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DETERMINANTS OF NON-PERFORMING LOANS IN NAMIBIA

ABSTRACT

This paper uses time-series data from 1996Q1-2021Q4 to examine the determinants of non-performing loans (NPL) in Namibia's banking industry and test for causality between NPL and its determinants. To accomplish this, the Autoregressive Distributive Lag (ARDL) and the Vector Autoregressive (VAR) pairwise Granger causality modelling approaches are employed. The findings reveal that in Namibia, NPL is influenced by a host of factors, including its own past values, output gap, unemployment rate, housing prices, return on assets, return on equity, lending behaviour, loan-to-deposit ratio, loan growth, narrow money supply, broad money supply, net foreign assets, repo rate, interest spread, deposit rates, private sector credit extension, oil prices, COVID-19 pandemic crisis, stock market prices, regulatory quality, government effectiveness, and the rule of law. The Granger causality test results indicate strong unidirectional causality running from past values of NPL, unemployment, housing prices, capital adequacy ratio, loan growth, and oil prices to NPL. Additionally, a bidirectional causal relationship exists between the repo rate, lending rate, and NPL. The policy implications emanating from this study need to be addressed in order to ensure the stability of the country's financial system.

Keywords: ARDL; Banking Sector; Namibia; Non-Performing Loans; Vector Autoregressive

JEL Classification: C53; E17; G21

RIASSUNTO

Questo studio utilizza dati time-series del periodo 1996 (primo trimestre)-2021 (quarto trimestre) per esaminare le determinanti dei prestiti in sofferenza (NPL) del sistema bancario della Namibia e per testare l'esistenza di relazioni di causalità tra gli NPL e le loro determinanti. Vengono applicati a tal fine i modelli ARDL e VAR pairwise Granger causality test. I risultati evidenziano che in Namibia gli NPL sono influenzati da una serie di fattori quali i loro valori passati, l'output gap, il tasso di disoccupazione, il mercato immobiliare, la redditività delle attività

e del capitale, il comportamento creditizio, il rapporto prestiti-depositi, l'aumento del credito, la diminuzione o l'aumento dell'offerta di moneta, le attività estere nette, il tasso di interesse a breve termine, lo spread, i tassi di deposito, l'estensione del credito del settore privato, il prezzo del petrolio, la crisi pandemica da COVID-19, il mercato azionario, la qualità normativa, l'azione di governo e il ruolo delle leggi. I test di Granger causalità indicano una forte causalità unidirezionale dai valori passati degli NPL, dal tasso di disoccupazione, dal mercato immobiliare, dal coefficiente di patrimonializzazione, dall'aumento del credito erogato e dal prezzo del petrolio agli NPL. Inoltre, si è riscontrata una relazione causale bidirezionale tra il tasso di interesse a breve termine, il tasso di prestito e gli NPL. Le implicazioni di policy evidenziate in questo studio, se di esse si tenesse conto, potrebbero migliorare la stabilità del sistema finanziario della Namibia.

1. INTRODUCTION

The global economic meltdown that erupted following the onset of the COVID-19 pandemic in 2019 is likely to be remembered as one of the most challenging periods for economies in the 21st century. This era threatened the survival of humanity, with millions of lives lost worldwide and significant negative impacts on most economies. Prior to this, the notorious global financial crisis of 2008 which originated from the United States of America property market due to a surge in lending to unqualified borrowers had already posed a severe challenge (Canepa and Khaled, 2018). In their studies, Koju *et al.* (2020) argued that credit risk, usually proxied by non-performing loans (NPL)¹, is an important indicator for gauging the stability of a country's banking sector.

Since loans are a major source of banks' income, credit risk constitutes the bulk of banking risks. To protect the stability of the banking system from potential threats, banking authorities need to understand the factors that cause destabilization. This knowledge will help commercial bank managers and policymakers develop effective policies to address these complex issues. Thus, efforts to uncover the root causes of credit risk and establish the nature of causality among the variables of interest are invaluable in averting potential crises. No wonder there is an ever-growing number of empirical studies on the determinants of NPL worldwide (Alrfai *et al.*, 2022; Ghosh, 2017; Gulati *et al.*, 2019; Nguyen and Trang Dinh, 2021; Us, 2017).

¹ In this study, NPL is measured as the ratio non-performing loans to total gross loans.

Like many countries, the bulk of Namibia's banking sector assets are composed of loans. Of this, with much of its credit risk exposure stemming from mortgage lending. For instance, the annual average mortgage lending as a percentage of total lending from 1996 to 2023 was 51.5%. While bank lending is crucial for the economic growth and development of any country, a decline in the quality of these concentrated assets poses risks to both the banking industry and the broader economy (Barra and Ruggiero, 2021).

Historically, credit risk has been linked to some of the worst global financial crises, especially when they originate from leading economies (Barra and Ruggiero, 2021; Rajha, 2017). Mazreku *et al.* (2018) contend that it is one of the main factors leading to the insolvency of many lending institutions, thereby creating an unstable banking environment. Just as NPL, a proxy for credit risk, is undesirable for lenders, it is equally unwanted for any country that is striving to become economically prosperous. The undesirability of NPL is primarily due to their negative spill-over effects on the overall economic performance. Moreover, rising credit risk could undermine the revenue collection base for a country like Namibia, whose fiscal budget is heavily reliant on government tax revenue², making it harder to achieve its developmental goals as outlined in various strategic blueprints³.

According to Erdas and Ezanoglu (2022) and Kjosevski and Petkovski (2021), the factors⁴ influencing NPL are multifaceted. Nevertheless, most studies are mainly centred on two categories of indicators: namely, the macroeconomic and bank-specific. As a result, other important categories are often overlooked. To address this gap, this study conducts a comprehensive analysis of various factors that could influence NPL. By so doing, the study provides a holistic understanding of the determinant of credit risk and contributes to the overall stability of Namibia's banking system. Additionally, it offers actionable insights to enhance the resilience of the banking sector and support economic development. Thus, the specific objectives of this study are to: a) establishes the key determinants of NPL in Namibia's banking sector, and b) analyse the causal relationship between such determinants and NPL.

² The Namibia Revenue Agency (NamRA) managed to generate 42% of the total tax revenue target of the overall Government expenditure budget of the anticipated N\$60.1 billion for this current financial period (2022/23).

³ Such as, the various National Development Plans (NDPs), Vision 2030, the Harambe Prosperity Plan 2 (HPP2) etc.

⁴ Such factors are usually classified into various categories of indicators, i.e., Macroeconomic, Bank-specific, Monetary, Interest rate, Financial, Institutional indicators, to mention but a few.

The rest of this paper is organised as follows; Section 2 presents a brief literature review. Section 3 outlines the methodology, followed by Section 4 which presents the empirical results. Finally, Section 5 summarises and draws conclusions.

2. LITERATURE REVIEW

2.1 Theoretical Literature

Although there are various theories for assessing the credit risk in the banking sector, this investigation focusses on three main theories: such as, the information asymmetry, moral hazard, and adverse selection. The information asymmetry theory, advanced by Akerlof (1970), refers to imbalances of information between lenders and borrowers, which limits banks' ability to accurately assess borrowers' creditworthiness. This theory is relevant because it highlights the difficulty banks face in perfectly determining a borrower's ability to repay debt.

On the other hand, the moral hazard theory, which according to Rowell and Connelly (2012) and Stiglitz (1983) is rooted in the insurance literature, describes problems associated with information asymmetry occurring after a transaction between parties has occurred. The theory asserts that banks with lower levels of capitalisation tend to experience rising levels of NPL because these banks have greater incentives to charge higher interest rates (Keeton and Morris, 1987; Wood and Skinner, 2018). Consequently, borrowers become overburdened and struggle to meet their contractual obligations, leading to an automatic increase in NPL.

Under the adverse selection theory, banks are unable to differentiate bad borrowers from the good ones, posing a serious selection challenge regarding whom they can lend their money to (Kwambai and Wandera, 2013). This dilemma is common in many developing economies, such as Namibia, due to the difficulties in distinguishing swindlers from earnest borrowers. This is because they are unable to know in advance with what probability a borrower will repay a loan (Santagata, 2023).

2.2 Empirical Literature

The empirical literature on the determinants of NPL in the banking sector is quite extensive (Radivojevic and Jovovic, 2017; Vogiazas and Nikolaidou, 2011). Most studies in this area identify macroeconomic factors as the predominant drivers of NPL (Canepa and Khaled, 2018; Kamati *et al.*, 2022; Kjosevski and Petkovski, 2017; Tracey, 2007). Another group of studies cites the bank-

specific factors (Dimitrios *et al.*, 2016; Petkovski *et al.*, 2018; US, 2020). Additionally, a significant number of studies consider a combination of various other factors (Bayar, 2019; Messai and Jouini, 2013; Ozili, 2018; Vogiazas and Nikolaidou, 2011; Wood and Skinner, 2018). In this paper, we extend Vogiazas and Nikolaidou's (2011) empirical analysis by examining the influence of macroeconomic, bank-specific, monetary, financial, interest rate and institutional factors on NPL. Many studies have confirmed the dynamic influence that past cumulative values of NPL have on NPL in the present periods (Canepa and Khaled, 2018; Erdas and Ezanoglu, 2022; Gaur *et al.*, 2022; Hajja, 2022; Koju *et al.*, 2020). What follows is a brief empirical review of the six categories of determinants of NPL upon which this study is premised.

2.2.1 Bank-Specifics Indicators

Radivojevic and Jovovic (2017) analysed the determinants of NPL ratio using a panel dataset from 25 emerging countries for the period 2000 to 2011. Their study employed three methods of static panel data and methods of dynamic panel estimation. The results highlight that the return on asset (ROA) negatively influences NPL. The capital to asset ratio (CAR) was found to positively influence NPL. Another separate study by Gashi (2021) used the Fixed effect (FE) and Generalized method of moments (GMM) techniques on a panel dataset from 18 banks in Poland for the period 2005 to 2018. The study found that return on equity (ROE) and growth of loans significantly influence NPL. Kjosevski and Petkovski (2017) performed three alternative estimation techniques (FE model, difference GMM and system GMM) on a panel of 21 commercial banks in the Baltic States for the period 2005 to 2016. The results showed that the equity to total assets ratio, ROA, ROE and GGL negatively influence NPL. The results are in agreement with those obtained by Radivojevic and Jovovic (2017). Similarly, Wood and Skinner (2018) carried out a study in Barbados using time series dataset from 1991-2015. The results show that ROE and ROA negatively influence NPL, whereas CAR and LDR have a positive effect on NPL.

2.2.2 Macroeconomics Indicators

The study by Radivojevic and Jovovic (2017) reveals that GDP and the unemployment rate negatively affect NPL. The finding regarding the unemployment rate contradicts the results of Rehman (2017) and Kjosevski *et al.* (2019). Similarly, Gashi (2021) found that GDP had a strong negative effect on the level of NPL, whereas public debt and the unemployment rate turned out to

have a positive effect on NPL. The results align with those obtained by Arham *et al.* (2020) and Vogiazas and Nikolaidou (2011), except for the debt component, which was found to negatively influence NPL. Canepa and Khaled (2018) used a balanced panel dataset of 23 countries spanning from 2000 to 2012. The results show that GDP and house prices are inversely related to NPL, whilst the rate of unemployment, household affordability and household indebtedness were found to positively influence NPL. Likewise, Wood and Skinner (2018) employed an OLS econometric approach using data from Barbados for period 1991 to 2015. Their results depict that GDP growth negatively affects NPL, meanwhile the rate of unemployment is found to positively influence NPL. On the other hand, interest rate was recorded to have negative influence on NPL. Nonetheless, the study by Hajja (2022) show that GDP growth has a positive influence on NPL, while the influence of inflation on NPL is negative.

2.2.3 Monetary Indicators

Asiama and Amoah (2019) assessed the influence of the monetary policy rate (using the central bank's repo rate as its proxy) on NPL in Ghana. The results from using an ARDL estimation reveal that, in the short run, monetary policy did not influence NPL. They argued that this might have been due to rising operating costs, brought about by the spread between the interest rate and the repo rate, which results in the rise of NPL. Nonetheless, in the long run, the monetary policy variable was found to positively influence NPL. Similarly, Anita *et al.* (2022) investigated the macroeconomic determinants of NPL for a panel of eight South Asian countries (Afghanistan, Bangladesh, Bhutan, India, Nepal, Maldives, Pakistan, and Sri Lanka) using annual data for the period 2008 to 2019. The study found that, among the variables employed, only money supply, a proxy of monetary policy, was found to negatively influence NPL. Likewise, Vogiazas and Nikolaidou (2011)'s study also reveals both the narrow and broad money supply to negatively influence NPL in Romania. However, Hajja (2022) found that an expansionary monetary raises the level of NPL in banks.

2.2.4 Interest Rate Indicators

Arham *et al.* (2020) analyse the determinants of NPL using a panel of 10 Asian countries and found the real interest rate to positively affect NPL. Likewise, Canepa and Khaled (2018) used a panel of 23 countries and found interest rate to be positively related to NPL. In another study conducted

by Hajja (2022), using Malaysian dataset, it was found that the lending rate positively influences NPL. These results contradict the findings of Ekanayake and Azeez (2015), who evaluated the determinants of NPL in the Sri Lankan banking sector between the period 1999 to 2012. Conversely, Vogiazas and Nikolaidou (2011) found the 3-month Euribor rate to have a negative significant effect on NPL. This outcome is against the *a priori* expectation which postulates that declines in the interest rate cause an increase in the appetite for households and corporations to borrow more, leading to a rise in NPL. Likewise, Tanasković and Jandrić (2015) found that the exchange rate (EXR) is positively related to NPL in the CESEE countries.

2.2.5 Financial Indicators

Vogiazas and Nikolaidou (2011) hypothesised that financial markets influence NPL in the Romanian banking system. Using an OLS estimation with monthly time series data from 2001 to 2010, their study concluded that none of the financial indicators analysed were statistically significant. Rehman (2017) examined factors influencing NPL in the South Asian banking sector for the period 1999 to 2015. Given the heterogenous nature of the data, the study employed the GMM estimation along with the impulse response function (IRF) to ensure robust results. The findings revealed that exchange rate depreciation leads to an increase in NPL levels. Conversely, Viphindrartin *et al.* (2021) analysed the factors affecting NPL in rural banks in Indonesia using monthly data from 2015 to 2018. Applying the Vector Error Correction Model (VECM) estimation approach, the study found that interest rate positively affects NPL in both the short and long run. However, the exchange rate variable was found to be negative and statistically insignificant, nor did the authors justify why this was the case. Lastly, Hajja (2022) concluded that higher stock market liquidity is inversely associated with NPL levels.

2.2.6 Institutional Indicators

The impact of institutional factors on NPL remains underexplored in the literature, especially in the context of Namibia. Among the few studies that examined this relationship is Rachid (2019) which analysed the determinants of NPL in 10 MENA and 11 CEE countries for the period 1997 to 2016 using panel data techniques. The study found that institutional indicators such as the “rule of law” and “political stability” positively influenced NPL in MENA countries, but negatively impacted NPL in CEE countries, likely due to political instability and corruption in the latter.

Arham *et al.* (2020) examined the determinants of NPL in 10 selected Asian economies using a static panel analysis covering the period 2007 to 2017. The study highlighted how institutional indicators, such as the control of corruption, government effectiveness, and regulatory quality mitigate the effects of the macroeconomics factors on NPL. Similarly, Kordbacheh and Sadati (2022) found that corruption increased financial instability in 98 countries using data from 2012 to 2015. They emphasised the role of institutional quality in reducing NPL and employed a Generalized Least Squares (GLS) to address heterogeneity in the data.

In Africa, Ozil (2018) identified that political stability, rule of law, and regulatory quality improved banking stability across 48 states between 1996 to 2015, while corruption control had a positive impact. In Namibia, Sheefeni (2015a) used time series data from 2001 to 2014 and found that the return on assets (ROA) negatively influenced NPL, while total assets and asset ratios had positive effects. Other studies by Sheefeni (2015b) and Kamati *et al.* (2022) explored the impact of macroeconomic factors on NPL from 2001 to 2014 and 2004 to 2021, respectively. Both studies employed the VAR estimation approach and concluded that GDP growth reduced NPL, while inflation had a positive effect. A similar conclusion was reached by Mpofo and Nikolaidou (2018), who used a panel dataset of 22 countries (including Namibia) covering the period 2000 to 2016.

3. METHODOLOGY

3.1 Model Specification

The empirical model used in this study is adapted from the empirical works of Rachid (2019), Radivojevic and Jovovic (2017) and Vogiazas and Nikolaidou (2011). Six equations, corresponding to six categories of indicators (macroeconomic, bank-specific, monetary, interest rate, financial and institutional indicators) are estimated in order to identify the individual effects that each variable has on NPL. To address the specific objectives of this study, two estimation techniques – the Autoregressive Distributive Lag (ARDL) bounds test developed by Pesaran *et al.*, (2001) and the Vector Autoregressive (VAR) pairwise Granger causality test – have been employed. The ARDL technique is used to establish the variables affecting NPL, whereas the VAR Granger causality test establishes the causal relationship between the regressors and NPL. Thus, the generic ARDL model is specified as:

$$\Delta NPL_t = \gamma_0 + \sum_{i=1}^p \Psi_i \Delta NPL_{t-1} + \sum_{j=0}^q \varpi_j \Delta \mathbf{X}_{t-j} + \Phi_1 NPL_{t-1} + \Phi_n \mathbf{X}_{t-1} + \boldsymbol{\varepsilon}_t \quad (1)$$

Where NPL is the ratio of non-performing loans to total gross loans; Δ is the first difference operator; $\gamma_0, \Psi_i, \varpi_j, \Phi_1$, and Φ_2 are parameter estimates; p, q and n represent the optimum number of lags of the regressand, the optimum number of regressors and $n = 2, \dots, 7$, respectively; \mathbf{X}_{t-i} is a $K \times 1$ vector capturing the isolated effects of individual variables featured in each of the six categories indicators; $\boldsymbol{\varepsilon}_t$ is the white-noise error term with standard properties⁵ at time period t .

The VAR pairwise Granger causality specification involving NPL and the vector of the six indicators (\mathbf{X}) is specified as:

$$NPL_t = \kappa_0 + \sum_{i=1}^n \kappa_i NPL_{t-1} + \sum_{j=1}^n \kappa_j \mathbf{X}_{t-i} + \mathbf{w}_{1t} \quad (2a)$$

$$\mathbf{X}_t = \rho_1 + \sum_{i=1}^n \rho_i \mathbf{X}_{t-i} + \sum_{j=1}^n \rho_j NPL_{t-1} + \mathbf{w}_{2t} \quad (2b)$$

Where, n is the optimal lag length; ρ_1 and κ_0 are intercepts; the rest of the ρ_i, ρ_j, κ_i and κ_j are the short run dynamics coefficients of the model's adjustment to long run equilibrium; \mathbf{w}_{it} are the stochastic error terms.

3.2 Data and Description of Variables

3.2.1 Data

This study relies on secondary time-series data obtained from various sources⁶ covering the period 1996 to 2021.

3.2.2 Description of the Dependent Variable

Like in previous empirical studies, NPL is the dependent variable used to proxy credit risk in Namibia's banking sector.

⁵ $\mu_t \sim N[0, \sigma^2]$ that is, error term is randomly normally distributed with zero mean and constant variance.

⁶ Refer to Appendix (A) for more details on variable descriptions, sources and the *a priori*.

3.2.3 Description of the Independent Variables

TABLE 1- *Independent Variables*

Indicator	Variables used in the indicator
MACRO indicators	Trade openness (OPEN), Debt stock (DEBT), Output gap (GAP), Unemployment (UN), House price index (HP) and Inflation (INF)
BANK indicators	Return on assets (ROA), Return on Equity (ROE), Capital adequacy ratio (CAR), Lending behaviour (LB), Net interest margin (NIM), Loan to deposit ratio (LDR) and Loan growth (LG)
MONE indicators	Narrow money (M1), Broad money (M2) and Net Foreign Assets (NFA)
INTER indicators	INTER index involve: Repo rate (REPO), Deposit rate (DEPO), Interest spread (IS) and Treasury bills rates (TBR)
FINA indicators	Real exchange rate (RER), the private sector credit extension (PSCE), the oil prices (OIL), the share prices (SHARE), and a dummy variable (COVID-19)
INST indicators	Voice and accountability (VA), Political stability and absence of violence/terrorism (PS), Control of corruption (CC), Regulatory quality (RQ), Government effectiveness (GE), Rule of law (RL), and Anti-corruption commission (ACC)

Source: Authors' computation.

Note: For more details on the variables on the right side of Table 1, see Appendix (A) which consists of the descriptions, expected signs and data sources.

3.3 Estimation Procedures

Before conducting the empirical estimations, the data were tested for stationarity to ascertain the order of integration required for the ARDL bounds test. To achieve this, the Dickey-Fuller Generalized Least Squares (DF-GLS) (1992) was employed. Stationarity was confirmed if the test statistic was more negative than the MacKinnon's critical values at 1%, 5% or 10% levels of significance. Subsequently, the optimal lag length for the estimations was determined using the VAR estimation model, which incorporate criteria such as the Sequential Modified Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz-Bayesian

Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ) tests. Due to the shorter time frame of the dataset, the SC criterion was selected as the most appropriate. An ARDL bounds test for cointegrating was conducted. This test is advantageous as it assesses both the long run and short run relationships. The test relies on the F -statistics test for joint significance to determine the presence cointegration among variables. Cointegration is confirmed if the null hypothesis of no cointegration is rejected. The short run coefficients were derived using an error correction mechanism (ECM), which was extracted from the long run model. Post-estimation diagnostic and stability tests were performed to validate the robustness of the estimated models⁷.

4. EMPIRICAL RESULTS AND DISCUSSION

4.1 Stationary Tests

The results of the DF-GLS stationarity test, as reported in Appendix B, indicate a mixed order of integration (I(0) and I(1)) among the variables. The next section examines whether a cointegrating relationship exists among the variables in the model.

4.2 Lag Length Selection Test Results

The optimal lag length required for all subsequent estimations was determined using the VAR estimation model. Based on the results presented in Table 2, two lags were selected as optimal in the majority of the seven tests. Notably, the SC information criterion for the overall model selected one lag. Since the ARDL model estimation only considers one specific lag selection test at a time, the SC test was selected due to its suitability for smaller sample sizes compared to other criteria.

⁷ The CUSUM and CUSUMSQR stability test are deliberately omitted due to space, however they are readily available upon request.

TABLE 2- VAR Lag Order Selection Criteria for all the Models

Category	Lag	LogL	LR	FPE	AIC	SC	HQ
Macroeconomic Model	0	-1223.27	NA	114.47	24.61	24.79	24.68
	1	-216.55	1852.37	0	5.45	6.91	6.04
	2	-45.21	291.27*	4.83e-08*	3.00*	5.74*	4.11*
	3	-18	42.45	0	3.44	7.45	5.06
	4	-1.47	23.48	0	4.09	9.38	6.23
Bank specific Model	0	-1663.7	NA	45754.73	33.43	33.64	33.52
	1	-451	2207.13	0	10.46	12.34	11.22
	2	-267.22	305.07*	4.51e-07*	8.06*	11.61*	9.50*
	3	-235.95	46.9	0	8.72	13.93	10.83
	4	-212.05	32.03	0	9.52	16.4	12.3
Monetary Model	0	-3275.14	NA	3.57e+23	65.58	65.69	65.63
	1	-	1499.7	6.85e+16	50.12	50.64	50.33
	2	-	169.88*	1.46e+16*	48.57*	49.51*	48.95*
	3	-	10.36	1.79e+16	48.77	50.13	49.32
	4	-	3.37	2.39e+16	49.05	50.82	49.77
Interest rate Model	0	569.1	NA	0	-11.26	-11.11	-11.2
	1	1356.03	1463.68	0	-26.28	-25.19	-25.84
	2	1531.83	305.90*	9.58e-21*	-29.08*	-27.05*	-28.25*
	3	1555.09	37.69	0	-28.82	-25.85	-27.62
	4	1578.08	34.48	0	-28.56	-24.65	-26.98
Financial Model	0	-	NA	6.45e+31	90.27	90.43	90.33
	1	-3490	1892.67	1.92e+23	70.64	71.73	71.08
	2	-	285.79*	1.49e+22*	68.08*	70.11*	68.90*
	3	-	28.7	2.19e+22	68.44	71.41	69.64
	4	-	11.71	4.00e+22	69	72.91	70.59
Institutional Model	0	-1870.77	NA	4.82e+07	37.56	37.74	37.63
	1	-890.49	1803.72	0.39	18.93	20.39	19.52
	2	-751.76	235.84*	0.07*	17.14*	19.87*	18.24*
	3	-730.49	33.18	0.12	17.69	21.7	19.31
	4	-717.27	18.78	0.26	18.41	23.69	20.55

Source: Authors' computations.

Note: The asterisks (*) appearing in Table 2 denotes the lag order selected by the respective criterion.

4.3 Cointegration Test Results

The results from the ARDL bounds test, which examines the impacts of macroeconomic indicators, bank specific indicator, monetary indicator, interest rate indicators, financial indicators and institutional indicators on NPL ratios, are presented in Table 3.

TABLE 3 - *ARDL Bounds Test Results for all the Models*

Model	Level of Significance	Critical Value		F-Statistics	k
		Lower Bound	Upper Bound		
Macroeconomic	1%	3.15	4.43	8.75 ^a	6
Bank specific	1%	2.96	4.26	10.37 ^a	7
Monetary	1%	4.29	5.61	7.15 ^a	3
Interest rate	1%	3.74	5.06	12.43 ^a	4
Financial	1%	2.06	3.24	18.77 ^a	5
Institutional	1%	2.79	4.1	4.04 ^a	7

Source: Authors' computation

Note: a) ^a, means the rejection of null hypothesis of no cointegration at 1% levels of significance. b) The critical values presented are the ones provided by Pesaran *et al.* (2001). Case III, which is based on the unrestricted constant without a trend is used. c) k is the number of independent variables present under each model.

The results presented in Table 3 indicate that the computed F-Statistic for the macroeconomics, bank specific, monetary, interest rate, financial and institution model exceeds the upper critical bound at the 1% level of significance. Consequently, the null hypothesis of no cointegration is rejected, suggesting the existence of a stable long run cointegrating relationship between the six categories of indicators and the NPL ratio in Namibia.

4.4 Unravelling the Determinants of NPL and the Causal Dynamics Variables

The confirmation of cointegration forms the basis for estimating the long run and short run effects of regressors on NPL. Tables 4 to 9 present the results related to the first specific objective of this study, whereas the causality results (shown in Appendix C) correspond to the second objective. Discussions for both the long run and short run estimations are presented beneath each table.

4.4.1 Analysis of the NPL Model with the Macroeconomic Indicators

TABLE 4 - ARDL Results for the Effects of the Macroeconomic Indicators on NPL

A. Short run Dynamics. Regressand: $\Delta \ln NPL$				B. Long run Dynamics. Regressand: $\ln NPL$			
Regressors	Coeff.	Std. Error	Prob.	Regressors	Coeff.	Std. Error	Prob.
$\Delta \ln NPL(-1)$	0.976 ^a	0.089	0.000	$\ln OPEN$	-1.371	1.145	0.316
$\Delta \ln OPEN$	1.983 ^a	0.537	0.000	$\ln DEBT$	0.018	0.352	0.948
$\Delta \ln OPEN(-1)$	-2.162 ^a	0.433	0.000	$\ln GAP$	1.556 ^b	0.754	0.019
$\Delta \ln DEBT$	0.303 ^b	0.103	0.004	$\ln UN$	3.358 ^b	0.960	0.025
$\Delta \ln DEBT(-1)$	-0.263 ^b	0.080	0.001	$\ln HP$	-0.649 ^a	0.170	0.000
$\Delta \ln GAP$	0.080	0.079	0.312	$\ln INF$	0.324	0.258	0.281
$\Delta \ln UN$	-1.088 ^a	0.449	0.018				
$\Delta \ln UN(-1)$	1.601 ^a	0.353	0.000				
$\Delta \ln HP$	0.128 ^a	0.043	0.004				
$\Delta \ln HP(-1)$	-0.178 ^a	0.037	0.000				
$\Delta \ln INF$	-0.290 ^a	0.113	0.012				
$\Delta \ln INF(-1)$	0.372 ^a	0.089	0.000				
ECT(-1)	-0.425 ^a	0.107	0.000				
C	0.001	0.006	0.830				
<i>Short run diagnostic tests</i>		Statistics	F-Stats	LM	JB	HET	RESET
Adjusted R ²	0.774	F-Stats	27.593	0.146	37.325	1.036	3.874
DW- Stats	1.893	p-value	0.000	0.863	0.000	0.424	0.052

Source: Authors' computation.

Note: a) The term Δ denotes the first difference; \ln = natural logs; ^{a, b, c} denotes the 1%, 5% and 10% significant levels, respectively. b) DW = Durbin-Watson; Stats. = Statistics; LM=Breusch-Godfrey Serial Correlation LM Test; JB=Jarque-Bera statistics; HET=Breusch-Pagan-Godfrey' test for Heteroskedasticity; RESET=Ramsey' test for functional misspecification.

The results from Table 4 show that in the long run, the output gap (GAP), unemployment rate (UN) and house price index (HP), are statistically significant determinants of NPL in Namibia's banking sector. Specifically, a 1% increase in GAP and UN leads to a 1.55% and 3.35% rise in NPL,

while a 1% rise in HP reduces NPL by 0.64%, respectively. These findings highlight the importance of addressing economic inefficiencies and unemployment to stabilise the financial system, aligning with prior studies (Alrfai *et al.*, 2022; Canepa and Khaled, 2018; Radivojevic and Jovovic, 2017).

In the short run, except for output gap, most macroeconomic indicators significantly influence NPL. The result of the lagged NPL is positive and consistent with earlier research (Gaur *et al.*, 2022; Koju *et al.*, 2018b; Radivojevic and Jovovic, 2017). A 1% rise in lagged trade openness reduces NPL by 2.16%. The finding aligns with Mpofu and Nikolaido (2018)'s who argued that a country with a higher degree of openness also tends to have a higher degree of credit risk exposure. Similarly, a 1% rise in DEBT in the previous quarter reduces NPL by 0.26%, while in the current period it increases NPL by 0.30%, underscoring the risks of debt accumulation. These results are comparable with those obtained by Gashi (2021) and Us (2017) using the data from Poland and Turkey, respectively. A 1% rise in past quarter rates of unemployment (UN) increases NPL by 1.60%, but its effect is limited in the current period, as it only increases NPL by 1.08%. This outcome is congruent with the findings of Gashi (2021), Kjosevski *et al.* (2019), Canepa and Khaled (2018), and Radivojevic and Jovovic (2017).

The housing price index (HP) exhibits contrasting effects, with a 1% rise in the previous quarter reducing NPL by 0.18%, while a current rise in HP increases NPL by 0.13%, attributed to high mortgage demand in Namibia. This finding aligns with the results obtained by Canepa and Khaled (2018). Inflation (INF) shows mixed short run effects, with a 1% rise in lagged INF increasing NPL by 0.37%, while its rise in the current quarter reduces NPL by 0.29%. These results underscore the adverse impact of inflation on asset quality. This finding is consistent with the studies by Wood and Skinner (2018) and Alizadeh *et al.* (2013), who reported similar findings using data from Barbados and Malaysia, respectively.

The Error Correction Term (ECT) confirms long run causality, as its negative and significant coefficient indicates a stable adjustment process. Short run causality tests reject the null hypothesis of no causality, confirming strong short run effects from key variables such as trade openness, DEBT, unemployment rate, housing price index, and inflation on NPL. The pairwise Granger causality test results, presented in Table 1C (see Appendix C), reveal a strong unidirectional causal relationship from the housing price index, a proxy for the Namibian housing

market, to NPL, and from unemployment rate to NPL. Conversely, NPL is found to mildly Granger cause trade openness in Namibia.

4.4.2 Analysis of the NPL Model with the Bank Specific Indicators

TABLE 5 - ARDL Results for the Effects of the Bank Specific Indicators on NPL

A. Short run dynamics. Regressand: Δ NPL				B. Long run dynamics. Regressand: NPL					
Regressors	Coeff.	Std Error	Prob.	Regressors	Coeff.	Std. Error	Prob.		
Δ NPL(-1)	1.127 ^a	0.120	0.000	ROA	-22.942 ^c	11.921	0.06		
Δ ROA	1.383	0.934	0.142	ROE	2.234 ^c	1.105	0.046		
Δ ROA(-1)	-2.599 ^a	0.536	0.000	CAR	-1.726	1.105	0.103		
Δ ROE	-0.165 ^c	0.091	0.072	LB	0.701	0.336	0.044		
Δ ROE(-1)	0.267 ^a	0.053	0.000	<i>ln</i> NIM	-12.296	7.958	0.126		
Δ CAR	-1.105 ^a	0.307	0.001	LDR	0.496 ^b	0.220	0.027		
Δ CAR(-1)	1.255 ^a	0.233	0.000	LG	-0.370 ^b	0.176	0.038		
Δ LB	0.269 ^a	0.082	0.001						
Δ LB(-1)	-0.294 ^a	0.103	0.005						
Δ <i>ln</i> NIM)	-0.359	0.896	0.689						
Δ LDR	0.097 ^a	0.026	0.000						
Δ LDR(-1)	-0.080 ^a	0.025	0.002						
Δ LG	0.004	0.042	0.924						
ECT(-1)	-0.657 ^a	0.115	0.000						
C	0.021	0.029	0.481						
<i>Short run diagnostic tests</i>				Statistics	F-Stats	LM	JB	HET	RESET
Adjusted R ²	0.782	F-stats	26.879	0.938	439.064	44.899*	1.836		
DW- Stats.	2.160	p-value	0.000	0.396	0.000	0.000	0.069		

Source: Authors' computation.

Note: a) The term Δ denotes the first difference; *ln* = natural logs; ^{a, b, c} denotes the 1%, 5%, and 10% significant levels, respectively. b) DW = Durbin-Watson; Stats. = Statistics; LM=Breusch-Godfrey Serial Correlation LM Test; JB=Jarque-Bera statistics; HET=Breusch-Pagan-Godfrey' test for Heteroskedasticity; *implies that heteroskedasticity has been accounted for by the White-Hinkley heteroskedasticity test which provides consistent standard errors and covariance; RESET=Ramsey' test for functional misspecification.

The ARDL results in Table 5 reveal that, over the long run, return on equity (ROE), lending behaviour (LB), and loan-to-deposit ratio (LDR) positively influence NPL, while return on assets (ROA), capital adequacy ratio (CAR) and loan growth (LG) have a negative effect. The ROE finding suggests that banks pursuing higher returns on equity are more likely to engage into riskier investments which may end up destabilising their loan portfolios. The LB result supports the moral hazard hypothesis and is consistent with the findings of Canepa and Khaled (2018), who analysed a panel of 23 countries. Meanwhile, the LDR finding contradicts Koju *et al.* (2018a), who argued that a high LDR enhances profitability, but it aligns with the outcomes of Wood and Skinner (2018). These findings, particularly for LB and LDR, are unsurprising given that the concentration of banks' assets in Namibia largely consists of mortgages (Bank of Namibia, 2023). On the other hand, the negative impact of ROA on NPL suggests that a profitable banking sector minimises NPL. This finding contrasts with the outcomes of ROE, the other measure of profitability, but is in alignment with previous empirical studies (Azar and Maaliki, 2018; Ghorbani and Jakobsson, 2019; Sheefeni, 2015a; Wood and Skinner, 2018). The negative relationship between loan growth (LG) and NPL is consistent with Rifat (2016), who argued that declining loan demands reduces NPL.

In the short run, most bank-specific indicators significantly influence NPL, except for ROA in the current quarter, net interest margin (NIM), and loan growth (LG). Specifically, lagged NPL, lagged ROE, lagged CAR, banks' lending behaviour (LB) in the current quarter, and LDR in current quarter were positively associated with NPL. Conversely, lagged ROA, lagged CAR in the current quarter, lagged LB, and lagged LDR had a negative effect. The significant influence of lagged NPL underscores its persistent impact on the banking sector, supporting findings from past studies (Gaur *et al.*, 2022; Koju *et al.*, 2018b; Radivojevic and Jovovic, 2017).

The Error Correction Term (ECT) confirms long run causality, as its negative and significant coefficient indicates a stable adjustment process. The short run causality test reveals causal relationship from the lagged NPL, lagged ROA, ROE, lagged ROE, CAR, lagged CAR, LB, lagged LB, LDR and lagged LDR to NPL. The pairwise Granger causality test results presented in Table 2C (see appendix C), show a strong unidirectional causal relationship from CAR to NPL and from LG to NPL. Conversely, a weak unidirectional relationship is identified from NPL to LB. The remaining variables show no predictive influence on the future behavioural patterns of NPL.

4.4.3 Analysis of the NPL Model with the Monetary Indicators

TABLE 6 - ARDL Results for the Effects of the Monetary Indicators on NPL

A. Short run Dynamics. Regressand: Δ NPL				B. Long run Dynamics. Regressand: NPL			
Regressors	Coeff.	Std Error	Prob.	Regressors	Coeff.	Std. Error	Prob.
Δ NPL(-1)	1.125 ^a	0.337	0.001	<i>ln</i> M1	28.966 ^c	16.192	0.077
Δ <i>ln</i> M1	-10.811 ^b	5.148	0.038	<i>ln</i> M2	-15.638 ^c	9.026	0.086
Δ <i>ln</i> M1(-1)	13.735 ^b	6.449	0.036	<i>ln</i> NFA	-16.286 ^c	9.671	0.095
Δ <i>ln</i> M2	-1.556	2.038	0.447				
Δ <i>ln</i> NFA	-0.890	1.017	0.383				
ECT(-1)	-0.597 ^b	0.253	0.020				
C	-0.023	0.079	0.429				
<i>Short run diagnostic tests</i>		Statistics	F-Stats	LM	JB	HET	RESET
Adjusted R ²	0.540	F-Stats	20.755	0.905	1784.736	14.445*	0.314
DW- Stats	2.088	<i>p</i> -value	0.000	0.408	0.000	0.009	0.314

Source: Authors' computation .

Note: a) The term Δ denotes the first difference; ln=natural logs; ^a, ^b, ^c denotes the 1%, 5% and 10% significant levels, respectively. b) DW=Durbin-Watson; Stats. =Statistics; LM=Breusch-Godfrey Serial Correlation LM Test; JB=Jarque-Bera statistics; HET=Breusch-Pagan-Godfrey' test for Heteroskedasticity; * implies that heteroskedasticity has been accounted for by the White-Hinkley heteroskedasticity test which provides consistent standard errors and covariance; RESET=Ramsey' test for functional misspecification.

The long run results in Table 6 illustrate that monetary indicators influence NPL, though their impact is weaker as they are significant at the 10% level. More distinctively, a 1% rise in the narrow money supply (M1) is projected to raise NPL by 0.29 units. According to Asiana and Amoah (2019), this is likely due to a wider gap between the repo rate and the interest rate, which is often the case in Namibia. This result contrasts with Vogiazas and Nikolaidou's (2011) finding for Romania. Conversely, broad money supply (M2) and net foreign assets (NFA) have a negative impact on NPL, with a 1 % rise in M2 and NFA causing a decline in NPL of approximately 0.16 units each. This finding is consistent with Rifat (2016) and implies that an expansionary monetary policy lowers NPL through reduced interest rates.

In the short run, lagged NPL, and M1 in both current and previous quarters significantly affect NPL. Notably, lagged NPL positively influence NPL, while M1 reduces it. However, the stronger positive effect of past M1 indicates that its influence persists over the long run, a conclusion supported by Gaur *et al.* (2022), Hajja (2022) and Koju *et al.* (2018b). Overall, the monetary indicators significantly influence NPL in Namibia's banking system.

The long run causal relationship is confirmed by the negative and significant Error Correction Term (ECT) at the 5% level, showing that variables like M1 and past NPL levels are causally related to NPL over time. However, pairwise Granger causality tests (Table 3C, Appendix C) indicate no causal relationship between monetary indicators and NPL, suggesting statistical independence.

4.4.4 Analysis of the NPL Model with the Interest Rate Indicators

The long run results in Table 7 indicate that the repo rate (REPO) and interest spread (IS) significantly influence NPL. Notably, a 1 unit rise in REPO decreases NPL by 1.28 units, suggesting that contractionary monetary policy lowers credit risk. A higher REPO encourages commercial banks to be more cautious when borrowing from central bank, thereby improving quality of their loan portfolios. Meanwhile, a 1 unit rise in IS raises NPL by 3.35 units. This result is consistent with the findings of Koju *et al.* (2018b) in Nepal.

In the short run, most variables, except for IS and treasury bill rate (TBR), are statistically significant. More precisely, a 1 unit rise in lagged NPL raises current NPL by 1.10 units, while a unit rise in lagged REPO increases NPL by 1.64 units. However, a 1 unit increase in the lagged deposit rate (DEPO) reduces NPL by 3.09 units. This improvement is short-lived, as a rise in DEPO during the current period exacerbates NPL by an additional 0.1 unit. The effect of lagged DEPO is consistent with Zheng *et al.* (2020) based on data from Bangladesh. Conversely, a 1 unit rise in the lagged IS was found to reduce NPL by 0.55 units.

TABLE 7- ARDL Results for the Effects of the Interest Rate Indicators on NPL

A. Short run Dynamics. Regressand: Δ NPL				B. Long run Dynamics. Regressand: NPL			
Regressors	Coeff.	Std Error	Prob.	Regressors	Coeff.	Std. Error	Prob.
Δ NPL(-1)	1.101 ^a	0.152	0.000	REPO	-1.276 ^b	0.540	0.020
Δ REPO	-1.624 ^a	0.304	0.000	DEPO	0.661	0.703	0.349
Δ REPO(-1)	1.642 ^a	0.319	0.000	IS	3.335 ^a	0.686	0.000
Δ DEPO	3.103 ^a	0.556	0.000	TBR	-0.352	0.421	0.405
Δ DEPO(-1)	-3.093 ^a	0.589	0.000				
Δ IS	0.382	0.356	0.286				
Δ IS(-1)	-0.558 ^b	0.177	0.011				
Δ TBR	-0.020	0.177	0.878				
ECT (-1)	-0.441 ^a	0.124	0.004				
C	-0.005	0.020	0.820				
<i>Short run diagnostic tests</i>	Statistics	F-Stats	LM	JB	HET	RESET	
Adjusted R ²	0.862	F-Stats	70.202	1.448	58.274	9.524*	20.140
DW-Stats	2.111	p-value	0.000	0.240	0.021	0.000	0.000

Source: Authors' computation.

Note: a) The term Δ denotes the first difference; ^a and ^b denote the 1% and 5% significant levels, respectively. b) DW = Durbin-Watson; Stats.=Statistics; LM=Breusch-Godfrey Serial Correlation LM Test; JB=Jarque-Bera statistics; HET=Breusch-Pagan-Godfrey' test for Heteroskedasticity; RESET=Ramsey' test for functional misspecification.

The Error Correction Term (ECT) coefficient, which is negative and statistically significant, confirms the presence of long run causality among variables. In the short run, causality runs from lagged NPL, REPO, lagged REPO, DEPO, lagged DEPO, and lagged IS to NPL. The Granger causality test (see Table 4C, Appendix C) reveals a bidirectional causality between REPO and NPL, DEPO and NPL, and TBR and NPL, indicating the interest rate indicators predict the trends of NPL in Namibia.

4.4.5 Analysis of the NPL Model with the Financial Indicators

Table 8 shows that, in the long run, all variables except the real exchange rate (RER), significantly

influence NPL. Specifically, a 1 dollar rise in private sector credit extension (PSCE) reduces NPL by approximately 0.27 units. This finding is in alignment with Petkovski *et al.* (2021), which used Polish commercial bank data, but contradicts those of Mpofu and Nikolaidou (2018), who examined credit risk determinants in 22 Sub-Saharan African countries. Global oil prices (OIL) negatively correlate with NPL, albeit weakly. Specifically, a 1 dollar rise in global oil prices reduces NPL by 0.02 units, which contradicts Kalirai and Scheicher (2002) who found an opposite effect in Australia's banking system.

TABLE 8- ARDL Results for the Effects of the Financial Indicators on NPL

A. Short run Dynamics. Regressand:			Δ NPL	B. Long run Dynamics. Regressand: NPL			
Regressors	Coeff.	Std Error	Prob.	Regressors	Coeff.	Std. Error	Prob.
$\Delta \ln$ NPL(-1)	0.979 ^a	0.100	0.000	RER	-0.055	0.192	0.775
Δ RER	0.024	0.031	0.439	PSCE	-0.269 ^a	0.096	0.006
Δ PSCE	0.097	0.060	0.109	OIL	-0.024 ^c	0.013	0.078
Δ PSCE (-1)	-0.129 ^a	0.046	0.007	COVID-19	-4.485 ^b	1.754	0.012
Δ OIL	0.000	0.003	0.911	SHARES	0.005 ^a	0.002	0.002
Δ COVID-19	0.201 ^a	0.066	0.003				
	-						
Δ COVID-19(-1)	0.330 ^a	0.095	0.001				
Δ SHARES	0.000	0.000	0.147				
ECT (-1)	-0.593 ^a	0.128	0.000				
C	-0.003	0.030	0.924				
<i>Short run diagnostic tests</i>	Statistics	F-Stats		LM	JB	HET	RESET
Adjusted R ²	0.794	F-Stats.	20.350	0.213	0.811	2.445*	7.669
DW- Stats	1.973	p-value	0.000	0.807	0.666	0.003	0.007

Source: Authors' computation.

Note: a) The term Δ denotes the first difference; \ln = natural logs; ^{a, b, c} denotes the 1%, 5% and 10% significant levels, respectively. b) DW = Durbin-Watson; Stats. =Statistics; LM=Breusch-Godfrey Serial Correlation LM Test; JB=Jarque-Bera statistics; HET=Breusch-Pagan-Godfrey' test for Heteroskedasticity; * implies that heteroskedasticity has been accounted for by the White-Hinkley heteroskedasticity test which provides consistent standard errors and covariance; RESET=Ramsey' test for functional misspecification.

Interestingly, the COVID-19 pandemic reduced NPL by an average of 0.04 units during the pandemic compared to non-pandemic periods. This unconventional finding likely reflects the policy interventions undertaken by the Namibian government and industry players at the beginning of the pandemic, echoing Žunić *et al.* (2021) results, who noted a delayed pandemic effect on NPL. Meanwhile, stock market prices (SHARES) marginally increase NPL, potentially due to risky market ventures. This contrasts with Beck *et al.* (2015), who found that rising share prices were associated with lower NPL, particularly in countries with larger stock markets.

In the short run, NPL persistence is evident, as a 1 unit increase in prior NPL raises current NPL by 0.98 units. Lagged PSCE reduces NPL by 0.13 units. COVID-19 increased NPL by 0.20 units in the current quarter, while past quarter of COVID-19 pandemic reduced it by 0.33 units, reflecting effective interventions by government and the pandemic's delayed effect impact. Long run causality is confirmed through the ECT, which is negative and significant at 1% level. The short-run causality tests reveal links from lagged NPL, lagged PSCE, and COVID-19 to NPL. The pairwise Granger causality tests (Table 5C, Appendix C) show that OIL causally predicts NPL, while other financial variables are independent.

4.4.6 Analysis of the NPL Model with the Institutional Indicators

The long run results from Table 9 show that the regulatory quality (RQ), government effectiveness (GE), and the rule of law (RL) are statistically significant. Specifically, a 1% rise in RQ reduces NPL by 20.8%, consistent with Rachid (2019) who analysed the NPL dynamics in Central and Eastern European (CEE) countries. This result highlights the role of institutional soundness in improving loan portfolio quality. Similarly, a 1% rise in GE lowers NPL by 12.4%, aligning with Tatarici *et al.* (2020) and suggesting that efficient governance enhances asset quality. Conversely, a 1% rise in RL increases NPL, possibly reflecting Namibia's corruption challenges, such as the "Fishrot"⁸ scandal, which undermined public trust and loan recoverability.

⁸The name "Fishrot" came about after the notorious 2019 Wikileaks documentary known as the "Fishrot Files".

TABLE 9- ARDL Results for the Effects of the Institutional Indicators on NPL

A. Short run dynamics. Regressand: $\Delta \ln NPL$				B. Long run dynamics. Regressand: $\ln NPL$			
Regressors	Coeff.	Std. Error	Prob.	Regressors	Coeff.	Std. Error	Prob.
$\Delta \ln NPL(-1)$	1.221 ^a	0.156	0.000	$\ln VA$	-12.082	8.817	0.174
$\Delta \ln VA$	-0.921	0.615	0.138	$\ln PS$	-1.573	1.862	0.400
$\Delta \ln PS$	0.989 ^b	0.378	0.011	$\ln CC$	-4.674	5.885	0.429
$\Delta \ln PS(-1)$	-1.058 ^a	0.303	0.001	$\ln RQ$	-20.766 ^b	10.302	0.047
$\Delta \ln CC$	-0.667	0.517	0.201	$\ln GE$	-12.377 ^a	4.156	0.004
$\Delta \ln RQ$	-2.992 ^a	0.683	0.000	$\ln RL$	11.323 ^a	5.480	0.042
$\Delta \ln RQ(-1)$	2.820 ^a	0.707	0.000	ACC	-0.022	1.102	0.984
$\Delta \ln GE$	0.149	0.704	0.833				
$\Delta \ln RL$	1.561 ^a	0.430	0.001				
$\Delta \ln RL(-1)$	-1.270 ^a	0.399	0.002				
ACC	-0.017	0.017	0.310				
ECT (-1)	-0.632 ^a	0.177	0.001				
C	0.016	0.015	0.315				
<i>Short run diagnostic tests</i>		Statistics	F-Stats	LM	JB	HET	RESET
Adjusted R ²	0.721	F-Stats	17.024	0.991	118.561	3.585*	11.076
DW- Stats	2.178	p-value	0.000	0.375	0.000	0.000	0.001

Source: Authors' computation.

Note: a) The term Δ denotes the first difference; \ln = natural logs; ^{a, b, c} denotes the 1%, 5% and 10% significant levels, respectively. b) DW = Durbin-Watson; Stats. = Statistics; LM=Breusch-Godfrey Serial Correlation LM Test; JB=Jarque-Bera statistics; HET=Breusch-Pagan-Godfrey' test for Heteroskedasticity; * implies that heteroskedasticity has been accounted for by the White-Hinkley heteroskedasticity test which provides consistent standard errors and covariance; RESET=Ramsey' test for functional misspecification.

In the short run, past NPL levels significantly influence current NPL, with a 1% increase in lagged NPL raising current NPL by 1.22%, indicating persistence over time. Political stability (PS), RQ, and RL also affect NPL. A 1% rise in lagged PS reduces current NPL by 1.06%, while a similar rise in current PS worsens the loan portfolio. This finding underscores the stabilising role of Namibia's political environment, consistent with Ozili (2018) who investigated the determinants of banking stability in Africa, though it contrasts with Rachid (2019). Lagged RQ increases NPL by 2.82%, but a 1% rise in current RQ improves loan quality by reducing NPL by 2.99%. Similarly, a 1% increase in lagged RL reduces NPL by 1.27%, but a rise in current RL worsens it by 1.56%, reflecting a net

deterioration of 0.29%. These results align with findings by Boudriga *et al.* (2010) and Ozili (2018) on governance and loan performance in MENA and African countries.

The long run causal relationship is confirmed through the Error Correction Term (ECT), which is negative and statistically significant at the 1% level. Short-run causality tests reveal that NPL, PS, RQ, and RL (both current and lagged) significantly predict NPL. However, pairwise Granger causality tests (Table 6C, Appendix C) show that only NPL strongly predicts PS, while other governance variables fail to predict future NPL.

5. CONCLUSION

This study investigated the determinants of NPL in the Namibian banking sector using quarterly data for the period 1996 to 2021. The ARDL modelling approach was employed alongside the pairwise Granger causality test to assess the effects of various variables, classified into six broad categories, had on NPL. The findings reveal that overall, the monetary indicators had little effect on NPL, and in the short run NPL was primarily influenced by its own past values. However, over the long run, NPL is positively influenced by output gap, unemployment rate, return on equity, lending behaviour, loan-to-deposit ratio, interest spread, stock market prices, and rule of law.

On the other hand, housing price index, return on assets, capital adequacy ratio, loan growth, repo rate, PSCE, COVID-19 pandemic, regulatory quality and government effectiveness were found to negatively influence NPL. In terms of the Granger causality, results showed a strong unidirectional causality from the past accumulated values of NPL, unemployment, housing prices, capital adequacy ratio, loan growth, and oil prices to NPL. A bidirectional causal relationship between the repo rate, lending rate, and NPL is also confirmed.

To mitigate the risks associated with NPL, it is essential to implement robust processes for monitoring and evaluating commercial banks. Policies related to credit risk management should be regularly reviewed to identify and eliminate obsolete measures. Furthermore, the monetary authority should promote policies that ensure a stable macroeconomic and financial environment. These actions, among others, are crucial for sustaining the stability of Namibia's financial system. Future studies should explore alternative measures of credit risk and consider including other variables that could determine credit risk in Namibia.

REFERENCES

- Akerlof, G.A. (1970), "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism", *Quarterly Journal of Economics*, 84(3), 488-500, <https://doi.org/10.2307/1879431>
- Alizadehjanvisloo, M. and J. Muhammad (2013), "Non-performing Loans Sensitivity to Macro Variables: Panel Evidence from Malaysian Commercial Banks", *American Journal of Economics*, 3(5C), 16-21, doi: [10.5923/c.economics.201301.04](https://doi.org/10.5923/c.economics.201301.04).
- Alrfai, M.M., D.B. Salleh and W. Waemustafa (2022), "Empirical Examination of Credit Risk Determinant of Commercial Banks in Jordan", *Risks*, 10(4), doi: [10.3390/risks10040085](https://doi.org/10.3390/risks10040085).
- Anita, S.S., Tasnova, N. and Nawar, N. (2022), "Are Non-Performing Loans Sensitive to Macroeconomic Determinants? An Empirical Evidence from Banking Sector of SAARC Countries", *Future Business Journal*, 8(1), 1-16, doi: [10.1186/s43093-022-00117-9](https://doi.org/10.1186/s43093-022-00117-9).
- Arham, N., Salisi, M.S., Mohammed, R.U. and Tuyon, J. (2020), "Impact of Macroeconomic Cyclical Indicators and Country Governance on Bank Non-Performing Loans in Emerging Asia", *Eurasian Economic Review*, 10 (4), 707-726, doi: [10.1007/s40822-020-00156-z](https://doi.org/10.1007/s40822-020-00156-z).
- Asiama, R.K. and A. Amoah (2019), "Non-Performing Loans and Monetary Policy Dynamics in Ghana", *African Journal of Economic and Management Studies*, 10(2), 169-184, <https://doi.org/10.1108/AJEMS-04-2018-0103>
- Azar, S.A. and M. Maaliki (2018), "Analysis of Non-Performing Loan Losses in Lebanese Banks", *International Journal of Finance and Economics*, 166, 78-91.
- Bank of Namibia (2023), "Annual Report, Bank of Namibia", Windhoek, Namibia.
- Barra, C. and N. Ruggiero (2021), "Do Microeconomic and Macroeconomic Factors Influence Italian Bank Credit Risk in Different Local Markets? Evidence from Cooperative and Non-Cooperative Banks", *Journal of Economics and Business*, 114, doi: <https://doi.org/10.1016/j.jeconbus.2020.105976>
- Bayar, Y. (2019), "Macroeconomic, Institutional and Bank-Specific Determinants of Non-Performing Loans in Emerging Market Economies: A Dynamic Panel Regression Analysis", *Journal of Central Banking Theory and Practice*, 8(3), 95-110, <https://doi.org/10.2478/jcbtp-2019-0026>
- Beck, R., P. Jakubik and A. Piloju (2015), "Key Determinants of Non-Performing Loans: New Evidence from a Global Sample", *Open Economies Review*, 26(3), 525-550, <https://doi.org/10.1007/s11079-015-9358-8>

- Boudriga, A., N.B. Taktak and S. Jellouli (2010), “Bank Specific, Business and Institutional Environment Determinants of Banks Nonperforming Loans: Evidence from MENA Countries”, *The Economic Research Forum, Working Papers No. 547*.
- Canepa, A. and F. Khaled (2018), “Housing, Housing Finance and Credit Risk”, *International Journal of Financial Studies*, 6(2), <https://doi.org/10.3390/ijfs6020050>
- Dimitrios, A., L. Helen and T. Mike (2016), “Determinants of Non-Performing Loans: Evidence from Euro-Area Countries”, *Finance Research Letters*, 18, 116-119, <https://doi.org/10.1016/j.frl.2016.04.008>
- Ekanayake, E.M.N.N. and Azeez, A.A. (2015), “Determinants of Non-Performing Loans in Licensed Commercial Banks: Evidence from Sri Lanka”, *Asian Economic and Financial Review*, 5(6), 868-882, <https://doi.org/10.18488/journal.aefr/2015.5.6/102.6.868.882>
- Erdas, M.L. and Z. Ezanoglu (2022), “How do Bank-Specific Factors Impact Non-Performing Loans: Evidence from G20 Countries”, *Journal of Central Banking Theory and Practice*, 11(2), 97-122, <https://doi.org/10.2478/jcbtp-2022-0015>
- Gashi, B. (2021), “Impact of Bank-Specific and Macro Determinants on Non-Performing Loans of Polish Banking Sector”, *Ikonomicheski Izsledvania (Economic Studies Journal)*, 30(7), 129-147.
- Gaur, D., D.R. Mohapatra and P.R. Jena (2022), “Credit Quality of Indian Banking Sector: Implications of Basel III Regulations”, *Journal of Asia-Pacific Business*, 23(3), 234-253, <https://doi.org/10.1080/10599231.2022.2095587>
- Ghorbani, T. and V. Jakobsson (2019), “Determinants of Non-Performing Loans: A Panel Data Empirical Analysis for South European Countries”, Lund University.
- Ghosh, A. (2017), “Sector-Specific Analysis of Non-Performing Loans in the US Banking System and their Macroeconomic Impact”, *Journal of Economics and Business*, 93, 29-45, <https://doi.org/10.1016/j.jeconbus.2017.06.002>
- Gulati, R., A. Goswami and S. Kumar (2019), “What Drives Credit Risk in the Indian Banking Industry? An Empirical Investigation”, *Economic Systems*, Elsevier, 43(1), 42-62, <https://doi.org/10.1016/j.ecosys.2018.08.004>
- Hajja, Y. (2022), “Impact of Bank Capital on Non-Performing Loans: New Evidence of Concave Capital from Dynamic Panel-Data and Time Series Analysis in Malaysia”, *International Journal of Finance and Economics*, 27(3), 2921-2948, <https://doi.org/10.1002/ijfe.2305>
- Kalirai, H. and M. Scheicher (2002), “Macroeconomic Stress Testing: Preliminary Evidence for

- Austria”, *Financial Stability Report*, 3, 58-74.
- Kamati, R., A. William, G. Kadhikwa and P. Mushendami (2022), “Macro-Stress Testing Npls In the Banking Sector of Namibia: A VAR Approach”, *Empirical Economic Review*, 5(2), 44–64.
- Keeton, W.R. and Morris, C.S. (1987), “Why do Banks’ Loan Losses Differ?”, *Economic Review*, 72(5), 3-21.
- Kjosevski, J. and M. Petkovski (2017), “Non-Performing Loans in Baltic States: Determinants and Macroeconomic Effects”, *Baltic Journal of Economics*, 17(1), 25-44, <https://doi.org/10.1080/1406099X.2016.1246234>
- Kjosevski, J. and M. Petkovski (2021), “Macroeconomic and Bank-Specific Determinants of Non-Performing Loans: The Case of Baltic States”, *Empirica*, 48(4), 1009-1028, <https://doi.org/10.1007/s10663-020-09491-5>
- Kjosevski, J., M. Petkovski and E. Naumovska (2019), “Bank-Specific and Macroeconomic Determinants of Non-Performing Loans in the Republic of Macedonia: Comparative Analysis of Enterprise and Household NPLs”, *Economic Research-Ekonomiska Istraživanja*, 32(1), 1185-1203, <https://doi.org/10.1080/1331677X.2019.1627894>
- Koju, L., R. Koju and S. Wang (2018a), “Macroeconomic and Bank-Specific Determinants of Non-Performing Loans: Evidence from Nepalese Banking System”, *Journal of Central Banking Theory and Practice*, 7(3), 111-138, <https://doi.org/10.2478/jcbtp-2018-0026>
- Koju, L., R. Koju and S. Wang (2018b), “Does Banking Management Affect Credit Risk? Evidence from the Indian Banking System”, *International Journal of Financial Studies*, 6(3), <https://doi.org/10.3390/ijfs6030067>
- Koju, L., R. Koju and S. Wang (2020), “Macroeconomic Determinants of Credit Risks: Evidence from High-Income Countries”, *European Journal of Management and Business Economics*, 29(1), 41-53, <https://doi.org/10.1108/EJMBE-02-2018-0032>
- Kordbacheh, H. and S.Z. Sadati (2022), “Corruption and Banking Soundness: Does Natural Resource Dependency Matter?”, *Journal of Financial Crime*, 29(1), 293-308, <https://doi.org/10.1108/JFC-01-2021-0004>
- Kwambai, D.K. and M. Wandera (2013), “Effects of Credit Information Sharing on Nonperforming Loans: The Case of Kenya Commercial Bank Kenya”, *European Scientific Journal*, 9(13), 168-193.
- Mazreku, I., F. Morina, V. Misiri, J.V. Spiteri and S. Grima (2018), “Determinants of the Level of

- Non-Performing Loans in Commercial Banks of Transition Countries”, *European Research Studies Journal*, 21(3), 3-13, <https://doi.org/10.35808/ersj/1040>
- Messai, A.S. and F. Jouini (2013), “Micro and Macro Determinants of Non-Performing Loans”, *International Journal of Economics and Financial Issues*, 3(4), 852-860.
- Mpofu, T.R. and E. Nikolaidou (2018), “Determinants of Credit Risk in the Banking System in Sub-Saharan Africa”, *Review of Development Finance*, 8(2), 141-153, <https://doi.org/10.1016/j.rdf.2018.08.001>
- Nguyen, P.A. and T.T. Trang Dinh (2021), “Factors Affecting Bank Risks in Vietnam”, *International Journal of Economics and Finance*, 13(10), 1-42, <https://doi.org/10.5539/ijef.v13n10p42>
- Ozili, P.K. (2018), “Banking Stability Determinants in Africa”, *International Journal of Managerial Finance*, 14(4), 462-483, <https://doi.org/10.1108/IJMF-01-2018-0007>
- Pesaran, M.H., Y. Shin and R.J. Smith (2001), “Bounds Testing Approaches to the Analysis of Level Relationships”, *Journal of Applied Econometrics*, 16(3), 289-326, <https://doi.org/10.1002/jae.616>
- Petkovski, M., J. Kjosevski and K. Jovanovski (2018), “Empirical Panel Analysis of Non-Performing Loans in the Czech Republic. What are their Determinants and how Strong is their Impact on the Real Economy?”, *Czech Journal of Economics and Finance*, 68(5), 460-490.
- Rachid, S. (2019), “The Determinants of Non-Performing Loans: Do Institutions Matter? A Comparative Analysis of the MENA and CEE Countries”, MPRA Paper 96428, p. 24.
- Radivojevic, N. and J. Jovovic (2017), “Examining of Determinants of Non-Performing Loans”, *Prague Economic Papers*, 26(3), 300-316, <https://doi.org/10.18267/j.pep.615>
- Rajha, K.S. (2017), “Determinants of Non-Performing Loans: Evidence from the Jordanian Banking Sector”, *Journal of Finance and Bank Management*, 5(1), 54-65, <https://doi.org/10.15640/jfbm.v5n1a5>
- Rehman, O.U. (2017), “Determinants of Non-Performing Loan in South Asia: The Role of Financial Crisis”, *Eurasian Journal of Business and Economics*, 10(20), 105-124, <https://doi.org/10.17015/ejbe.2017.020.07>
- Rifat, A.M. (2016), “An Analytical Study of Determinants of Non-Performing Loans: Evidence from Non-Bank Financial Institutions (NBFIs) of Bangladesh”, *Journal of Business and Technology (Dhaka)*, 11(1), 55-67, <https://doi.org/10.3329/jbt.v11i1.34242>
- Rowell, D. and L.B. Connelly (2012), “A History of the Term ‘Moral Hazard’”, *The Journal of Risk*

- and Insurance*, 79(4), 1051-1075, <https://doi.org/10.1111/j.1539-6975.2011.01448.x>
- Santagata, M. (2023), "Actual and Historical Experiences of Successful Joint-Liability Lending", *Economia Internazionale/International Economics*, online first December, 4.
- Sheefeni, J.P.S. (2015a), "Evaluating the Impact of Bank Specific Determinants of Non-Performing Loans in Namibia", *Journal of Emerging Issues in Economics, Finance and Banking*, 4(2), 306-367.
- Sheefeni, J.P.S. (2015b), "Impact of Macro-Economic Determinants on Non-Performing Loans in Namibia", *International Review of Research in Emerging Markets and the Global Economy*, 1(4), 612-632.
- Stiglitz, J.E. (1983), "Risk, Incentives and Insurance: The Pure Theory of Moral Hazard", *The Geneva Papers on Risk and Insurance*, 8(26), 4-33, <https://doi.org/10.1057/gpp.1983.2>
- Tanasković, S. and M. Jandrić (2015), "Macroeconomic and Institutional Determinants of Non-Performing Loans", *Journal of Central Banking Theory and Practice*, 4(1), 47-62, <https://doi.org/10.1515/jcbtp-2015-0004>
- Tatarici, L.R., M.N. Kubinski and D. Barnea (2020), "Determinants of Non-Performing Loans for the EEC Region. A Financial Stability Perspective", *Management & Marketing*, 15(4), 621-642, <https://doi.org/10.2478/mmcks-2020-0036>
- Tracey, M. (2007), "A VAR Analysis of the Effects of Macroeconomic Shocks on Banking Sector Loan Quality in Jamaica", Bank of Jamaica, mimeo.
- Us, V. (2017), "Dynamics of Non-Performing Loans in the Turkish Banking Sector by an Ownership Breakdown: The Impact of the Global Crisis", *Finance Research Letters*, 20(C), 109-117, doi: [10.1016/j.frl.2016.09.016](https://doi.org/10.1016/j.frl.2016.09.016).
- US, V. (2020), "A Panel VAR Approach on Analyzing Non-Performing Loans in the Turkish Banking Sector", *BDDK Bankacılık ve Finansal Piyasalar Dergisi*, 14(1), <https://doi.org/10.46520/bddkdergisi.789935>
- Viphindartin, S., M. Ardhanari, R.N. Wilantari, R.P. Somaji and S. Arianti (2021), "Effects of Bank Macroeconomic Indicators on the Stability of The Financial System in Indonesia", *Journal of Asian Finance, Economics and Business*, 8(1), 647-654.
- Vogiazas, S.D. and E. Nikolaidou (2011), "Investigating the Determinants of Nonperforming Loans in the Romanian Banking System: An Empirical Study with Reference to the Greek Crisis", *Economics Research International*, 214689, <https://doi.org/10.1155/2011/214689>
- Wood, A. and Skinner, N. (2018), "Determinants of Non-Performing Loans: Evidence from

- Commercial Banks in Barbados”, *The Business & Management Review*, 9(3), 44-64.
- Zheng, C., P.K. Bhowmik and N. Sarker (2020), “Industry-Specific and Macroeconomic Determinants of Non-Performing Loans: A Comparative Analysis of ARDL and VECM”, *Sustainability*, 12(1), <https://doi.org/10.3390/su12010325>
- Žunić, A., K. Kozarić and E. Žunić Dželihodžić, (2021), “Non-Performing Loan Determinants and Impact of COVID-19: Case of Bosnia and Herzegovina”, *Journal of Central Banking Theory and Practice*, 10(3), 5-22, <https://doi.org/10.2478/jcbtp-2021-0021>

APPENDICES

APPENDIX (A): DESCRIPTION OF VARIABLES

TABLE 1A - *Macroeconomic Indicators*

Indicators	Sign	Definition	Source
<i>Trade openness (OPEN)</i>	(+)	Calculated as the logarithm of the sum of imports and exports to real Gross Domestic Product (GDP).	Computed using NSA dataset
<i>Debt Stock (DEBT)</i>	(+)	Calculated as the ratio of total Government debt to GDP.	BON
<i>Output Gap (GAP)</i>	(+)	GAP is the difference between actual and potential output. It is measured as $\left(\frac{\text{Real GDP} - \text{Potential GDP}}{\text{Potential GDP}}\right) \times 100$.	Computed using NSA dataset
<i>Unemployment (UN)</i>	(+)	Represents the number of unemployed work force as a % of total labour force.	WDI
<i>House price index (HP)</i>	(-)	Represents house price index, used as a proxy for demand for housing in Namibia.	FNB
<i>Inflation (INF)</i>	(±)	Is the rate of <i>inflation</i> , measured by the changes in the growth of <i>ceteris paribus</i> .	NSA

Source: Authors' compilation.

Note: BON= Bank of Namibia; NSA = Namibia Statistics Agency; WDI = World Development Indicators (World Bank); FNB = First National Bank.

TABLE 2A - *Bank Specific Indicators*

Indicators	Sign	Definition	Source
<i>Non-performing loans (NPL)</i>	(+)	Represents non-performing loans as a % of total gross loans.	BoN
<i>Return on Assets (ROA)</i>	(-)	Represents the banks' net income as a % of total assets.	BoN
<i>Return on Equity (ROE)</i>	(-)	Represents the banks' net income as a % of shareholders' equity.	BoN
<i>Capital Adequacy Ratio (CAR)</i>	(-)	The sum of Tier 1 and 2 capital over the risk-weighted assets of the banks.	BoN
<i>Lending behaviour (LB)</i>	(+)	Represents the ratio between mortgage and real GDP.	BoN & NSA
<i>Net interest margin (NIM)</i>	(-)	Represents a ratio of net interest income to total assets ⁹ .	BoN
<i>Loan to Deposit Ratio (LDR)</i>	(+)	Represents the ratio of total loans to total deposits.	BoN data
<i>Loan growth (LG)</i>	(+)	Loan growth is expected to be positive.	BoN

Source: Authors' compilation.

Note: BON = Bank of Namibia.

TABLE 3A - *Monetary Indicators*

Indicators	Sign	Definition	Source
<i>Narrow money (M1)</i>	(-)	Consists of currency in circulation plus overnight deposits (Vogiazas & Nikolaidou, 2011).	BoN
<i>Broad money (M2)</i>	(-)	Is defined to include currency outside depository corporations, transferable and other deposits in national currency of the resident sectors. It excludes deposits of the Central Government and those of the depository corporations.	BoN
<i>Net foreign assets (NFA)</i>	(-)	It represents the capability of the banking sector to service the country's foreign debt.	BoN

Source: Authors' compilation.

Note: BON = Bank of Namibia.

$${}^9NIM = \left(\frac{\text{Interest Income} - \text{Interest Expenses}}{\text{Total Assets}} \right)$$

TABLE 4A - Interest Rate Indicators

Indicators	Sign	Definition	Source
<i>Repo rate (REPO)</i>	(+)	The cost of credit to the banking sector charged by the BoN.	BoN
<i>Deposit Rate (DEPO)</i>	(-)	Refers to the amount of interest that may be paid to depositors.	BoN
<i>Interest Spread (IS)</i>	(+)	Represents the difference between lending rate and deposit rate.	Computed using BoN data
<i>Treasury Bill Rate (TBR)</i>	(+)	Refers to the yield that investors earn when the T-bill matures.	BoN

Source: Authors' compilation.

Note: BON = Bank of Namibia.

TABLE 5A - Financial Indicators

Indicators	Sign	Definition	Source
<i>Real exchange rate (RER)</i>	(-)	The RER between two currencies (i.e., N\$ and US\$) represents the product of the nominal exchange rate and the ratio of prices between Namibia and the United States.	BoN
<i>Private sector credit extension (PSCE)</i>	(-)	<i>PSCE</i> refers to the ratio of credit to the private sector to real GDP.	BoN
<i>Oil prices (OIL)</i>	(+)	OIL represents the Brent crude oil prices, measured in US\$ per barrel.	BP
<i>COVID-19</i>	(+)	COVID-19 represents a dummy variable meant to capture the impacts of a pandemic on NPL.	Computed
<i>Stock market prices (SHARES)</i>	(-)	Represent the current market value of a company's shares or stocks (measured in N\$).	NSX

Source: Authors' compilation.

Note: BON = Bank of Namibia; BP = British Petroleum; NSX = Namibia Stock Exchange.

TABLE 6A - *Institutional Factors*

Indicators	Sign	Definition	Source
<i>Voice and Accountability (VA)</i>	(-)	Refers to the extent to which Namibian citizens are able to partake in the election process of their government, and the ability to exercise their freedom of expression, freedom of association, and a free media.	WGI
<i>Political Stability and Absence of Violence/Terrorism (PS)</i>	(-)	It measures perceptions for the probability of political instability and/or politically motivated violence, including terrorism.	WGI
<i>Control of corruption (CC)</i>	(-)	It measures perceptions of the extent to which public power is exercised for private gain as well as state capture by elites and private interests.	WGI
<i>Regulatory Quality (RQ)</i>	(-)	It measures perceptions of the ability for government to formulate and implement sound policies and regulations that permit and promote private sector development	WGI
<i>Government Effectiveness (GE)</i>	(-)	It measures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	WGI
<i>Rule of Law (RL)</i>	(-)	It measures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	WGI
<i>Anti-corruption commission (ACC)</i>	(-)	Represents a dummy variable for the period since the formation of ACC.	Computed

Source: Authors' compilation.

Note: WGI = Worldwide Governance Indicators¹⁰.

¹⁰ For a comprehensive description of the WGI methodology, consult the WGI report on the six broad dimensions of governance for the period 1996-2021.

APPENDIX (B) STATIONARITY TESTS

TABLE 1B - *Stationarity Test for the Macroeconomic Indicators*

Variable Name	Model Specification	DF - GLS		Order of Integration
		Levels	1 st Diff.	
<i>OPEN</i>	Intercept	-1.229 (-1.944)	-	I(0)
	Trend & Intercept	-1.290 (-3.021)	-5.206 ^b (-3.028)	I(1)
<i>DEBT</i>	Intercept	-1.464 (-1.994)	-5.800 ^b (-1.944)	I(1)
	Trend & Intercept	-2.398 (-3.028)	-5.893 ^b (-3.028)	I(1)
<i>GAP</i>	Intercept	-3.252 ^b (-1.944)	-	I(0)
	Trend & Intercept	-3.255 ^b (-3.028)	-	I(0)
<i>UN</i>	Intercept	-3.241 ^b (-1.944)	-	I(0)
	Trend & Intercept	-4.031 ^b (-3.029)	-	I(0)
<i>HP</i>	Intercept	-3.055 ^b (-1.994)	-	I(0)
	Trend & Intercept	-3.535 ^b (-3.028)	-	I(0)
<i>INF</i>	Intercept	-3.065 ^b (-1.944)	-	I(0)
	Trend & Intercept	-4.217 ^b (-3.029)	-	I(0)

Source: Authors' compilations.

Note: a) ^a, ^b, ^c denotes the rejection of the null hypothesis of non-stationarity at 1%, 5%, and 10% critical levels, respectively. b) The values not in parenthesis are the t-statistics whilst those in parenthesis are the critical values based on MacKinnon's critical value. c) Wherever the t-statistics value is not denoted with plus signs, the 5% critical level is selected by default. d) Wherever the variable is stationary at all the levels of significance, the default critical value selected is also the 5% critical level.

TABLE 2B - Stationarity Test for the Bank Specific Indicators

Variable Name	Model Specification	DF - GLS		Order of Integration
		Levels	1 st Diff.	
<i>NPL</i>	Intercept	-1.229 (-1.944)	-1.880 ^c (-1.615)	I(1)
	Trend & Intercept	-1.290 (-3.021)	-3.307 ^b (-3.036)	I(1)
<i>ROA</i>	Intercept	-1.464 (-1.994)	-4.368 ^b (-1.944)	I(1)
	Trend & Intercept	-2.398 (-3.028)	-4.847 ^b (-3.028)	I(1)
<i>ROE</i>	Intercept	-1.001 (-1.944)	-3.207 ^b (-1.944)	I(1)
	Trend & Intercept	-2.345 (-3.028)	-4.091 ^b (-3.028)	I(1)
<i>CAR</i>	Intercept	-1.759 ^c (-1.615)	-	I(0)
	Trend & Intercept	-3.502 ^b (-3.028)	-	I(0)
<i>LB</i>	Intercept	-1.929 ^c (-1.614)	-	I(0)
	Trend & Intercept	-3.170 ^b (-3.029)	-	I(0)
<i>NIM</i>	Intercept	-2.287 ^b (-1.944)	-	I(0)
	Trend & Intercept	-2.509 (-3.028)	-5.526 ^b (-3.028)	I(1)
<i>LDR</i>	Intercept	-3.098 ^b (-1.944)	-	I(0)
	Trend & Intercept	-3.369 ^b (-3.028)	-	I(0)
<i>LG</i>	Intercept	-1.615 (-1.944)	-3.659 ^b (-1.944)	I(1)
	Trend & Intercept	-1.888 (-3.028)	-4.215 ^b (-3.028)	I(1)

Source: Authors' compilations.

Note: a) ^b and ^c denotes the rejection of the null hypothesis of non-stationarity at 5% and 10% critical levels, respectively. b) The values not in parenthesis are the t-statistics whilst those in parenthesis are the critical values based on MacKinnon's critical value. c) In instances where the t-statistics value is not with asterisks, the 5% critical values is selected. d) In instances where all the variable is stationary at all the levels of significance, the 5% critical value is by default selected.

TABLE 3B - *Stationarity Test for the Monetary Indicators*

Variable Name	Model Specification	DF - GLS		Order of Integration
		Levels	1 st Diff.	
<i>M1</i>	Intercept	-2.089 ^b (-1.944)	-	I(0)
	Trend & Intercept	-0.543 (-3.028)	-4.783 ^b (-3.028)	I(1)
<i>M2</i>	Intercept	-1.529 (-1.944)	-4.100 ^b (-1.944)	I(1)
	Trend & Intercept	-1.097 (-3.028)	-4.601 ^b (-3.028)	I(1)
<i>NFA</i>	Intercept	-1.988 ^b (-1.944)	-	I(0)
	Trend & Intercept	-1.724 (-3.028)	-5.602 ^b (-3.028)	I(1)

Source: Authors' compilations.

Note: a) ^b, denotes the rejection of the null hypothesis of non-stationarity at 5% critical levels. b) The values not in parenthesis are the t-statistics whilst those in parenthesis are the critical values based on MacKinnon's critical value. c) Wherever the t-statistics value is not denoted with a plus sign, the 5% critical level is selected by default. d) Wherever the variable is stationary at all the levels of significance, the default critical value selected is also the 5% critical level.

TABLE 4B - *Stationarity Test for the Interest Rate Indicators*

Variable Name	Model Specification	DF - GLS		Order of Integration
		Levels	1 st Diff.	
<i>REPO</i>	Intercept	-0.358 (-1.994)	-6.178 ^b (-1.944)	I(1)
	Trend & Intercept	-2.431 (-3.028)	-6.301 ^b (-3.028)	I(1)
<i>DEPO</i>	Intercept	-0.153 (-1.944)	-4.603 ^b (-1.944)	I(1)
	Trend & Intercept	-2.345 (-3.028)	-5.393 ^b (-3.028)	I(1)
<i>IS</i>	Intercept	-0.808 (-1.944)	-5.389 ^b (-1.944)	I(1)
	Trend & Intercept	-2.331 (-3.028)	-5.393 ^b (-3.028)	I(1)
<i>TBR</i>	Intercept	-0.808 (-1.944)	-5.389 ^b (-1.944)	I(1)
	Trend & Intercept	-2.331 (-3.028)	-5.393 ^b (-3.028)	I(1)

Source: Authors' compilations.

Note: a) ^b, denotes the rejection of the null hypothesis of non-stationarity at 5% critical levels. b) The values not in parenthesis are the t-statistics whilst those in parenthesis are the critical values based on MacKinnon's critical value. c) Wherever the t-statistics value is not denoted with plus signs, the 5% critical level is selected by default. d) Wherever the variable is stationary at all the levels of significance, the default critical value selected is also the 5% critical level.

TABLE 5B - *Stationarity Test for the Financial Indicators*

Variable Name	Model Specification	DF - GLS		Order of Integration
		Levels	1 st Diff.	
<i>RER</i>	Intercept	-1.134 (-1.994)	-3.656 ^b (-1.944)	I(1)
	Trend & Intercept	-2.862 ^c (-2.738)	-	I(1)
<i>LNPSCE</i>	Intercept	-0.132 (-1.944)	-2.726 ^b (-1.944)	I(1)
	Trend & Intercept	-0.421 (-3.028)	-3.165 ^b (-3.028)	I(1)
<i>OIL</i>	Intercept	-1.115 (-1.944)	-4.421 ^b (-1.944)	I(1)
	Trend & Intercept	-2.345 (-3.028)	-4.353 ^b (-3.028)	I(1)
<i>SHARES</i>	Intercept	-0.938 (-1.994)	-5.039 ^b (-1.944)	I(1)
	Trend & Intercept	-4.293 ^b (-3.029)	-	I(1)

Source: Authors' compilation.

Note: a) ^b and ^c denotes the rejection of the null hypothesis of non-stationarity at 5% and 10% critical levels, respectively. b) The values not in parenthesis are the t-statistics whilst those in parenthesis are the critical values based on MacKinnon's critical value. c) Wherever the t-statistics value is not denoted with plus signs, the 5% critical level is selected by default. d) Wherever the variable is stationary at all the levels of significance, the default critical value selected is also the 5% critical level.

TABLE 6B - *Stationarity Test for the Institutional Indicators*

Variable Name	Model Specification	DF - GLS		Order of Integration
		Levels	1 st Diff.	
VA	Intercept	-1.442 (-1.994)	-3.876 ^b (-1.944)	I(1)
	Trend & Intercept	-1.749 (-3.028)	-4.816 ^b (-3.028)	I(1)
PS	Intercept	-1.983 ^b (-1.944)	-	I(0)
	Trend & Intercept	-2.128 (-3.028)	-4.304 ^b (-3.028)	I(1)
CC	Intercept	-0.924 (-1.944)	-2.739 ^a (-1.944)	I(1)
	Trend & Intercept	-2.114 (-3.049)	-2.765 ^c (-2.758)	I(1)
RQ	Intercept	-0.905 (-1.944)	-6.032 ^b (-1.944)	I(1)
	Trend & Intercept	-3.751 ^b (-3.028)	-	I(0)
GE	Intercept	-1.975 ^b (-1.944)	-	I(0)
	Trend & Intercept	-3.271 ^b (-3.028)	-	I(0)
RL	Intercept	-2.669 ^b (-1.944)	-	I(0)
	Trend & Intercept	-3.236 ^b (-3.028)	-	I(0)

Source: Authors' compilations.

Note: a) ^a, ^b, ^c denotes the rejection of the null hypothesis of non-stationarity at 1%, 5%, and 10% critical levels, respectively. b) The values not in parenthesis are the t-statistics whilst those in parenthesis are the critical values based on MacKinnon's critical value. c) Wherever the t-statistics value is not denoted with plus signs, the 5% critical level is selected by default. d) Wherever the variable is stationary at all the levels of significance, the default critical value selected is also the 5% critical level.

APPENDIX (C) GRANGER CAUSALITY

TABLE 1C - *Pairwise Granger Causality Test Results for the Macroeconomic Indicators*

<i>Null Hypothesis:</i>	<i>Lags: 2 Quarters</i>		
	<i>Obs.</i>	<i>F-Stat.</i>	<i>P-value</i>
<i>lnOPEN does not GC lnNPL</i>	102	1.902	0.155
<i>lnNPL does not GC lnOPEN</i>		3.019	0.054 ^c
<i>lnDEBT does not GC lnNPL</i>	102	0.159	0.853
<i>lnNPL does not GC lnDEBT</i>		0.196	0.823
<i>lnGAP does not GC lnNPL</i>	102	1.448	0.240
<i>lnNPL does not GC lnGAP</i>		0.906	0.408
<i>lnUN does not GC lnNPL</i>	102	4.040	0.021 ^b
<i>lnNPL does not GC lnUN</i>		0.282	0.755
<i>lnHP does not GC lnNPL</i>	102	5.462	0.006 ^a
<i>lnNPL does not GC lnHP</i>		0.238	0.789

Source: Authors' compilation.

Note: a) ln = natural logs; ^{a, b, c} denotes the 1%, 5% and 10% significant levels, respectively. GC stands for Granger cause.

TABLE 2C - *Pairwise Granger Causality Test Results for the Bank Specific Indicators*

<i>Null Hypothesis:</i>	<i>Lags: 2 Quarters</i>		
	<i>Obs.</i>	<i>F-Stat.</i>	<i>P-value</i>
ROA does not GC NPL	102	0.739	0.480
NPL does not GC ROA		2.147	0.122
ROE does not GC NPL	102	1.609	0.205
NPL does not GC ROE		1.296	0.278
CAR does not GC NPL	102	4.329	0.016 ^b
NPL does not GC CAR		0.201	0.818
LB does not GC NPL	102	0.138	0.872
NPL does not GC LB		2.658	0.075 ^c
<i>ln</i> NIM does not GC NPL	102	0.303	0.739
NPL does not GC <i>ln</i> NIM		0.352	0.704
LDR does not GC NPL	102	1.613	0.205
NPL does not GC LDR		0.314	0.731
LG does not GC NPL	102	5.571	0.005 ^a
NPL does not GC LG		0.038	0.963

Source: Authors' compilation.

Note: a) ln = natural logs; ^{a, b, c} denotes the 1%, 5% and 10% significant levels, respectively. GC stands for Granger Cause.

TABLE 3C - *Pairwise Granger Causality Test Results for the Monetary Indicators*

<i>Null Hypothesis:</i>	<i>Lags: 2 Quarters</i>		
	<i>Obs.</i>	<i>F-Stat.</i>	<i>P-value</i>
<i>lnM1 does not GC lnNPL</i>	102	1.15763	0.3185
<i>lnNPL does not GC lnM1</i>		0.2923	0.7472
<i>lnM2 does not GC lnNPL</i>	102	0.59698	0.5525
<i>lnNPL does not GC lnM2</i>		0.07188	0.9307
<i>lnNFA does not GC lnNPL</i>	102	0.71493	0.4918
<i>lnNPL does not GC lnNFA</i>		0.06884	0.9335
<i>lnRGDP does not GC lnNPL</i>	102	2.28768	0.107
<i>lnNPL does not GC lnRGDP</i>		1.88162	0.1579

Source: Authors' compilation.

Note: a) ln = natural logs; ^c denotes the 10% significant levels, respectively. GC stands for Granger Cause.

TABLE 4C - *Pairwise Granger Causality Test Results for the Interest Rate Indicators*

<i>Null Hypothesis:</i>	<i>Lags: 2 Quarters</i>		
	<i>Obs.</i>	<i>F-Stat.</i>	<i>P-value</i>
REPO does not GC NPL	102	3.098	0.050 ^b
NPL does not GC REPO		2.414	0.095 ^c
DEPO does not GC NPL	102	3.114	0.049 ^b
NPL does not GC DEPO		4.856	0.010 ^a
IS does not GC NPL	102	0.736	0.482
NPL does not GC IS		0.689	0.504
TBR does not GC NPL	102	2.491	0.088 ^c
NPL does not GC TBR		4.318	0.016 ^b

Source: Authors' compilation.

Note: a) a, b, c denotes the 1%, 5% and 10% significant levels, respectively. GC stands for Granger Cause.

TABLE 5C - *Pairwise Granger Causality Test Results for the Financial Indicators*

<i>Null Hypothesis:</i>	<i>Lags: 2 Quarters</i>		
	<i>Obs.</i>	<i>F-Stat.</i>	<i>P-value</i>
RER does not GC NPL	102	0.085	0.919
NPL does not GC RER		0.677	0.511
PSCE does not GC NPL	102	1.368	0.259
NPL does not GC PSCE		1.750	0.179
OIL does not GC NPL	102	3.857	0.024 ^b
NPL does not GC OIL		0.087	0.917
COVID-19 does not GC NPL	102	0.142	0.868
SHARES does not GC NPL	102	0.389	0.679
NPL does not GC SHARES		0.420	0.658

Source: Authors' compilation.

Note: a) b and c denotes the 5% and 10% significant levels, respectively. GC stands for Granger Cause.

TABLE 6C - *Pairwise Granger Causality Test Results for the Institutional Indicators*

<i>Null Hypothesis:</i>	<i>Lags: 2 Quarters</i>		
	<i>Obs.</i>	<i>F-Stat.</i>	<i>P-value</i>
<i>lnVA</i> does not GC <i>lnNPL</i>	102	1.431	0.244
<i>lnNPL</i> does not GC <i>lnVA</i>		0.450	0.639
<i>lnPS</i> does not GC <i>lnNPL</i>	102	0.839	0.435
<i>lnNPL</i> does not GC <i>lnPS</i>		3.593	0.031 ^c
<i>lnCC</i> does not GC <i>lnNPL</i>	102	1.157	0.319
<i>lnNPL</i> does not GC <i>lnCC</i>		0.185	0.831
<i>lnRQ</i> does not GC <i>lnNPL</i>	102	0.993	0.374
<i>lnNPL</i> does not GC <i>lnRQ</i>		0.288	0.751
<i>lnGE</i> does not GC <i>lnNPL</i>	102	0.802	0.452
<i>lnNPL</i> does not GC <i>lnGE</i>		0.491	0.614
<i>lnRL</i> does not GC <i>lnNPL</i>	102	0.028	0.972
<i>lnNPL</i> does not GC <i>lnRL</i>		1.197	0.307
ACC does not GC <i>lnNPL</i>	102	1.537	0.220
<i>lnNPL</i> does not GC ACC		0.573	0.566
<i>lnPS</i> does not GC <i>lnVA</i>	102	0.981	0.379
<i>lnVA</i> does not GC <i>lnPS</i>		0.310	0.734

Source: Authors' compilation.

Note: a) ln = natural logs; a, b, c denotes the 1%, 5% and 10% significant levels, respectively. GC stands for Granger Cause.

