMF (2021) have examined panel analyses of the phenomenon of SSA. While these studies may differ only in the analytical approaches adopted in regressing the NPL ratio against selected macroeconomic factors, none took into account the possible contingency effect of governmental institutions on credit risk. The need to fill this gap in literature becomes even more compelling as the SSA has come under scrutiny in recent times regarding the perceived adverse effects of poor governance quality in the region. In this regard, Adegboye *et al.* (2020) contend that the quality of institutions undermines domestic sector investment in the SSA sub-region. In the same vein, Kilishi et al. (2013), Borojo and Yushi (2020), and Yushi and Borojo (2019) argue that institutional quality really matters for economic performance in the SSA. Improved institutional quality has also been linked to less risk in the banking system and better financial development (Koumou, 2021).

Son, Liem and Khuong (2020) argue that corruption influences the economy through the channels of the banking system. In the same way, some extant literature contends that governance and quality of institutions may indirectly affect economic growth via other channels such as foreign direct investment, private investment, human capital, public expenditure, etc. (Grundler & Potrafke, 2019).

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According to Chen, Liu, and Su (2013), poor institutional quality signals, such as bribery, permit more productive businesses to obtain larger loans from deposit money institutions. This argument backs up the "grease the wheels" theory, which postulates that corruption makes things run more smoothly (Dreher & Gassebner, 2013).

However, according to Khwaja and Mian (2005), businesses that interact with politicians are more likely to receive faster financing, but they also have a greater default rate. In the same vein, Charumilind, Kali and Wiwattanakantang (2006) claim that when enterprises in close proximity to political office holders apply for long-term bank loans, they are required to put up less collateral, putting banks at risk.

In light of this, Sub-Saharan African countries have come under intense scrutiny for poor governance and institutional quality perceptions, which continue to be the region's bane. Corruption control, regulatory quality, government effectiveness, and the rule of law, among other facets of governmental institution indicators, have continued to receive low ratings among the SSA countries. In spite of this, several studies investigate the effects of macroeconomic factors on NPLs in the region's banking system, but little attention is paid to the effect of the macroeconomic environment and governmental institutions on NPLs. The theoretical argument is that good governance would act as an accelerator to growth and thus be expected to bring about a reduction in NPLs through its positive influence on the macroeconomic environment. We make important contributions to the literature by investigating the effect of macroeconomic factors on NPLs, conditional on the quality of governmental institutions. This paper further reports the results of the contingency effect of governance and interaction terms on NPLs. Economic stability, institutional quality, and political stability are three broad types of governance indicators we examined based on the World Bank's World Governance Indicators. Also, we looked at the six components of governance indicators that make up these broad types of governmental institution variables.

The rest of the paper is organised as follows: In Section 2, we reviewed related literature. Section 3 describes the data and our empirical methodology. Our results and discussion are presented in Section 4, and Section 5 presents our concluding implications.

2. REVIEW OF LITERATURE

2.1 Macroeconomic factors and NPLs literature

Higher levels of nonperforming loans are a common signalling element of banking crises, according to Ari, Chen, and Ratnovski (2020). Nonperforming loans are ones that do not pay interest or principal for a specified period of time; different countries have varying time frames for classifying loans as nonperforming assets. Most jurisdictions adopt a 90-day rule, which states that if a loan's principal or interest payment is not made for three months in a row, the loan is considered nonperforming (Syed & Tripathi, 2019).

Numerous empirical studies explore the macroeconomic factors that influence NPLs across many jurisdictions. In particular, Castro (2013), Liu, Liu and Kim (2019), Koju,

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Abbas and Wang (2018), and Morakinyo and Sibanda (2016), among others, suggest the inclusion of macroeconomic variables into the analysis and contend that they exert considerable influence on NPLs. Khumalo, Ferreira-Schenk, Rensburg, and Mokatsanyane (2021) assessed the relationship between credit risk and the macroeconomic environment of South Africa. They found a significant long-run relationship between credit risk and macroeconomic variables like the interest rate, GDP growth, unemployment rate, and money supply.

Olarewaju (2020) used the GMM estimation for 110 commercial banks from nine SSA countries for the years 2010–2017. The results revealed that the lag of nonperforming loans, lending rates, and credit growth, among others, significantly influenced nonperforming loans. Similarly, the IMF (2021) found that an increase in lending rates and credit growth was associated with a rise in NPL ratios in the SSA, whereas a slowdown in GDP growth was found to instantly reduce the borrowers' capacity to repay, hence increasing the NPL ratio. This is in line with Mpofu and Nikolaidou (2018), who studied the macroeconomic determinants of non-performing loans in the banking systems of 22 SSA countries over the period 2000–2016. The findings show that increasing the GDP growth rate has a statistically significant effect on lowering the sub-regions' NPL ratios. In the same vein, Fofack (2005) found a positive and significant association between macroeconomic shocks and the NPL ratio in the SSA. In the same vein, Jabbouri and Naili (2020) and Syed and Tripathi (2019) for the MENA countries and BRICS banking sectors, respectively, also highlight GDP growth, inflation, and unemployment as the main macroeconomic factors affecting NPLs.

While results for the SSA do not differ significantly in both direction and magnitude, conflicting results abound, especially in other emerging economies. Bayar (2019) concludes that economic growth and inflation affected nonperforming loans negatively, while unemployment affected nonperforming loans positively for emerging market economies. In contrast, Al Masud and Hossain (2021) find that the GDP growth rate, unemployment rate, and inflation are positively and significantly related to NPLs. This is in accordance with Klein (2013) for Central, Eastern, and South-Eastern Europe (CESEE). However, findings in Tanasković and Jandrić (2015) for the CEEC and SEE countries reveal a negative association between GDP growth and the rise of the NPL ratio.

Jakubik and Kadioglu (2021) contend that macroeconomic variables (inflation rate, effective tax rate, lending rate, and unemployment rate) have a statistically significant influence on the NPL ratio. On the other hand, poor credit monitoring, exchange rates, and credit policies indicate a statistically insignificant impact on NPLs. Within the context of income levels, Koju, Abbas and Wang (2018) explore the macroeconomic determinants of NPLs in low- to high-income economies in Asia using the GMM estimation approach based on a period spanning from 1998 to 2015. The results reveal that NPL responds negatively to inflation in high- and middle-income countries and positively in low-income countries. The increase in GDP per capita has a negative relationship with the NPL in

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high- and low-income countries. Similarly, the direction of influence of the unemployment rate on NPL varies across income levels, with a positive effect in the middle- and low-income countries and a positive influence in the high-income countries.

Mixed findings have been observed in some country-specific studies. For example, in the Chinese context, Umar and Sun (2018) find that GDP has an inverse relationship with NPLs, whereas inflation is positively associated with the NPL ratio. This finding is in accordance with expectations and is supported by Prasanna, Thenmozhi, and Rana (2014) for India and Khumalo, Ferreira-Schenk, Rensburg, and Mokatsanyane (2021) for South Africa. However, these results are in tandem with Laila (2017) for Indian private sector banks and in part with Goswami (2021) for selected nationalised banks, private sector banks, and foreign banks in India. Pestova and Mamonov (2013) also contend that macroeconomic factors significantly influence loan quality in Russia. Taking the investigation further to the peer-to-peer lending market, Nigmonov, Shams, and Alam (2022) argue that high interest rates and inflation rates increase the chances of defaults.

2.2 Macroeconomic factors, Governance quality and NPLs literature

Empirical studies on macroeconomic conditions, governance quality, and nonperforming loans (NPLs) are still evolving. The dearth of literature in this area extends across all regions, with none, to our knowledge, focusing on the SSA countries. Besides, the few empiricists did not attempt to determine the augmenting role of governance but only used selected governance indicators exogenously as adjustment variables. For example, Son, Liem, and Khuong (2020) used the 3SLS regressions to investigate the impact of corruption on both the banking sector and economic growth, based on international evidence. According to the findings, corruption contributes to higher levels of nonperforming loans in the banking sector. Similarly, Murshed and Saadat (2018) investigated how corruption control affects NPLs in three South Asian countries: Bangladesh, India, and Pakistan. The results show that the NPL ratio declines when there are stronger measures against corruption and the rule of law is put into place.

Hasan and Ashfaq (2021), on the other hand, used the GMM to examine the relationship between corruption (as measured by the corruption score), growth, and NPLs in a panel of 178 countries between 2000 and 2017. They argue that corruption has a positive and strong relationship with credit risk in the banking sector. For instance, using the System GMM in a panel of emerging market economies, Bayar (2019) argues that economic freedom (as a proxy for institutional development) has a negative impact on nonperforming loans.

2.3 Theoretical Argument and Knowledge Gap

There seems to be a general consensus that good governance promotes the efficient operation of financial markets, facilitates productive cooperation, and encourages other types of commercial activity (Yin, 2019). Broadly speaking, and in line with the World Bank classifications, governance quality comprises regulatory quality, government effectiveness, control of corruption, the rule of law, political stability, and voice and

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accountability. Classical literature has acknowledged that these governance qualities, if improved, can actually mitigate asymmetric information and transaction costs and, therefore, improve resource allocation (Williamson, 1981; Ho & Michaely, 1988). Keuschnigg and Weyerstrass (2015) highlight that institutional improvements following the Global Financial Crisis strengthened economic surveillance. Moreover, the improvement in institutional quality may have an important impact on credit risk in the banking system and is crucial in mitigating the occurrence of banking crises (Gaies et al. 2019). More importantly, Vo and Nguyen (2014) contend that bank managers' actions may vary depending on the macroeconomic condition. As a result, depending on economic conditions, the effects of institutional quality on bank risk may vary.

In view of this, the theoretical question this study attempts to answer is "to what extent did governance quality influence the impact of the macroeconomic environment on non-performing loans in the SSA countries?" The role of governance in promoting economic conditions is documented in numerous works of economic literature. For example, Sehrawat and Giri (2019) observed that institutional quality is crucial to accelerating economic performance. Similarly, Fetai (2018) asserts that institutional quality has a positive relationship with financial development indicators and GDP per capita growth. We, therefore, hypothesise that good governance quality is positively related to economic performance and, when this is the case, is expected to reduce the NPL ratio in the banking system. Following this theoretical model, Duuren, Haana and Kerkhof (2020) assessed such a contingency effect using financial stability transparency, and not economic growth, as a medium of interaction. They contend that financial stability and transparency are negatively related to NPLs with low institutional quality. In spite of the robust arguments in recent literature about the augmenting role of governmental institutions on credit risk (Canh, Schinckus, Su and Chong, 2020; Son, Liem, & Khuong, 2020), this combined effect of governance quality and economic growth on NPLs remains understudied, especially for developing economies.

Notably, the few studies that examined the phenomenon selected sub-facets of governance quality, mainly the corruption index, thereby leaving out the core and broader governmental institution indexes like government effectiveness, regulation quality, rule of law, political stability, and voice and accountability, whose improvements are expected to be positively related to the macroeconomic environment, hence lowering credit risk. In light of this, we built the six sub-facets of governance, including corruption perception, into three major governance quality indicators, namely the economic index, the institutional quality index, and the political index, in accordance with the World Bank's World Governance Indicators classification. In addition, the inability to investigate the contingency effect of governance indicators on the macroeconomic condition and the NPL nexus is a gap in the existing literature.

To fill this gap, we determine the combined effect of governance quality and macroeconomic condition on NPLs by interacting each of the key governance quality

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indicators with the GDP per capita growth rate using a broad-based dynamic modelling approach for the SSA countries.

3. DATA AND METHODOLOGY

3.1 Data and Methodology

In this analysis, we use a panel dataset of 28 SSA countries from 2010 to 2020. The main data sources are the World Development Indicators [WDI] (2021) for data on nonperforming loans and macroeconomic variables and the World Governance Indicators [WGI] (2021) of the World Bank, where data on governmental institution variables were obtained. The choice of 2010 as the base year was informed by the availability of data on the nonperforming loan (NPL) ratio in the region, which became available on the WDI database for most of the countries in 2010. As a result, only countries with significant data on NPL were selected. The estimation approach employed in this study is the generalised method of moments (GMM). Existing empirical studies contend that the dynamic panel model is specifically fashioned for a situation where the time period "T" is small and the number of cross-sections "N" is large (i.e., N>T) so as to control for possible dynamic panel bias (Roodman, 2006; Bond, 2002). The capacity of dynamic estimations to resolve potential endogeneity problems produced by time-invariant and country-specific effects by internally generating valid instruments is one of the key advantages of dynamic estimations over traditional models (Hsiao, 2003). We employ the two-step generalised method of moments (SGMM) introduced by Arellano and Bover (1995) and Blundell and Bond (1998) to address the issue of endogeneity, which is deemed more resilient than the single step-wise method. The SGMM estimator consists of a first-difference equation that uses acceptable instruments as lagged levels as well as a level equation that uses relevant instruments as lagged first-differences. The Sargan test can be used to determine the instrument's validity for over-identifying constraints, while the AR(1) and AR(2) tests can be used to determine the presence of serial correlation. The standard errors of the coefficients are not affected by heteroscedasticity (Roodman, 2007).

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Table 1: Description of Model Variables

Variable	Description	Measure	Designation	Expected Sign
NPL	Bank nonperforming loans to total gross loan	% of total gross loan	Dependent Variable	-/+
GDPPC	GDP per capita growth rate	Annual %	Explanatory Variable	-
FDI	Foreign direct investment	% of GDP	Explanatory Variable	+
UER	Unemployment	% of total labor force (modeled ILO estimate)	Explanatory Variable	+
INF	Inflation	consumer prices (annual %)	Explanatory Variable	+
REER	Real effective exchange rate	Natural Logarithm	Explanatory Variable	-/+
PSC	Private sector credit	% of GDP	Explanatory Variable	+
IQI	Institutional quality index	0 corresponding to lowest rank, and 100 to highest rank	Moderating Variable	-
ECOI	Economic index	0 corresponding to lowest rank, and 100 to highest rank	Moderating Variable	-
POLI	Political index	0 corresponding to lowest rank, and 100 to highest rank	Moderating Variable	-
GOVI	Aggregate governance indicator	0 corresponding to lowest rank, and 100 to highest rank	Moderating Variable	-

Source: World Bank's World Development Indicators (WDI) and World Governance Indicators (WGI), 2021.

GDPPC = GDP per capita growth rate. UER = unemployment rate. INF = inflation rate, PSC = domestic credit to the private sector. FDI = foreign direct investment. REER = real effective exchange rate. IQI = Institutional quality index. ECOI = Economic index. POLI = Political index. GOVI = Aggregate governance indicator

3.2 Model Specification

In analysing the determinants of nonperforming loans in the banking system in the SSA, we follow the extant literature (see, e.g., Mpofu & Nikolaidou, 2018; Klein, 2013; Castro, 2013; Koju, Abbas & Wang, 2018; and others) by adopting a dynamic panel approach to account for the influence of possible omitted regressors and the time persistence of

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NPLs. Therefore, the baseline model is captured by the following general equation:

$$\Delta NPL_{i,t} = \alpha + \delta \Delta NPL_{i,t-1} + \Delta \beta X'_{i,t} + \varphi_i + \Delta \varepsilon_{it} \quad (1)$$

Where $NPL_{i,t}$ denotes the NPL ratio for country *i* at time *t*; $NPL_{i,t-1}$ represents the NPL ratio of country *i* at time *t−1*; $X_{i,t}$ denotes the matrix of macroeconomic variables used in the nonperforming loan and macroeconomic environment literature, namely GDP per capita growth rate, private sector credit, foreign direct investment, unemployment rate, exchange rate and inflation rate. α is the intercept; δ and β are the corresponding coefficient vectors. The parameter estimate of lagged dependent variable is expected to be positive and less than unity. φ_i is unobserved country-specific effect, and ε_{it} is the error term. $\varphi_i + \varepsilon_{it} = \mu_{i,t}$ has the standard error component structure. The innovations are assumed to have the following characteristics:

$$E[\varphi_i] = 0, \;\; E[\varepsilon_{i,t}] = 0, \;\; E[\varepsilon_{i,t}, \varphi_i] = 0, i = 1,2, \dots, N, \;\; t = 2,3, \dots, T. \quad (2)$$

In Equation (1), the fixed effects are correlated with the regressors. In order to remove such time in-variant country specific effect, a transformation like first differencing is the option to obtain valid moment conditions. First differencing removes the individual effect and omitted variable bias from the equation. The following expression represents the first difference:

$$\Delta NPL_{i,t} = \alpha + \delta \Delta NPL_{i,t-1} + \Delta \beta X'_{i,t} + \varphi_i + \Delta \varepsilon_{it} \quad (3)$$

After the first differencing, $\Delta NPL_{i,t-1}$ gets correlated with the error term ($\Delta \varepsilon_{it}$) in Equation (3) after the first differencing. Anderson and Hsiao's (1981) instrumental variable estimator and Arellano and Bond's (1991) Generalized Method of Moments are two extensively used methods for resolving this issue. Arellano and Bond (1991) is an econometric estimator that uses the lagged value of independent variables as an instrumental variable within the equation if the series of independent variables is preset and there is no contemporaneous connection. The lagged dependent variable in the above specification captures the link between past and present values.

The model used to estimate the impact of governmental institutions on the macroeconomic environment-NPLs relationship is as follows:

$$\Delta NPL_{i,t} = \alpha + \beta_1 \Delta NPL_{i,t-1} + \beta_2 \Delta X_{i,t} + \beta_3 \Delta GOV_{i,t} + \beta_3 \Delta\left(X_{i,t} * GOV_{i,t}\right) + \beta_4 \Delta \gamma_{i,t} + \varphi_i + \Delta \varepsilon_{i,t} \quad (4)$$

β_2 denotes the coefficient of our main independent variable, GDP per capita growth rate denoted as *X*. The coefficient associated with β_3 captures the effect of governmental institutions on the macroeconomic factor–NPL ratio relationship. In other words, the interaction variable, $X_{i,t} * GOV_{i,t}$, captures the idea that governance factors may explain the variation in the macroeconomic environment–NPLs nexus with GDP per capita growth rate as the main explanatory variable in line with Staehr and Uuskula (2019) and Radivojevic and Jovocic (2017). Thus, GOV is the interacting term (i.e.,

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interaction between GDP per capita growth rate and a vector of four governmental institution indicators, namely, an economic index, an institutional quality index, a political index, and an aggregate governance index). Y is the vector of control variables comprising private sector credit, unemployment rate, foreign direct investment, the real effective exchange rate, and the inflation rate.

4. RESULTS AND DISCUSSION

Table 2 presents descriptive statistics on the variables over the period of 2010–2020 for 28 SSA countries. The information derived from the descriptive statistics provides an overview of a country's position in the sample. The average nonperforming loan ratio is 9.33% and is within a 0.96% to 48.81% range with a standard deviation of 6.95%. The average growth rate of GDP per capita is 0.78%, with a standard deviation of 4.68%. Meanwhile, the average unemployment rate and foreign direct investment are approximately 8.67% and 4.13%, respectively. The averages of the three institutional quality indicators (institutional quality index, economic index, and political index) are 31.74, 30.45, and 33.59, respectively, while the aggregate governance indicator averaged 31.93. Since governance indicators are measured such that 0 and 100 imply a low and high level of governance institutions, respectively, this means, on average, governance indicators are fairly moderate in the SSA countries. Moreover, Figure 2 displays additional details and demonstrates the country-specific percentile ranking across the three facets of governance as well as the aggregate governance indicator. The chart shows that Botswana and Mauritius are the best-ranked countries in the SSA, with an average 70+ percentile rank across all indicators. On the other hand, Angola, Burundi, Chad, Equatorial Guinea, and the Central African Republic are among the worst-ranked countries, with an average single-digit percentile rank across the three governance indicators (see Figure 1).

Table 2: Descriptive Statistics

Variable	Mean	Max.	Min.	SD	Obs.	Source of Data
NPL	9.33	48.81	0.96	6.95	272	WDI, World Bank
GDP per capita growth	0.78	11.32	-36.56	4.68	308	WDI, World Bank
Unemployment rate	8.67	28.74	0.60	7.69	308	WDI, World Bank
Foreign direct investment	4.13	39.83	-6.37	6.35	280	WDI, World Bank
Private sector credit	7.51	28.61	-17.52	6.94	282	WDI, World Bank
Real effective exchange rate	788.60	9183.88	1.43	1530.88	307	WDI, World Bank
Inflation rate	6.70	32.01	-4.29	5.52	295	WDI, World Bank
Institutional quality index	31.74	76.20	1.92	21.19	308	WGI, World Bank
Economic index	30.45	82.69	3.35	19.83	308	WGI, World Bank
Political index	33.59	79.55	4.67	18.71	308	WGI, World Bank
Aggregate governance index	31.93	77.40	4.84	18.86	31.93	WGI, World Bank

Table 3; Durbin-Wu-Hausman Test of Endogeneity: Wald Test

Test Statistic	Value	df	Probability
F-statistic	9.22	(8, 642)	0.00
Chi-square	61.25	8	0.00

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From the endogeneity test in Table 3, the null hypothesis is that the variables are exogenous. Given a Chi-square value of 61.25 and a probability value of 0.00, we cannot reject the alternative hypothesis, indicating that the variables in our study are endogenous. Panel Least Square would have been a consistent estimator in the absence of endogeneity issues. But once endogeneity is established, the GMM estimator will be a consistent and efficient way to estimate endogenous regressions.

Table 4 shows the relationship between the nonperforming loan ratio, governmental institutions, and macroeconomic factors. The baseline results on the effect of the macroeconomic environment on nonperforming loans are presented in column 2 (model 1(a)). In addition, models 1(b), 1(c), and 1(d) present the results of the baseline model with the inclusion of governmental institution variables, namely the institutional quality index, the economic index, the political index, and the aggregate governance index, respectively. Notes: ***, **, and * denote significant values of 1%, 5%, and 10%, respectively. Statistics in parenthesis denote the *t*-statistics.

Table 4: Results on GMM-System Estimation Macroeconomic Factors, Governmental Institutions and Nonperforming Loans Quality (Without Interaction Variable)

	Model 1(a)	**Model 1(b)**	**Model 1(c)**	**Model 1(d)**	**Model 1(e)**
	Main Model	**Governance Indicator: Institutional quality Index**	**Governance Indicator: Economic Index**	**Governance Indicator: Political Index**	**Aggregate governanc e indicator**
NPL (-1)	0.78***	0.74***	0.73***	0.79***	0.75***
	(11.71)	(9.69)	(8.78)	(10.97)	(0.06)
GDPPC	-0.35***	-0.31***	-0.35***	-0.38***	-0.35***
	(-5.60)	(-5.52)	(-5.41)	(-5.58)	(-5.46)
FDI	0.16**	0.14**	0.15**	0.15**	0.14**
	(2.44)	(2.19)	(2.33)	(2.41)	(2.37)
PSC	0.05**	0.04**	0.04**	0.05**	0.03**
	(-2.36)	(-2.81)	(-2.76)	(-2.34)	(-2.38)
UER	0.07	0.06***	0.07***	0.06**	0.08**
	(1.53)	(3.20)	(3.28)	(2.42)	(2.66)
EXR	1.27	1.31**	1.68**	1.42**	1.07**
	(2.59)	(2.40)	(2.46)	(2.37)	(2.60)
INF	0.09**	0.08**	0.08**	0.10**	0.08**
	(2.30)	(2.21)	(2.51)	(2.34)	(2.17)
GOV		-0.10**	-0.06**	-0.04**	-0.04**
		(-2.68)	(2.50)	(2.45)	(2.98)
Constant	-1.42**	2.39***	-0.09*	-2.57**	-1.60***
	(-2.35)	(3.19)	(-1.60)	(-2.51)	(3.09)
AR(2) test (p-value)	0.58	0.63	0.59	0.58	0.74
Sargan test (p-value)	0.71	0.70	0.72	0.71	0.70

The results on the effects of macroeconomic factors and governance on the NPL ratio are shown in Table 4. Our analysis starts by examining the impact of macroeconomic

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variables on NPL, as shown in column 2 (Model 1(a)). The results reveal that the initial NPL ratio is positively and significantly associated with current NPLs. This is in line with Mpofu and Nikolaidou (2018), who argue that lagged NPL is expected to positively affect current NPL levels. The results further show that the GDP per capita growth rate (GDPPC) is negatively and significantly related to the NPL ratio. This is in tandem with the *a priori* expectation and implies that an increase in GDP per capita leads to a reduction in the NPL ratio. The parameter estimate suggests that when GDPPC increases by one percentage point, the NPL level declines by 0.35 percentage points. This is consistent with the findings in Koju, Abbas, and Wang (2018), and Bayar (2019). Moreover, contrary to theoretical expectation, FDI is shown to have a significant positive influence on NPL, where one percentage point increase in FDI brings about a 0.16 percentage point increase in NPL. The direction of impact of other control variables is consistent with expectations. The private sector credit to GDP results indicate a statistically significant and positive sign of nonperforming loans across all models. Based on the coefficients obtained, we can state that a 1% increase in credit to the private sector correlates with an increase in nonperforming loans in the 0.04% to 0.06% range.

In the other four models (Models b, c, d, and e), the slope coefficient GDPPC is statistically significant and ranges from -0.31 to -0.38, implying a decrease in NPL of at least 0.31 percent for a percentage change in GDPPC. With the exception of FDI, the control variables show the correct signs and are significant at the 5 percent conventional probability level. Furthermore, at the 5% significance level, the main model could not reject the null hypothesis of no second-order serial correlation. Furthermore, the Sargan test p-value of 0.70 to 0.72 indicates that we were unable to reject the null hypothesis of no over-identifying restriction for the estimation. This demonstrates that the instrument variables are validly exogenous and that the GMM estimations in our system are efficient.

Table 5 presents results of the interaction between governmental institution variables and the main macroeconomic variable of interest (i.e. GDP per capita growth rate). Notes: ***, ** and * denote significant at 1%, 5%, and 10%. Statistics in parenthesis denote the *t*-statistics.

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Table 5: Results on GMM-System Estimation on Macroeconomic Factors, Governmental Institutions and Nonperforming Loans Quality (With Interaction Variable)

Nonperforming loan ratio	Model 2(a) Governance Indicator: Institutional Index	Model 2(b) Governance Indicator: Economic Index	Model 2(c) Governance Indicator: Political Index	Model 2(d) Aggregate governance indicator
NPL (-1)	0.76***	0.75***	0.82***	0.78***
	(9.97)	(9.09)	(11.19)	(9.78)
GDPPC	-0.48***	-0.50***	-0.50***	-0.51***
	(-5.81)	(-5.92)	(-5.56)	(-5.77)
FDI	0.15**	0.15**	0.16**	0.15**
	(2.28)	(2.36)	(2.45)	(2.43)
PSC	0.056**	0.051**	0.043**	0.055**
	(-2.27)	(-2.33)	(-2.38)	(-2.34)
UER	0.13*	0.13**	0.13**	0.14**
	(2.39)	(2.42)	(2.44)	(2.45)
REER	1.69*	1.72*	2.09**	1.79**
	(1.87)	(1.89)	(2.14)	(2.31)
INF	0.10**	0.10**	0.12**	0.11**
	(2.43)	(2.36)	(2.66)	(2.48)
GOV	-0.05**	-0.07**	-0.02**	-0.04***
	(-2.97)	(-2.89)	(2.37)	(-2.52)
GDPPC*GOV	0.013**	0.014***	0.014**	0.016***
	(2.56)	(2.90)	(2.37)	(2.68)
Constant	-1.45**	-1.20	-5.55**	-2.58***
	(-2.31)	(-1.23)	(-3.07)	(-3.49)
AR(2) test (p-value)	0.61	0.58	0.69	0.62
Sargan test (p-value)	0.73	0.71	0.74	0.71

*GDPPC = GDP per capita growth rate. UER = unemployment rate. INF = inflation rate, PSC = domestic credit to the private sector. FDI = foreign direct investment. REER = real effective exchange rate. GOV denote Institutional quality index, Economic index, Political index, and. Aggregate governance indicator, respectively. GDPPC*GOV = interaction between GDPPC and GOV.*

We analyse the effect of institutions of governance on the NPL ratio and report the results in columns 3–6 of Table 4 (i.e., we estimate Models 1(b), (c), (d), and (e), respectively. The three out of four institutional variables, namely the economic index, political index, and aggregate governance indicator, have a negative and statistically significant impact on the NPL ratio, meaning that these facets of governance institutions contribute to a decrease in NPL levels, which is consistent with several studies (Bayar, 2019). Moreover,

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with the inclusion of the governance indicators in the baseline specification, the macroeconomic factor of interest, the GDP per capita growth rate, consistently contributed significantly to the reduction in the NPL ratio, at least at the 5% significance level (i.e., Models 1(b), (c), (d), and (e)). Based on the *p*-values in the 0.58 to 0.69 range across all the models, the AR (2) test could not reject the null of no second-order serial correlation. The Sargan test could not reject the null hypothesis that there is no over-identification restriction. This means that the instruments are very reliable.

We further extended our analysis to consider the contingency effect of governmental institutions on the macroeconomic environment–NPLs nexus. Intuitively, since macroeconomic factors also involve equal representation of government policies and private sector active participation in the financial macroeconomic ecosystem, the quality of governmental institutions matters in ensuring an efficient and healthy banking system, as well as the efficient allocation and distribution of credit to targeted sectors in line with industry-specific standards and formulated policies. We follow Daud's (2020) approach and report our results in Table 5. The results show that the interaction terms between our macroeconomic variable of interest and the four facets of governance institution variables (i.e., Models 2a to 2d) are significant at a 1% to 5% range of significance levels, implying that the effect of the macroeconomic environment on the NPL ratio depends on the quality level of the governmental institution. However, the positive sign of the interaction terms would lead to an argument regarding why the macroeconomic environment is positively related to the region’s nonperforming loan ratio as the quality of governmental institutions improved. For instance, the coefficient of the aggregate governance indicator suggests that a one percent change in aggregate governance quality is associated with a 0.02% increase in the non-performing loan ratio, contrary to expectations. This implies that even though the augmenting effect of governmental institutions on the level of NPLs is significant, irrespective of the facet of the governance indicator, they have not contributed to a reduction in the NPL ratio in the region’s banking system.

At the 5% level of significance, the other explanatory variables have a consistent effect on the NPL ratio. The p-values for the serial correlation test indicate that we were unable to reject the null hypothesis of no second-order serial correlation. The Sargan test also doesn't reject the null hypothesis that there is no restriction on over-identification. This proves that the instruments are valid.

4.1 Multicolinearity Diagnostics

We understand the problem associated with multicolinearity in any regression estimate where it would be problematic to distinguish between the individual effects of the explanatory variables on the dependent variable. While multicolinearity may not seriously affect the accuracy of the model, it is noteworthy that we might lose reliability in determining the effects of individual features in our model, which could pose the problem of interpretability. To this end, we tested for multicolinearity in all the nine models using the variance inflation factor (VIF) presented in Table 6. By convention, a VIF exceeding 5 or 10 indicates high multicollinearity between the independent variables and the others.

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The results show that the VIF across the models is within the 1.02 and 3.60 range, suggesting that our models do not suffer from any multicolinearity problems.

Table 6: Test for Multicolinearity across all models: Variance Inflation Factor (VIF) Results

	Model 1a	**Model 1b**	**Model 1c**	**Model 1d**	**Model 1e**
Variable	**VIF**	**VIF**	**VIF**	**VIF**	**VIF**
GDPPC	1.356298	1.238260	1.246020	1.205338	1.240240
PSC	1.172204	1.030791	1.031298	1.016704	1.023967
FDI	1.393981	1.163014	1.161222	1.150751	1.159006
UER	3.542005	1.715893	1.453470	1.702229	1.713412
REER	3.930328	1.049643	1.038441	1.029388	1.040974
INF	1.300734	1.898866	1.624815	1.775230	1.878625
Institutional quality index		1.238260			
Economic index			1.246020		
Political index				1.205338	
Aggregate gov. index					1.240240
	Model 2a	**Model 2b**	**Model 2c**	**Model 2d**	
Variables	**VIF**	**VIF**	**VIF**	**VIF**	
GDPPC	1.915280	2.151017	2.895523	2.366199	
PSC	1.046284	1.054765	1.036636	1.041391	
FDI	1.189433	1.182848	1.174037	1.179244	
UER	2.262947	2.237978	2.312118	2.343992	
REER	1.105113	1.107536	1.088381	1.101729	
INF	2.000707	1.952801	1.988929	1.988777	
Institutional quality index	2.442127				
Economic index		2.096868			
Political index			2.204122		
Aggregate gov. index				2.382696	
GDPPC*Institutional quality index	2.606375				
GDPPC*Economic index		3.050271			
GDPPC* Political index			3.598764		
GDPPC* Aggregate gov. index				3.212802	

5. Concluding Implications

In this paper, we examine the effects of governance quality and the macroeconomic environment on nonperforming loans while controlling for the traditional determinants of nonperforming loans. An important way our work is different from the literature is that we estimate and model the broad contingency effect of governmental institutions, taking into account all six facets of governance built into three indicators in line with the World Governance Indicator of the World Bank. We examine the way macroeconomic factors and governance quality interact and test how these parameters influence the impact of the macroeconomic environment on nonperforming loans. We hypothesise that, while GDP per capita growth rate, which is our main macroeconomic factor of

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interest, and governance quality are negatively associated with nonperforming loans, their interaction should have a moderating effect on nonperforming loans. In addition, as governance quality improves, the effect of macroeconomic factors on NPLs should be negative (i.e., cause NPLs to decline). We find that as the respective governance indicators, as well as the aggregate governance quality, improve, the negative association between the macroeconomic environment and nonperforming loans also improves. However, the contingency effect (when governance indicators interact with the GDP per capita growth rate) suggests that interacting terms are positively and significantly associated with the NPL ratio. This contradicts *a priori* expectations and suggests that the augmenting effect of governmental institutions on NPLs via the GDP per capita growth rate has not yielded the expected outcome of reducing nonperforming loans in the region's banking system. We estimate that when the interaction terms increased by one percent, the NPL ratio increased by 0.01% to 0.02%. This outcome has implications for the quality of governmental institutions in the SSA countries, which have come under intense scrutiny. *A fortiori*, the accumulated non-performing loans need to be reduced to a prudent level where good governance quality could positively complement the effect of the macroeconomic environment on a region's NPL ratio. With only Botswana, Mauritius, Namibia, and Ghana having an average percentile score above 50 percentile points and the vast majority of the SSA countries having mean percentile scores below 20 percentile points, there is a need for the region to improve the quality of governmental institutions. These results indicate that, in years of credit expansion, commercial banks in the SSA countries operate with increased caution when granting new credit products. Thus, during these periods, banks are mostly expected to focus on improving their credit portfolios by cleaning up non-performing loans and working to maintain a satisfactory rate of credit growth.

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