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Macroeconomic shocks and cedit risk in the Kenyan banking sector

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Macroeconomic Shocks and Cedit Risk in the Kenyan Banking Sector

Faith Atiti, Stephanie Kimani and Raphael Agung

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58

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Macroeconomic Shocks and Cedit Risk in the Kenyan Banking Sector

Faith Atiti, Stephanie Kimani and Raphael Agung

Abstract

This paper examines how macroeconomic shocks affect credit risk in the Kenyan banking sector. Using an autoregressive distributed lag (ARDL) model within a time-series framework, we establish the existence of both a short-run and long-run nexus between macroeconomic variables and bank-credit risk. We establish a negative relationship between credit risk and GDP growth although not significant. We also find that the relationship between bank profitability and asset quality is negative in the short-run but positive in the long-run. The paper also documents a positive short-run relation between asset quality and private sector credit growth, which turns negative in the long-run. Furthermore, the bank asset quality-capital nexus is positive in the short-run but turns negative in the long-run. The concave relationship suggest that NPLs will rise with increases in capital to a certain threshold (moral hazard effect), after which more capital build ups decrease NPLs (disciplinary or regulatory effect). Finally, the speed of adjustment coefficient is negative and statistically significant. A shock in any period is self-correcting at a rate of 24.96%, implying that the long-run market equilibrium is restored within a period of four quarters.

1.0 Introduction

A macroeconomic shock is an unexpected event that has a large scale, unexpected impact on the economy. It entails any change to macroeconomic variables or relationships that has substantial effects on measures of economic performance such as unemployment, consumption and inflation (Smart assets, 2020).

In some cases, macroeconomic shocks could originate from the financial sector and snowball to the greater economy; like the Great Financial Crisis. In other cases, the shocks could be a result of direct jolts to economic output for example the ongoing Covid-19 pandemic. Both shocks have the potential to underpin a significant surge in Non-performing loans.

Increase in non-performing loans (NPLs) is therefore not a new phenomenon especially in times of financial distress. The IMF in 2019 observed that banks reported elevated NPLs' that exceeded 7.0% of total loans during most crises. In nearly half of the financial downturns between 1990 and 2018, NPLs more than doubled from pre-crisis levels (Anil, Sophia & Ratnovski, 2019).

In the aftermath of the Great Financial Crisis, total and corporate write-offs were associated with the significant deviations of output from potential (Glen, Steffen & Lea, 2005). Indeed, the Covid-19 pandemic has caused unprecedented financial disruption. The world recorded its worst financial downturn since the World War II in 2020 and whereas there has been considerable progress in containing the crisis, its persistence will continue to present significant credit risks to financial institutions.

A major increase in the ratio of non-performing loans could therefore be a serious financial consequence of the pandemic. Early indicators suggests that the ongoing crisis has escalated credit risks in banks and weakened the quality of assets across many countries. The OECD in 2021 posited that Covid-19's economic impacts have contributed to a sharp rise in defaults of corporate and household debt that is eroding the quality of bank assets across OECD countries.

Even then, the severity of Covid-induced credit risks varies across economies and sectors depending on the degree of exposure and scale of policy support. Beck & Keil, 2021, posited that whereas banks were catching Corona, the effect on banks' balance sheets had not become as obvious given the easing of regulatory requirements on loan classification and provisioning.

On one hand, evidence of the crisis on bank balance sheets in advanced economies remains weak. The European Central Bank (ECB) in its 2020 Bank Supervision report concluded that pandemic-induced shocks were not yet visible in the aggregate NPL ratio for European banks. In fact, the NPL ratio declined in 2020, driven by legacy NPL resolution programs including sales through publically supported securitization schemes and asset management companies.

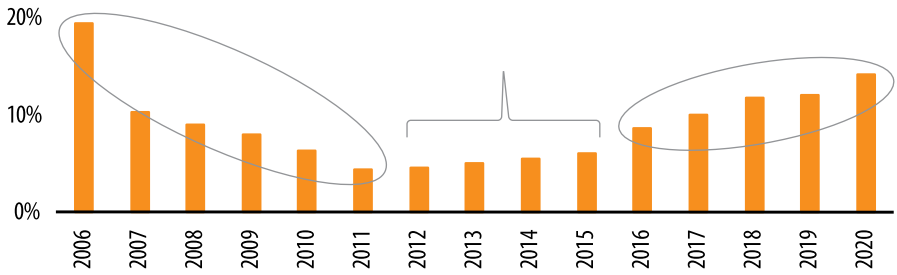
On the other hand, emerging and frontier markets face increased risks from Covid-19 pandemic. FITCH (2021) argued that emerging market banks in Europe, Middle East and Africa could see meaningful increases in reported non-performing loan (NPL) ratios in 2021, with the expiration of moratoria and other loan forbearance programs.

Some countries are projected to see several folds increase in NPLs (NPL Markets, 2021), especially those reliant on human mobility and those that were already vulnerable prior to the crisis. Moreover, unlike advanced economies, most emerging and developed markets lack both the resources and infrastructure to deal with a sharp deterioration in asset quality.

Asset quality concerns could be more profound in Sub-Saharan Africa where legacy structural challenges have kept NPL ratio in double digits especially in commodity dependent and politically fragile states (IMF, 2021).

In Kenya, NPLs were already high prior to the crisis, having risen to 14.10% of total loans in 2020 from about 6.0% in 2015. The pandemic is presenting increased risk of escalation given its extraordinary and prolonged shocks to household and business balance sheets.

Figure 1: Non-performing Loan (NPL) Ratio



Source: Central Bank of Kenya

The increase in levels of NPLs over the last four years can be explained by a myriad of economic, credit and regulatory factors. For the latter, changes in the recognition and treatment of NPLs, consistent with the IFRS 9 financial accounting Framework have contributed to the noted increase.

Indeed, during the pandemic, fiscal, monetary and prudential easing has helped to soften the scarring from the crisis. To this end, banks stepped up liquidity support for businesses, averting large-scale solvency problems. Additionally, moratoriums on interest payments and flexibilities in the recognition and treatment of NPLs could delay the reflection of the said credit risks on balance sheets.

High and increasing non-performing loans portend great danger to any economy as was evident during the financial crisis of 2008/09. While banks have been a useful source of resilience to economies during the pandemic, the sector could come under far more stress than is being envisioned (Elena, Stijn & Antonio 2020). Merhbene (2021) posits that if the harmful effects of these problems are not remedied, they could create a new crisis. According to the OECD (2021), deteriorating asset quality could limit banks' capacity to absorb loan losses over time, reducing their ability to effectively intermediate credit.

The end of insolvency moratoria, employment protection schemes and the unprecedented central bank liquidity support could trigger a sizeable increase in NPLs. The ECB highlighted that loans emerging from moratoria and other Covid-19 forbearance measures have so far underperformed the overall loan book, and signs of weakening credit quality are apparent.

If left undressed, NPLs could be a serious burden to any financial system; they can impair a bank's ability to provide financing, cause a growing number of businesses to fail and set off a downward spiral of instability (Steger, Gulden and Kaznacheev, 2021). Aiyar et al. (2015) illustrate that high NPL ratios are positively correlated with corporate debt overhangs, which depress investment and delay economic recovery. Kalemli-Ozcan et al., 2018 show empirically that a corporate debt overhang explained about 40% of the cumulative decline in aggregate investment among European firms in the 4 years after the European debt crisis in 2008.

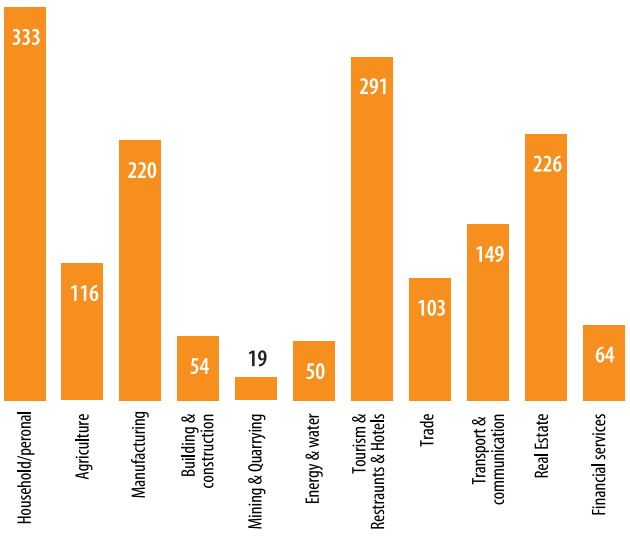
No doubt, the credit outlook has improved somewhat with ongoing vaccination campaigns against Covid-19. However, the road to recovery will be long and rough. Sustained mobility restrictions and prolonged pain for businesses could be a tipping point for bank balance sheets given the potential increase in NPLs. As a result, non-performing loans will continue to command greater attention from banks, financial sector regulators, governments and investors, with a notable increase in NPL-driven stress tests.

2.0 Motivation of the Study

The remarkable post-Global Financial Crisis prudential adjustments saw the banking sector enter the crisis with stronger capital and liquidity buffers. Complemented by enhanced regulatory support, this has reduced the pandemic's impact on bank balance sheets. For Kenya, the sector has remained profitable, liquid and well capitalized. Even then, the scale, magnitude and the uncertain duration of the pandemic is presenting new risks to the asset quality.

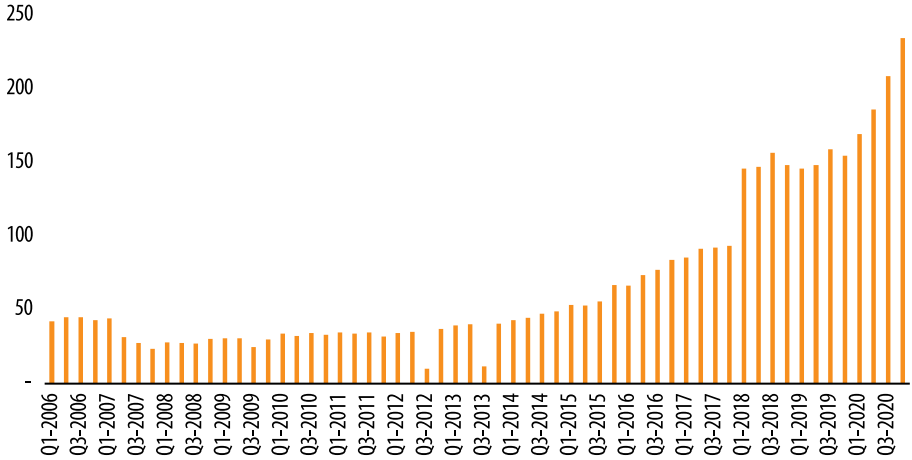
In the seven months to December 2020, a total of 401,498 loan accounts, with a cumulative value of Ksh.1626.19 billion (54% of the sector's loan book), were restructured across different sectors (including Personal loans).

Figure 2: Restructured Loans (March - December 2020)



Source: KBA/Central Bank of Kenya

Figure 3: Loan loss Provisions (KES Mn')



In response, to the new risks and as required by the prudential regulations, banks scaled up their loan loss provisions as illustrated below (**Figure 3**).

That said, following the expiry of moratoriums, a significant portion of the loans have normalized. According to the MPC statement (May, 2021), only 19% of loans were still under Covid relief programs as at the end of March 2021. However, given the divergent recovery prospects and the Covid-19 overhang, there remain a fair risk that some of the loans may tip-over into NPLs.

The potential threat to capital from lower earnings and higher loan loss provisions could disincentive lending, worsening the rather fragile credit posture and delaying recovery. Moreover, Jolevska and Andovski, (2015) argued that if non-performing loans are kept and continuously rolled over, resources are locked up in unprofitable sectors, hindering economic growth and efficiency.

To ensure that banks remain well cushioned against future shocks and minimize moral hazard risks, regulators have commenced reducing some of the Covid-19 macro-prudential response measures. This has to be choreographed in a manner that preserves incentives for lending while maintaining overall stability. A premature withdrawal of stimulus could worsen credit risk for banks with implications for lending and stability.

Earlier studies have linked the strong absorption of NPLs to strong profitability levels for the industry as well as solid capitalization. However, the progressive increase in loan loss provisions continue to reflect a steady rise in credit risk that if not arrested, could be a harbinger for the sector's instability.

3.0 Literature Review

Empirical literature on determinants of credit risk and their linkages with macroeconomic conditions is grounded in models that deal with business cycles, with an explicit role for financial intermediation. Historically, non-performing loans have been linked to bank failures, which coupled with other factors; act as a forerunner to banking crisis' (Ghosh, 2015). Faith, Raphael & Stephanie, 2019 found a strong and positive nexus between NPLs and banking sector stability in Kenya.

In theory, drivers of NPLs have been associated with macroeconomic as well as institutional factors, in some cases with no conclusive findings. Muchoki (2018) found exchange rates, inflation, GDP growth rates, bank size, banks ownership and management efficiency to be important factors in explaining credit risks in the Kenyan banking sector.

Traditionally, benign economic conditions as measured by real GDP growth implies better loan service and therefore, lower NPLs (Ghosh, 2015; beck at. al, 2010). Deteriorating asset quality is considered one of the channels for macroeconomic shocks on bank balance sheets (Nikolaidou, Vogiazas; 2017).

Fofack, 2015; and Flamine et. al 2009, found macroeconomic volatility to be the main driver of NPLs, whereas Fofack (2005) identified causality linkages between NPLs & GDP per capita. Glen, Steffen & Lea (2007) found that corporate write-offs to loan ratios increased following an adverse output shock.

Kangogo & Asienga (2014) panel study of banks in Kenya between 2000-2012 found a negative relationship between GDP, unemployment and NPLs but found a positive relationship between inflation, interest rates and NPLs. Waweru & Kalani (2009) and Washington (2014) posited that unfavorable economic conditions negatively affect NPLs in Kenya.

Mawili's (2013) study provides evidence of a negative relationship between money supply (M3) and capital inflows in Kenya while inflation was found to have a negative relationship in the short run and a positive relationship in the long run. Using the Autoregressive Distributed Lag (ARDL) model, Nikolaidou, Vogiazas (2014) found that increased money supply had a decreasing effect on NPLs in Kenya, Uganda, South Africa and Zambia.

Warue 2013, panel data provide evidence of a positive and significant correlation between lending rates and NPLs but no clear evidence that inflation was related to NPLs in Kenya except in government-linked banks. Abedola et. Al (2011), Grenidge & Grosvenor (2009) found a significant long run impact of interest rates on NPLs whilst Kalaidou & Viogiaz (2014) provide evidence that lending, money supply & unemployment are significant determinant of credit risk in Romania.

Although macro-instability has been a common feature and often a proximate cause of NPLs, banking crises often emerge because instability in the economy reveal existing weaknesses within the banking system (Karkler & Festic, 2010).

Poor management as captured by low efficiency, low capital, excess lending was also linked to higher NPLs. Weak efficiency levels reflect badly managed portfolios where poor loan underwriting, poor monitoring & controls result in increased NPLs (Berger & De Young, 1997, podpiera & Neill, 2018). Waweru, Kalani (2009), argued that poor risk assessment criteria and high lending rates charged on loans, aggravated credit risk in Kenya. High cost could imply that banks are not allocating enough resources towards risk monitoring, increasing levels of NPLs.

Ghosh (2015), argued that liquidity risk and operating inefficiencies increased NPLs, while higher profitability lowered NPLs. Moreover, banks with low liquidity as measured by loans to assets or loans to deposits ratio are expected to face higher NPLs as they are unable to cover funding gaps.

The IMF (2020), included pre-crisis government-debt-to-GDP ratio in its study of NPLs evolution during crises. Higher public debt could be associated with higher NPLs and longer NPL stabilization and resolution time, for two reasons. First, high public debt reduces the government's fiscal space, limiting its ability to cushion the fallout from the banking crisis. Second, high public debt may induce a sovereign-bank nexus where banks increase their domestic sovereign bond purchases due to government pressure or in a gamble for resurrection, thereby crowding out new credit to the private sector (Acharya et al. 2018; Ari, 2017).

Meanwhile, some studies argue that the relationship between NPLs and some macro-variables is not necessarily linear. Hajja (2017), established that capital (in the past and in the future) is a concave function of NPLs implying that increasing the capital will initially increase the NPLs until NPLs reach a maximum threshold (under the moral hazard effect),

after which more capital buildups will succeed in decreasing NPLs (under the disciplinary or regulatory effect).

It is important to underscore that the impact of non-performing loans on banking stability varies across banks and countries depending on market discipline, risk management strategies, regulatory and supervisory measures, and sources of capital (Detragiache and Gupta (2006), Martinez-Miera and Repullo (2010) and Bertayet al. (2013)).

On NPL resolution, some researchers argue that requiring banks to hold specified amounts of capital acts to both increase and decrease NPLs (Williams, 2014). To be sure, changes in macroeconomic variables affect bank capital either through changes in operating income, valuation of assets or in the creation on non-performing exposures (NPLs).

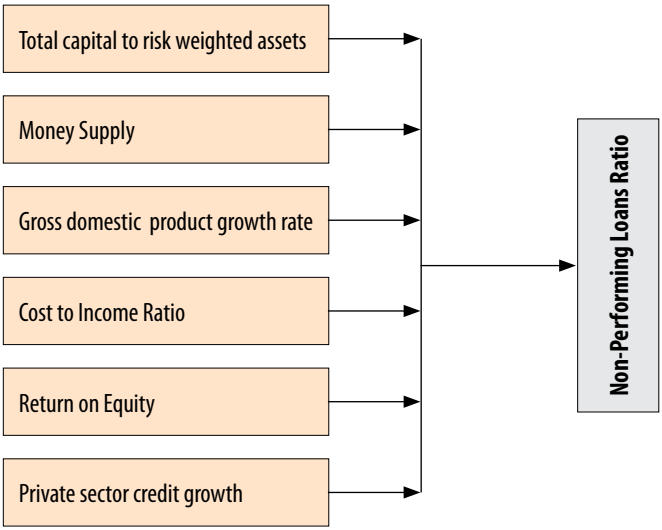
Krueger and Tornell (1999) studied the financial crisis in Mexico and the credit crunch and noted increased level of NPLs. They explained that the bailout policy adopted in 1995 could not resolve the problem of non-performing assets in the banking sector. In addition, the authors explained that non-performing assets are unlikely to disappear on their own even under a high growth scenario. In addition, they called for an alternate strategy under which all non-performing assets were recognized at once and the fiscal costs were all paid up-front as preferable to solve the issue of the non-performing assets in the banking sector.

All said, it its evident that performance of loans is vital to the stability of the banking sector. Therefore, regulators should constantly monitor and ensure swift micro and macro-prudential responses to NPLs. Espinoza & Prasad, 2010, Nkusu, 2011 & Klein (2013) documented a feedback effect from NPLs to the macro-economy. Banks asset quality could reinforce the business cycle in a pro-cyclical manner and high NPLs could complicate the process of economic recover (Klein, 2013). This underscores the need for effective containment and resolution of NPLs within any economy.

This requires an appreciation and constant review of the fundamental determinants of NPLs. Investigating the impact of bank capital as well as the impact of the macroeconomic environment on NPLs will remain an important practice for regulators concerned with financial stability and for banks' management as they wade through the unchartered terrain presented by the Covid-19 pandemic.

4.0 Research Methodology

Figure 4: Conceptual framework



The key variables of interest for this study are banking sector variables such as the NPLR: non-performing loans ratio as the dependent variable and TCRWA: total capital to risk weighted assets, M3: money supply, GDP: gross domestic product growth rate, CI: cost to income ratio, ROE: return on equity and PSC: private sector credit growth as the independent variables.

Table 1: Definition of Variables

Variable	Definition
Non-performing loans ratio (NPLR)	Is a measure of asset quality and is used to assess banks' credit risk and quality of outstanding loans. There is comprehensive literature to support the fact that a bank's allocation of credit is positively correlated to its risk appetite.
Total capital to risk weighted assets ratio (TCRWA)	Better known as the capital adequacy ratio, is the ratio of bank capital to its risk weighted assets. The ratio assesses a bank's ability to provide funds for business development and to accommodate and anticipate risks.
Private sector credit growth (PSC)	This is the change in the amount of credit extended by banks to the private sector. From literature, private sector credit has a negative relationship with NPLs. That is, as NPLs rise, bank willingness to lend to the private sector declines and as such, private sector credit growth slows.
Gross domestic product growth rate (GDP)	This is used as a proxy for the business environment. The business environment defines among other things the credit risk that banks may be exposed to. This measure represent factors beyond the firms that influence credit allocation decisions and the performance of loans. Khemraj and Pasha (2009) and Farhan et al. (2012) posit that real GDP has a significant and negative relationship with NPLs. That is, a strong performance in the real economy is linked lower NPLs.
Return on Equity (ROE)	This measures the efficiency in the deployment of bank capital. The higher the ROE (increased profitability) the better. It reflects a stronger bank, with the ability to better absorb NPL shocks.
Cost to Income Ratio (CI)	This is a common proxy for banks' operational efficiency which measures the cost of running a bank in relation to its operating income. Low levels of efficiency could imply poor credit management – (Management hypothesis).
Money Supply (M3)	This is the broadest measure of money supply that includes currency, large time deposits and institution money market funds.

4.1 Functional model

A multiple regression model as specified below guided the study:

$$NPLRt = f(TCRWAt , GDPt , M3t , ROEt , PSCt , CIt, et)$$

Table 2: Model assumption

Variable Name	Notation	Expected Sign (Study)
Non-performing loans ratio (NPLR)	NPLR	
Capital adequacy ratio	TCRWA	(-)
Money supply	M3	(+)
Economic growth	GDP	(+)
Return on Equity	ROE	(-)
Cost to Income ratio	CI	(+)
Private sector credit growth	PSC	(-)

4.2 Empirical Model

To ascertain the relationship between the explanatory variables and credit risk, as outlined in the conceptual framework, the study adopted an Autoregressive Distributed Lag model (ARDL), developed by Peseran et al. (2001). The model is one of the cointegrating techniques for determining long term relationships among variables under study. The ARDL methodology is a dynamic specification which includes lagged values of the dependent and explanatory variables as well as contemporaneous values of explanatory variables to estimate both the long and short run relations among several variables of interest.

We use the ARDL methodology for several reasons. Our variables have mixed integration. The ARDL methodology can be applied irrespective of the regressors' order of integration, I(0) or I(1), so long as the variables are not stationary at second difference and the dependent variable is stationary at first difference. Secondly, it allows for statistical inferences on long-run estimates, which are not possible under alternative Cointegration techniques. Finally, the ARDL model provides better results when the sample size T is small (like in our case) as compared to traditional approaches to Cointegration.

4.2.1 ARDL Model Specification

The general ARDL model is formulated as follows:

$$yt = \sum_{j=1}^{p} \delta\, y_{t-1} + \sum_{j=0} \beta_j\, X_{t-j} + \varphi + e_t$$

Where:

yt = dependent variable

$X't$ = is a kx1 vector of either I(0) or I (1)

δ_j = coefficient of lagged dependent variables

β_j = kx1 coefficient vectors

φ_I = unit specific fixed effects

t = 1, 2, . . . T

p, q = optimal lag lengths

e_t = error term

The model specification is therefore as follows:

$$\Delta NPL_t = \Theta_i\, (NPL_{t-1} - \lambda X_t) + \sum_{j=1}^{p-1} \xi_j \Delta NPL_{t-j} + \sum_{j=0} \beta_j \Delta X_{t-j} + \varphi + e_t$$

Where:

Θ_i = - $(1-\delta_i)$, group specific speed of adjustment coefficient where $\Theta_i > 0$

λ_i = vector of long run coefficients

ξ_j, β_j = short run dynamic coefficients

$NPL_{t-j} - \lambda X_t$ = error correction term (ECT)

Target population

The main target population is the Kenyan banking sector; as the main provider of credit to the private sector as well as policy makers given the need to understand the nexus between regulatory requirements and economic performance with credit risk, stakeholders like the IMF, keen on the stability of the sector.

Data Collection

The sample for the study includes quarterly data for the aggregate banking sector in Kenya in the period between 2006 and 2020. Collectively the sample constitutes 60 data points. Banking sector data was obtained from the central bank of Kenya while macroeconomic data was sourced from the Kenya National Bureau of Statistics (KNBS).

Data Analysis

The collected data was analyzed using trend analysis with tabular representations that revealed the trends among the different data sets. Diagnostic tests were performed to ensure no violation of assumptions of normality, homogeneity, stationarity, heteroscedasticity and serial correlation using the Stata software package version 16.

4.3 Econometric Processing and Analysis

Unit Root Test

This test established whether the data variables have a unit root or not. That is, whether the data variables are stationary and at what level of integration.

Correlation Test

The study employs the serial correlation described in Born & Breitung (2016) for the variables. The underlying concept of the test is to regress current demeaned residuals on past demeaned and bias-corrected residuals (up to order lags) using a heteroskedasticity and autocorrelation robust estimator. A Wald test is then performed on the estimated coefficients. The test calculates the Q (p) statistic that is asymptotically equivalent to this Wald test. Born & Breitung (2016) have verified that the test in its current form is also valid for unbalanced panels. It might be slightly oversized (rejects the null too often), but this is still a matter of debate).

Cointegration Test

This test established whether the data variables have a long run association with each other. This test is developed from the ARDL model.

5.0 Research Findings and Discussion

This chapter presents the results of the econometric analysis. Logarithm is only used for the loan loss provisions consistent with Cruz and Teixeira (1999), who argued that the data's logarithm increases the stability for variance and the optimization of empirical estimates. The majority of the variables, NPLt, TCRWAt, GDPt, IRt, LRt, and PSCt, are not transformed into logs, as they are either ratios or percentages. Diagnostic tests were conducted. These tests included descriptive tests for normality of the data, unit root test for stationarity, the granger causality test to test the causal relationship between the variables, the test for heteroscedasticity and the test for serial correlation.

Table 3: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
NPL	0.0849	0.0378	0.0347	0.1958
TCRWA	0.1897	0.0154	0.1630	0.2330
M3	0.1417	0.0155	0.0299	0.2617
GDP	0.0482	0.0229	-0.0550	0.0830
ROE	0.2158	0.0446	0.1510	0.3443
CI	0.5667	0.0825	0.4393	0.7770
PSC	0.1535	0.1077	0.0000	0.5734

The study uses the mean as the standard measure of the center of distribution for all the data variables. The standard deviations of the data variables, NPLt, TCRWAt, M3t, ROEt and GDPt are close to 0 indicating that the variables are not volatile.

Table 4: Correlation Analysis

	NPL	GDP	PSC	TCRWA	M3	CI	ROE
NPL	1.0000						
GDP	0.0379	1.0000					
PSC	-0.5437	-0.0027	1.0000				
TCRWA	-0.6163	-0.0772	-0.0332	1.0000			
M3	-0.4413	0.0146	0.5961	0.1418	1.0000		
CI	0.5347	-0.4384	-0.0749	-0.2808	0.0773	1.0000	
ROE	-0.1185	0.3485	0.3965	-0.1034	0.4058	-0.1897	1.0000

The NPL ratio has a strong correlation with the capital adequacy ratio (TCRWA), cost to income ratio (CI) and private sector credit growth (PSC). Moreover, money supply (M3) has a strong correlation with private sector credit growth (PSC).

Table 5: Unit Root Test

Variable	I(0)	I(1)
NPL		*,**,***
TCRWA	**,***	
M3		*,**,***
GDP	*,**,***	
CI		*,**,***
ROE	*,**,***	
PSC	*,**,***	

*,**,*** variable is stationary at the 1%, 5% and 10% significance level

The results from the table indicate that the variables are of mixed integration. The ARDL methodology is therefore ideal for the data set.

Table 6: Optimal Lag Order Selection

Max Lag(n)	NPL	GDP	PSC	TCRWA	M3	CI	ROE
	3	0	3	1	0	1	3

The optimal lag structure of the model was 4. From the above results, the lags to be used in the model are ARDL (3, 0, 3, 1, 0, 1, 3).

Table 7: ARDL Bounds Test

```
Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship                F =  2.542
                                          t = -2.786

Critical Values (0.1-0.01), F-statistic, Case 3
```

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_6	2.12	3.23	2.45	3.61	2.75	3.99	3.15	4.43

```
accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), t-statistic, Case 3
```

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_6	-2.57	-4.04	-2.86	-4.38	-3.13	-4.66	-3.43	-4.99

```
accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

k: # of non-deterministic regressors in long-run relationship
Critical values from Pesaran/Shin/Smith (2001)
```

From the results of the ARDL Bounds test, the F-statistic is higher than the I(0) of the regressors. As such, there is evidence of Cointegration in the model. That is, there is evidence of a long run relationship between all/some of the variables.

Table 8: ARDL Model

ARDL(3,0,3,1,0,1,3) regression

Sample: 2008q1 - 2020q3	Number of obs	=	51
	R-squared	=	0.6684
	Adj R-squared	=	0.4976
Log likelihood = 212.25406	Root MSE	=	0.0047

D.NPLRatio	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
NPLRatio						
L1.	-.2495556	.0814449	-3.06	0.004	-.4152564	-.0838547
LR						
GDPGrowthRate	-.3174331	.2384171	-1.33	0.192	-.8024963	.1676301
PrivateSectorCreditGrowth	-.4383589	.1075293	-4.08	0.000	-.6571288	-.2195889
TotalCapitaltototalriskweig	-1.239484	.2649196	-4.68	0.000	-1.778467	-.7005007
MoneySupplyYYM3	-.1628772	.0922972	-1.76	0.087	-.3506572	.0249029
CostincomeRatio	.0499066	.0817259	0.61	0.546	-.1163659	.2161792
ROE	.4576442	.2206613	2.07	0.046	.0087053	.9065831
SR						
NPLRatio						
LD.	-.3574818	.128612	-2.78	0.009	-.6191449	-.0958187
L2D.	-.3221148	.0996347	-3.23	0.003	-.5248231	-.1194064
PrivateSectorCreditGrowth						
D1.	.0710096	.019828	3.58	0.001	.0306692	.11135
LD.	.0783316	.0170173	4.60	0.000	.0437097	.1129536
L2D.	.0288189	.0094225	3.06	0.004	.0096487	.0479891
TotalCapitaltototalriskweig						
D1.	.147979	.0880612	1.68	0.102	-.0311829	.3271408
CostincomeRatio						
D1.	-.0251454	.020606	-1.22	0.231	-.0670685	.0167778
ROE						
D1.	-.1220205	.0318129	-3.84	0.001	-.1867443	-.0572966
LD.	-.0854865	.0254588	-3.36	0.002	-.1372828	-.0336903
L2D.	-.0509094	.0222592	-2.29	0.029	-.0961962	-.0056227
_cons	.0752857	.0277711	2.71	0.011	.018785	.1317863

5.1 Error Correlation Term (ECT)

The error correction term (adjustment factor) is appropriately negative and significant at the 5% significance level. This suggests that there a long run relationship between all/some of the variables, as earlier confirmed by the ARDL Bounds test.

5.2 Analysis of short run relationship

Impact of lagged non-performing loans ratio on current non-performing loans ratio

The first and second lags of the NPL ratio have a negative and significant relationship with the current NPL ratio at the 1%, 5% and 10% significance levels. This suggests that when the NPL ratio for the previous two quarters decline the current NPL ratio is likely to rise. This may be explained by a greater willingness to extend credit to the private sector, amid an improving credit risk environment, which then exposes banks to a greater level of risk.

Impact of cost to income ratio on non-performing loans ratio

The NPL ratio has a negative relationship with the current level of the CI ratio though this relationship is not significant.

Impact of ROE on non-performing loans ratio

The NPL ratio has a negative and significant relationship with the current and previous two lags of the ROE. This suggests that as banks become more profitable over the short run, they have fewer incentives to engage in high-risk lending thus are more likely to put in place more stringent lending measures to maintain their profitability.

Impact of private sector credit growth rate on non-performing loans ratio

The NPL ratio has a positive and significant relationship with private sector credit growth at the current and in the previous two quarters. Based on the Principal-Agent problem, extensive lending to the private sector in order to utilize deposits, results in increased riskiness of the loan portfolio thus raising the NPL ratio.

Impact of total capital to risk weighted assets on non-performing loans ratio

The NPL ratio has positive and significant relationship with the capital adequacy ratio at both the current level and in the immediate past quarter. This positive relationship affirms the moral hazard effect of bank capital on NPLs. That is NPLs continue to rise with increases in capital.

5.4 Analysis of long run relationship

Impact of GDP on non-performing loans ratio

There is a negative relationship between GDP growth and the NPL ratio though the relationship is not significant in the long run.

Impact of private sector credit growth rate on non-performing loans ratio

There is a negative and highly significant relationship between credit growth and the NPL ratio. Should PSC rise by 1.00% then the NPL ratio would decline by 44 percentage points.

Impact of total capital to risk weighted* assets *on non-performing loans ratio

There is a negative and highly significant relationship between capital and the NPL ratio. This suggests that a 1.00% increase in TCRWA would result in a 123.95% decline in the NPL ratio. This confirms a concave relationship between bank capital and NPLs whereby as more capital is built up over time, then NPLs would decline (disciplinary or regulatory effect).

Impact of money supply on non-performing loans ratio

There is a negative relationship between M3 and the NPL ratio though the relationship is not significant in the long run.

Impact of cost to income ratio on non-performing loans ratio

There is a positive relationship between operating efficiency and the NPL ratio though the relationship is not significant in the long run.

Impact of return on equity on non-performing loans ratio

There is a positive and significant relationship between ROE and the NPL ratio. A 1.00% increase in the ROE would result in a 45.76% uptick in the NPL ratio. This may suggest that as banks become more profitable they become more willing to increase lending activities to the private sector thus potentially exposing them to greater risks.

5.5 Post Estimation Tests

Table 9: Serial Correlation Test

Durbin-Watson d-statistic (18, 51) = 2.025535

Breusch-Godfrey LM test for autocorrelation

Lags (p)	Chi2	df	Prob>Chi2
4	5.833	4	0.2119

H0 : no serial correlation

The results of the serial correlation test show that there is no serial correlation in the model.

Table 10: Heteroskedasticity test

White's test for Ho: homoskedasticity
Against Ha: unrestricted heteroskedasticity

chi2 (50) = 51.00
Prob> Chi 2 = 0.4341

Breusch-Godfrey LM test for autocorrelation

Source	Chi2	df	p
heteroskedasticity	51.0	50	0.2119
Skweness	8.00	17	0.9665
Kurtosis	2.35	1	0.1255
Total	61.35	68	0.7028

From the results, there is no heteroscedasticity.

6.0 Conclusion and Policy Inferences

Asset quality plays a critical role in driving banks' credit intermediation role, critical for any country's economic outcomes. Literature documents a clear feedback loop between NPLs and the macro-economy through the credit channel. This underscores the need for a quick, yet tactful resolution of NPL.

In Kenya, NPLs have been high and sticky and could rise further as the pandemic soars the credit risk environment. Even so, the impact on balance sheets has been contained by macro-prudential easing that allowed for flexibility in the identification and treatment of NPLs. While nearly 85% of loans restructured during the first year of the crisis have normalized, fragile incomes, changing consumer needs and a prolonged crisis could tip some businesses into solvency and aggravate NPL risks.

The prudential comfort notwithstanding, banks scaled up their loan loss provisions by 42% in 2020 in anticipation of higher credit losses. However, most of this has been written back as loan performance improves.

All said, the Kenyan banks entered the crisis with stronger balance sheets and sound prudential buffers. This reflects the continued adoption of global best practices under Basel II and IFRS 9 frameworks. Liquidity and capital buffers have remained at record highs, enabling the sector to adequately weather the Covid shocks, complemented by the prudential, monetary and fiscal support.

However, with the uncertainty of the pandemic and evidence of policy exhaustion, the risk of higher NPLs will remain apparent. The combination of credit losses and increase in loan loss provisions may gradually weaken banks' ability to increase capital stock. Moreover, higher NPL ratio could weaken banks' ability to absorb

future losses, with the potential to hurt credit supply. Banks should therefore constantly monitor and forecast loan loss provisions under evolving scenarios to ensure prompt response and future resilience (OECD, 2021).

For now, strong capital and liquidity buffers should continue to provide room to absorb shocks linked to the pandemic. Our findings confirm a concave relationship between bank capital and NPLs where NPLs continue to rise with increases in capital until a certain threshold (moral hazard effect), after which more capital build ups decrease NPLs (disciplinary or regulatory effect).

The significant impact of a buildup in capital on NPLs over the long term, as displayed by the model, should present the regulator comfort in the effectiveness of some of the tools under their disposal. For instance, altering bank capital buffers should help inform risk taking behavior of banks in response to NPLs. However, this should be complemented by other measures given the inherent difficulties in raising more capital, especially, in an uncertain economic environment.

The research also makes one more contribution in response to systemic shocks to the sector. From the model, the Error correction term suggests that should there be a shock in any quarter, the market will correct at a speed 24.96% after four quarters. This indicates a slow speed of adjustment of disequilibrium correction for reaching long run equilibrium in steady state position.

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