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Non-Performing Loans and Commercial Bank Profitability: Evidence from Cambodia

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Abstract

This study looks at the macroeconomic and bank-specific factors that affect non-performing loans and how they affect Cambodian banks' profitability. The study uses panel data with a sample of 35 commercial banks in Cambodia from 2017 to 2022 given an observation of 210. The findings showed that among the factors influencing non-performing loans among commercial banks in Cambodia are bank profitability, bank size, and inflation. The results also show that while the loan-to-deposit ratio, bank size, economic growth, and inflation have positive and substantial effects on the profitability of Cambodian banks, the non-performing loans ratio has a negative and significant impact on that profitability. The findings of this study have important implications for policy makers and bank managers and the paper offers significant value in shaping and improving the banking sector of emerging markets. The findings suggest that Cambodian banks should align their loan practices with the state of the economy because NPLs typically rise during economic downturns and fall during stable economic times. To reduce the surge in nonperforming loans brought on by increased lending, banks should develop strong credit risk management practices. And banks should take advantage of their economies of scale to improve data collection on borrowers and lower the number of nonperforming loans.

Keywords: Non-performing loans; Profitability; Commercial bank; Cambodia

1. Introduction

Commercial banks and other financial institutions play a key role in promoting economic sustainability and growth by extending loans to consumers and businesses to boost economic activity. However, there is a good chance that commercial banks will fail if borrowers don't pay back the money, they've lent them. Commercial banks manage non-performing loans (NPLs), which are loans that have not been repaid in full for 90 days or longer, including the principle and/or interest on the loans, in order to lower the risk of default (NBC, 2018). Banks can identify their exposure to counterparties and verify that borrowers have strong credit standing, are able to pay off outstanding obligations, and are managed by qualified employees by evaluating the credit risk of the borrowers. In comparison to other nations in the region, Cambodia's microfinance sector has a low and controllable NPL rate, which is used to gauge its risk tolerance and portfolio quality. Studies have indicated that while lending interest rates have a positive link with NPLs, the GDP growth rate, return on assets, and inflation have a negative relationship with NPLs in the microfinance sector in Cambodia (Preak & Phok, 2016). This shows that greater microfinance profitability lowers risk exposure and lessens pressure on the management team to increase revenue from lending activities.

For banks to analyze counterparty risk and apply mitigation measures, effective credit risk management is essential. By evaluating credit risk, banks can alter their capital and market transactions to account for the potential for counterparties to default. According to studies (DeYoung & Rice, 2004; Saksonova, 2014), interest margins are the main driver of bank earnings, and banks with higher interest margins tend to be more lucrative. Therefore, NPLs tend to rise in the absence of effective credit risk management, decreasing interest income and resulting in a drop in net interest margins.

The banking industry's operations are expanding in both scope and size, becoming increasingly linked, and playing a significant role in the financial system of Cambodia. The National Bank of Cambodia (NBC)'s supervisory report from 2021 states that total assets continued to rise by 17.5% to USD 60 billion despite the proliferation of Covid-19, which has a detrimental impact on Cambodia's banking industry. The primary sources of funding are USD 35.1 billion in client deposits, USD 11.5 billion in shareholder stock, and USD 2.5 billion in borrowing money. By dispersing credits among so many institutions and enormous amounts of assets, Cambodia is able to mobilize a very strong number of financial resources for its growth. Customers' credit climbed by 22% to USD 38.6 billion, bringing the total amount of credit to USD 40.4 billion (NBC, 2021). Credit is the main source of finance for all economic activities in Cambodia. Similar to other businesses, banks are judged on their profitability and asset quality when determining their success. The asset quality, the rate of progress, or the price behavior are frequently considered to be some of the primary metrics of a business' performance (Ma'aji & Barnett, 2019).

In order to better manage NPLs in the industry, this paper explores the firm-specific and macroeconomic causes of nonperforming loans in Cambodia as well as the impact of

these loans on bank profitability. To estimate and test for confirmation of the links among NPL and its drivers, this study extensively utilizes panel data techniques.

2. Literature Review

2.1 Concept of Profitability

Profitability is a critical concept in business that measures the ability of a company to generate profits over a specific period. It is the ultimate goal of any organization, including commercial banks, as it determines the financial viability and long-term sustainability of the business. In this literature, we will discuss the concept of profitability, its importance, and how it is measured, with references to relevant research studies. Profitability is essential for companies because it enables them to generate returns for their shareholders, reinvest in the business, and maintain financial stability. Profitability is also an important indicator of the company's competitiveness in the market, as higher profits can result from a competitive edge, operational efficiency, and effective management. Therefore, understanding profitability and its drivers is crucial for business success.

The measurement of profitability depends on the type of business and the industry it operates in. In the case of banks, profitability is measured using various financial ratios such as Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM). ROA measures the bank's ability to generate profits from its total assets, while ROE measures the return generated for shareholders' equity. NIM measures the bank's ability to generate income from its core operations by calculating the difference between the interest income earned on loans and the interest paid on deposits as a percentage of total assets.

Research studies have examined the drivers of profitability in the banking industry. For instance, the study by Kasman et al. (2015) examined the profitability of Turkish banks, finding that banks with larger assets and loan portfolios tend to have higher profitability, while higher liquidity and capital ratios can reduce profitability. Similarly, in their study of Indian banks, Kumar and Singh (2020) found that profitability is positively associated with higher asset quality, lower non-performing assets, and better credit risk management practices. Moreover, profitability is crucial for investors when making investment decisions. Investors are interested in companies that generate consistent profits, pay dividends, and maintain financial stability. A study by Firth et al. (2018) examined the relationship between profitability and stock returns of listed Chinese banks, finding that higher profitability leads to higher stock returns, indicating that investors value profitability in their investment decisions.

In summary, profitability is a crucial concept for businesses and investors as it measures the financial viability and long-term sustainability of a company. Banks use various financial ratios such as ROA, ROE, and NIM to measure profitability. Research studies have identified the drivers of profitability in the banking industry, including asset quality, loan portfolio, liquidity, and capital ratios. Investors value profitability when making investment decisions, as higher profitability is associated with higher stock returns. Therefore, understanding and managing profitability is essential for the success of any organization.

2.2 Bank Profitability Indicators

Many indicators can be used to measure the profitability of a bank and the superiority. According to Goudreau and Whitehead (1989) and Uchendu (1995), among indicators net interest margin (NIM), return on equity (ROE) and return on assets (ROA) are the three best indicators. Accordingly, measurement of profitability by ROE was used by Hancock (1989); and by NIM was conducted by Odufulu (1994). However, this study will utilize ROA as a measure of commercial bank's profitability in Cambodia. ROA is preferred over ROE when evaluating the profitability of banks because it is a more comprehensive measure of a bank's performance. ROA takes into account all of the bank's assets, including those funded by debt, while ROE only considers equity funding. Banks can increase ROE by increasing their leverage (using more debt), but this also increases the riskiness of the bank's operations. On the other hand, ROA is less sensitive to changes in a bank's capital structure and provides a more accurate measure of a bank's operating efficiency. Additionally, NIM alone may not be an accurate measure of a bank's profitability because it does not take into account other sources of income or expenses, such as fees or operating expenses. For a more comprehensive measure of a bank's profitability, ROA is preferred (Cao & Luo, 2018; Hasan & Dridi, 2011). The formula for ROA is as below:

$$\text{ROA} = \frac{\textit{Net Profit}}{\textit{Total assets}}$$

Furthermore, ROA provides a comprehensive view of a bank's profitability as it considers the total assets utilized in generating profits. It reflects the bank's efficiency in utilizing its resources to generate returns for both equity and debt holders. ROA enables the comparison of banks of different sizes and structures. By using a standardized measure, it allows for a meaningful comparison across institutions within the same industry, facilitating performance evaluation and benchmarking. Additionally, ROA helps assess the risk-return trade-off of a bank. A higher ROA may indicate a higher level of risk-taking, whereas a lower ROA may signal more conservative risk management practices. Understanding the relationship between risk and profitability is crucial for stakeholders, regulators, and investors.

2.3 Non-Performing Loans (NPLs)

Non-performing loans (NPLs) are a critical concept in the banking industry, representing loans that borrowers have failed to repay as per the agreed terms and conditions. NPLs pose significant challenges to banks and have broader implications for the financial system and the economy. This essay will explore the concept of NPLs, discuss their impact on banks and the economy, and provide references to support the analysis. Non-performing loans are typically categorized as loans that have remained in arrears for a specified period, often 90 days or more, depending on the regulatory framework of a particular country. NPLs can arise due to various reasons, including borrower defaults, financial distress, economic downturns, or structural weaknesses in the lending process. These loans represent potential losses for banks, impacting their profitability, liquidity, and overall stability.

NPLs will have many implications for banks. The first is financial health; NPLs have a direct impact on the financial health of banks. They erode a bank's profitability by reducing interest income and increasing provisions for loan losses. High NPL levels can weaken a bank's capital adequacy ratio, limiting its ability to lend and potentially leading to liquidity challenges (Altunbas, Carbo-Valverde & Marques-Ibanez, 2011). Secondly is on risk management: NPLs highlight deficiencies in a bank's risk management practices. Effective credit risk assessment, loan underwriting, and ongoing monitoring processes are crucial to prevent excessive NPL formation. Banks need to strengthen their risk management frameworks to mitigate the potential impact of NPLs on their operations. Thirdly, is the implication of NPL for banks would be regulatory compliance: Regulators closely monitor NPL levels as part of their supervisory role. High NPL ratios can attract regulatory intervention, including increased capital requirements or restrictions on dividend distributions (Dell'Ariccia & Marquez, 2014). Therefore, managing NPLs is essential to maintain compliance with regulatory standards.

Furthermore, NPL also have a major implication on the general economy as well such as implication on the availability of credit; a high level of NPLs can impede the availability of credit in the economy. Banks, burdened by NPLs, may become more risk-averse, tightening their lending criteria and reducing credit access for both individuals and businesses. This can hinder economic growth and investment. Additionally, NPLs would have implication for the stability of the financial system. Excessive NPLs can pose systemic risks to the financial system. If NPLs accumulate across multiple banks, it can undermine overall financial stability, affecting market confidence and potentially leading to contagion effects. Effective measures to address NPLs are crucial to maintaining a stable banking sector. Finally, economic productivity is another implication of NPLs on the economy as NPLs divert financial resources away from productive activities. As banks allocate resources to manage NPLs, funds that could have been used for lending to productive sectors of the economy are instead tied up in non-performing assets. This can hinder economic productivity and growth potential (Demirgüç-Kunt & Huizinga, 1999; Dell'Ariccia & Marquez, 2014). Non-performing loans have significant implications for both banks and the broader economy. They challenge the financial health and risk management practices of banks, impacting profitability, liquidity, and regulatory compliance (Ma'aji, Shrubsall & Anderson, 2023).

2.4 Theoretical Review

The two theories (1) Asymmetric Information Theory and (2) Modern Portfolio Theory, are used in this study helps to provide a framework to understanding the phenomenon of non-performing loans in the banking industry and for understanding the risk and return characteristics of a bank's loan portfolio.

2.4.1 Asymmetric Information Theory

Asymmetric Information Theory provides a framework to understand the phenomenon of non-performing loans in the banking industry. According to this theory, information is not equally available to all parties in a transaction, and this asymmetry can lead to adverse selection and moral hazard problems (Demirgüç-Kunt & Huizinga, 2010). Pagano and

Jappelli (1993) demonstrated that banks' credit applicants' information can be improved and the likelihood of a negative selection reduced through information sharing. The hypothesis showed that separating between a terrible and a decent borrower is difficult; this might influence loaning conduct and can bring about unfavorable choice and moral risk issues (Bofondi and Gobbi, 2003). According to Auronen (2003), in the market, the party with more information can negotiate a better deal for the transaction's terms. As a result, the party with less specific information has the ability to make good or bad decisions regarding the transaction. Studies by Allen, Carletti, & Marquez, (2011) and DeYoung, Glennon, & Nigro, (2008) examines how borrower-lender distance and credit scoring affect non-performing loans among small businesses, using Asymmetric Information Theory to explain how these factors can affect banks' ability to screen borrowers and monitor loan performance. The authors find that non-performing loans are more common among small businesses that are further away from their lenders and have less transparent credit histories. The studies cited under this section demonstrate how Asymmetric Information Theory provides a useful framework for understanding the factors that contribute to non-performing loans in the banking industry. By highlighting the impact of information asymmetry on banks' lending decisions and borrowers' behaviors, researchers can develop insights and policy recommendations aimed at reducing the incidence of non-performing loans.

2.4.2 Modern Portfolio Theory

Modern Portfolio Theory provides a framework for understanding the risk and return characteristics of a bank's loan portfolio, and can therefore inform research on non-performing loans. This theory suggests that diversification across different types of assets can reduce overall portfolio risk, and that investors should strive to find an optimal balance between risk and return (Markowitz, 1952). In the context of banking, Modern Portfolio Theory suggests that a bank's loan portfolio should be diversified across different sectors and borrower types to reduce the risk of non-performing loans. Research on non-performing loans often draws on Modern Portfolio Theory to analyze how banks' loan portfolios are structured and to identify factors that contribute to loan defaults. Research by Tchamyou, Asongu and Nwachukwu (2019) uses Modern Portfolio Theory to analyze the impact of entrepreneurship on the loan portfolio risk of African banks. The authors find that greater entrepreneurship activity is associated with higher loan portfolio risk, but that diversification across different borrower types can mitigate this risk. Murinde and Poshakwale (2018) also examines how bank market power affects loan portfolio risk in the Indian banking industry, drawing on Modern Portfolio Theory to analyze the relationship between diversification and non-performing loans. The authors find that banks with more diversified loan portfolios are less likely to have non-performing loans, and that greater market power can increase the risk of non-performing loans.

Additionally, Hasan and Dridi (2011) paper compares the risk and return characteristics of Islamic and conventional banks during the global financial crisis, using Modern Portfolio Theory to analyze the performance of their loan portfolios. The authors find that Islamic banks, which tend to have more diversified loan portfolios, performed better during the crisis than conventional banks. These studies demonstrate how Modern Portfolio Theory provides a

valuable framework for understanding the risk and return characteristics of bank loan portfolios, and how diversification can mitigate the risk of non-performing loans. By analyzing the factors that contribute to loan defaults and identifying strategies for risk mitigation, researchers can develop insights and policy recommendations aimed at improving the performance of bank loan portfolios.

2.5 Effects of Non-Performing Loans on Bank Profitability

Non-performing loans (NPLs) have significant implications for bank profitability. NPLs can adversely impact a bank's income, capital adequacy, and financial stability, leading to reduced profitability. Numerous studies have demonstrated a negative relationship between NPLs and bank profitability. High levels of NPLs impose costs on banks, such as provisions for loan losses and write-offs, which directly impact their profitability. For instance, Cândido et al. (2020) found a significant negative relationship between NPLs and bank profitability in the Brazilian banking sector. Similarly, Fiordelisi et al. (2011) showed that NPLs negatively affect bank profitability in European countries. NPLs reduce a bank's interest income, as borrowers' default on their loan obligations. A study by Demyanyk and Hemert (2011) found that higher NPL ratios lead to lower net interest margins, which are a key determinant of bank profitability. As banks charge higher interest rates to compensate for NPL losses, they may face increased competition, leading to further pressure on their net interest margins. Girma (2018) found that NPLs hamper banks' interest income on Ethiopian banks, a crucial component of profitability. When borrowers default on loans, interest payments may be missed or delayed, leading to lower interest income for the bank. Consequently, the interest margin decreases, impacting profitability.

Additionally, managing NPLs requires banks to set aside provisions to cover potential losses. Higher NPL levels necessitate larger provisions, which can erode profitability. Research by Rullán et al. (2019) in the Spanish banking sector demonstrated that banks with higher NPLs experienced higher provisioning expenses, which adversely affected profitability. Similarly, a study by Delis et al. (2011) found that provisions for NPLs had a negative effect on bank profitability in the Greek banking sector. Furthermore, high levels of NPLs can impact a bank's capital adequacy, which is a crucial indicator of its financial strength. As banks set aside provisions for NPLs, their capital adequacy ratio may decline, leading to reduced lending capacity and profitability. A study by Koopman and Bruinshoofd (2013) found that NPLs have a negative effect on bank capital adequacy in European countries. Additionally, provisioning requirements for NPLs may reduce capital levels, potentially leading to liquidity and solvency concerns. Ongore and Kusa (2013) found a significant negative relationship between NPLs and capital adequacy ratios in Kenyan banks, impacting profitability. NPLs can impede a bank's liquidity position, further affecting profitability. Banks with high NPL levels may face challenges in converting non-performing assets into liquid assets, limiting their ability to meet short-term obligations. Berger and Bouwman (2013) found that NPLs can lead to liquidity challenges for banks, as they may struggle to convert non-performing assets into cash. As a result, banks may need to sell assets at a discount, leading to further losses.

Moreover, persistent NPL problems can erode investor confidence in a bank, affecting its market valuation and access to capital. Investors may view high NPL levels as a sign of weak risk management and poor loan quality, leading to a decline in share prices and difficulties in raising capital. A study by Beltrán-Esteve et al. (2019) in the Spanish banking sector demonstrated a negative relationship between NPLs and bank stock returns. As a result, banks must implement effective measures to mitigate the adverse effects of NPLs, such as prioritizing effective credit risk management, early identification of problem loans, loan restructuring, and proactive measures to address NPLs in a timely manner. By adopting prudent risk management practices and implementing effective strategies to manage NPLs, banks can enhance profitability and maintain financial stability.

In Cambodia, Non-performing loan refers to the loan which was overdue to pay back for 90 days or more (NBC, 2009). Therefore, this study measure NPL as non-performing or impaired loan to total loan with the following hypothesis for the case of Cambodia:

The NPLs ratio has a statistically significant and negative relationship with bank profitability.

3. Methodology and Data

3.1 Research Design

The goal of this study was to pinpoint the factor that contribute to nonperforming loans in Cambodia and to empirically assess the effect of those loans on bank profitability. Macroeconomic level data were sourced from the World Bank and Asia Development Bank (ADB) for the study period, which runs from 2017 to 2022, while firm specific data were taken from the financial statements of 35 sampled Cambodian commercial banks. The chose this time frame solely on the basis of availability of data, given 210 observations will be used in the research, which is suitable and fits the criteria. The study therefore used an unbalanced panel data set collected on an annual basis.

The dependent variable, nonperforming loans (NPL), is defined as the proportion of nonperforming loans to total loans in order to meet the study's first objective, to determine the causes of NPLs as shown in equation 1. The study's independent variables include return on assets (ROA), calculated as net income divided by total bank assets, loan to deposit ratio (LDR), measured by total loan to total deposit ratio; bank size (BANKSZ), calculated as the log of total assets, annual inflation (INF), calculated as the Consumer Price Index, and economic growth (GDP), calculated as the annual growth rate of gross domestic product. Bank profitability measured using ROA will be employed in a second regression as the dependent variable in order to meet the study's second goal, to examine the effect of NPL on bank performance as measured by ROA as shown in equation 3.

3.2 Research Model

In order to determine the causes of NPLs in the Cambodian banking industry, the study builds on the work of Jesus and Gabriel (2006). A multiple regression function is the model that links the ratio of non-performing loans to total loans with important macroeconomic and

bank-specific variables. After that, the effect of NPLs on Bank profitability was investigated using ROA as a measure of profitability while utilizing NPL as an explanatory variable in the presence of specific control variables. The following are the regression equations:

$$NPL_{it} = \alpha + \beta_1 ROA_{it} + \beta_2 LDR_{it} + \beta_3 BANKSIZE_{it} + \beta_4 GGDP_i + \beta_5 CPI_i + e_{it}. \quad (1)$$

Based on the theoretical relationship among variables and the previous regression model, a newly modified model was introduced by Gwahula and Mnyavanu (2018) to examine the effect of NPL on bank performance as measured by ROA:

$$ROA_{it} = \alpha + \beta_1 NPL_{it} + \beta_2 LDR_{it} + \beta_3 CAR_{it} + \beta_4 GGDP_i + \beta_5 CPI_i + e_{it}. \quad (2)$$

In this paper, the capital adequacy ratio will not be used because the credit risk of the loans will not be considered. Instead, the bank size will be added to the model to test whether the amount of asset the bank processes will affect the profitability or not, since the total assets reflect the bank size. The variable BANKSIZE will be used and is equal to the logarithm of the total assets. the new model is as follow:

$$ROA_{it} = \alpha + \beta_1 NPL_{it} + \beta_2 LDR_{it} + \beta_3 BANKSIZE_{it} + \beta_4 GGDP_i + \beta_5 CPI_i + e_{it}. \quad (3)$$

Table 1. Summary of variables in the research model

Description of variables	Name	Measurement	Expected sign
Bank's profitability	ROA	$Net\ income/Total\ Asset$	
Non-performing loan ratio	NPL	$Non-performing\ loan/\ Total\ loan$	-
Loans to deposits ratio	LDR	$Total\ loans/\ Total\ deposit$	+/-
Size of bank	BANKSZ	Logarithm (total assets)	-
GDP growth rate	GGDP	$GDP_t - GDP_{t-1} / GDP_{t-1}$	+/-
Consumer price index	CPI	*Annual inflation*	+/-

3.3 Research Method

The research sample is initially analyzed using the descriptive statistical method in order to determine the maximum value, minimum value, mean value, variance, and standard deviation. Panel data was collected from 35 commercial banks in Cambodia between 2017 and 2022. Regression models with panel data are therefore used in the study to run tests. Fixed effects model (FEM) investigates the link between NPLs and bank performance with explanatory variables under the presumption that each entity has unique characteristics that may have an impact on explanatory variables. To estimate the net effects of the explanatory variables on the dependent variable, FEM regulates and separates the influence of the individual characteristics (constant over time) from the explanatory variables. The estimation model used in this method take the form of:

$$Y_{it} = C_i + BX_{it} + U_{it} \quad (4)$$

where, Y_{it} is the dependent variable with i represents the bank and t is the time (year). X_{it} are independent variables, C_i is the intercept for each observed entity, B is the slope and U_{it} is the balance.

Fixed effects model has added index i for C blocking coefficient to differentiate the intercept of each different bank that may be different. This variation may be the result of various bank features or diverse management practices and business practices. Feasible general least square (FGLS) will be utilized to combat this issue if the chosen model occurs to be self-correlated or the variance varies across the entity.

4. Results and Discussion

4.1 Descriptive Statistics and Correlation between Variables

The overview of the descriptive statistics for the variables in the study's regression model is presented in Table 2. The findings indicate that the profitability of commercial banks as determined by ROA has a mean of 10% and a standard deviation of 15%. 53% is the highest level of profitability, and 54% is the lowest. Additionally, the results demonstrate that the average NPL rate in the commercial banking sector was approximately 1.22% throughout the period under consideration, the largest NPL during that time was 9.2%, and the lowest NPL was 0.06%. The NPL ratio's standard deviation was 98.15%. The National Bank of Cambodia (NBC) has instructed banks and microfinance institutions (MFIs) to reevaluate how many of the loans restructured as part of COVID relief measures in early 2020 should be classified as bad debt and provision accordingly. As a result, NPL in Cambodia is predicted to rise in the upcoming years. To prevent massive defaults as the COVID-19 epidemic impacted Cambodia's primary industries of garment manufacture, construction, and tourism, the NBC introduced the restructuring program in March 2020.

Table 2. Descriptive statistic results

Variables	Observation	Mean	Min	Max	Standard Deviation	VIF
ROA	210	0.1076	-0.5466	0.5337	15.38%	1.05
NPL	210	0.1215	0.0006	0.0921	98.15%	1.67
LDR	210	0.8851	0.2346	1.4237	18.15%	1.23
BANKSZ	210	13.846	10.984	16.855	123.93%	1.55
GGDP	210	0.0442	0.0820	0.0760	0.906%	1.01
CPI	210	0.0306	0.0194	0.0521	0.720%	1.22

Note. Return on assets (ROA), Non-performing loan (NPL), Loan to deposit ratio (LDR), Bank size (BANKSZ), GDP growth (GGDP), Annual inflation (CPI).

Additionally, the research sample's 35 commercial banks' average LDR is 88.5%, with a standard deviation of 18.2%. Between banks, the highest LDR was 142% and the lowest was 23.5%. The natural logarithm of total assets, which is used to gauge bank size, yields a mean value of 13 and a standard deviation of 123.9%. There are 10 in the bank with the smallest

size, and 17 in the bank with the largest size. The average GDP growth rate for the study period, which runs from 2017 to 2022, is 4.4%, despite a reduction of 3.1% in 2020 due to the Covid-19 epidemic, which had an impact on the world's economies. The year 2018 saw the highest growth rate of 7.5% and the lowest GDP growth rate was -3.1% in 2020. The GDP has a 0.91% standard deviation. Between 2017 and 2022, Cambodia experienced an average inflation rate of 3.1% with a standard deviation of 0.72%. 2019 saw the lowest inflation rate at 1.94%, while 2022 saw the highest inflation rate at 5.2%, the highest level in more than ten years. The Covid-19 pandemic increases in household demand and supply-chain shortages brought on by the pandemic, the war in Ukraine, the existence of a robust labor market, among other things, are some of the causes of the high inflation.

The study initially examines the correlation between the variables that could be responsible for NPLs before presenting the regression results. Table 3 shows the outcomes of the Pearson correlation test, which was performed to examine the link between the independent variables. The results demonstrate that the variables only have a minor connection, ranging from -0.309 to 0.252. Table 2 includes the variance inflating factor (VIF) to further show that multicollinearity is not a concern in the econometric model. If a variable's VIF is larger than 10 or if the tolerance result is less than 0.10, the study has a multicollinearity problem (Gujarati & Porter, 2003). However, as shown in Table 2, all of the independent variables in this study had VIF values ranging from 1.01 to 1.67, which suggests there was no multicollinearity issue with the study.

Table 3. Pearson correlation analysis

Variables	ROA	NPL	LDR	BANKSZ	GGDP	CPI
ROA	1					
NPL	-0.1278	1				
LDR	0.1360	0.0269	1			
BANKSZ	-0.2328	-0.1652	0.0515	1		
GGDP	-0.0324	-0.0193	0.0616	0.1159	1	
CPI	0.0339	-0.0201	0.2521	0.1371	-0.3086	1

Note. Return on assets (ROA), Non-performing loan (NPL), Loan to deposit ratio (LDR), Bank size (BANKSZ), GDP growth (GGDP), Annual inflation (CPI).

4.2 Regression Results

4.2.1 Dependent variable NPL

Table 4's three distinct diagnostic checks, which were originally carried out by the study, revealed that none of the variables utilized had multivariate normality. In addition, the preliminary OLS estimation included first order serial correlation and hetroskedasticity. Because of this, the OLS was unable to provide BLUE coefficients. The Hausman specification test was then used to determine whether the fixed effect model was preferable to the random effect model. Table 5 displays the findings from the fixed effect model.

Table 4. Model Diagnostics

Variables	
AR (1) F (1, 20)	105.85
Prob > F	0.0051
Doornik-Hansen chi2(16)	537.82
Prob>chi2	0.0000
BP/ CW Hettest chi2 (1)	190.57
Prob > chi2	0.0000

Source: Research Data, 2022.

Results shown in Table 5 show that although both GDP growth and bank loan to deposit ratio are shown to be negatively connected to nonperforming loans in Cambodia, they are not significant in determining nonperforming loans in Cambodia. Our results demonstrate that inflation is statistically significant and positively related to NPL across Cambodian banks. Higher interest rates are frequently accompanied by higher inflation, increasing the cost of borrowing. Borrowers may experience difficulties fulfilling their repayment commitments when the cost of servicing loans grows, which will result in an increase in NPLs. Similar to how low inflation depletes people's and businesses' purchasing power, excessive inflation makes it harder for them to make money. As borrowers' income streams weaken, their capacity to service loans declines, increasing the likelihood of loan defaults. The finding is consistent with the studies of Akinboade and Ayodeji (2015), Al-Eitan and Bani-Khalid, (2019) and Beybur, (2022) where they all found inflation to be positively associated with NPLs. In addition, the study discovers that bank size is statistically significant and negatively related to explaining nonperforming loans. Therefore, compared to smaller banks, larger banks see fewer nonperforming loans. This may be due to the economies of scale that major banks benefit from in terms of information collecting, diversification, and greater resources for loan management. This greatly lessens the information asymmetry that large banks have, which in turn lowers their nonperforming loans (Ma'aji, Anderson, & Colon, 2021).

Numerous empirical research has looked at the connection between bank size and NPLs, offering resounding insights on the subject. Demirgüç-Kunt and Huizinga (1999), for instance, discovered that larger banks typically have lower NPL ratios, demonstrating the advantages of economies of scale and diversification. Similarly, Elsas and Krahnen (2003) conducted a study on German banks and found that larger banks had lower NPL ratios compared to smaller banks. This diversification can help mitigate the impact of economic shocks or downturns in specific sectors, reducing the likelihood of NPLs. Additionally, larger banks may have more resources and expertise to manage and monitor loans effectively, which can contribute to lower NPL ratios.

Table 5. Determinants of Nonperforming loans

	Coefficient	Std. Err.	t-stat	P>t
Constant	0.1190	0.0278	4.27	0.000***
ROA	-0.4276	0.1138	-3.76	0.000***
LDR	-0.1230	0.0925	-1.33	0.1860
BANKSZ	-0.0107	0.0027	-3.88	0.000***
GGDP	-0.0501	0.0393	-1.27	0.2050
CPI	0.8915	0.4181	2.13	0.0350**
F (5, 204)	13.28			
Prob > F	0.000			
R^2	0.4470			
Adjusted R^2	0.4133			
Observations	210			
Hausman chi2(7)	21.67			
Prob>chi2	0.000***			

*Note. *, **, *** significant at the 10 percent, 5 percent and 1 percent levels, respectively. Return on assets (ROA), Non-performing loan (NPL), Loan to deposit ratio (LDR), Bank size (BANKSZ), GDP growth (GGDP), Annual inflation (CPI).*

Additionally, the return on assets (ROA), a metric of a bank's profitability, is negative and statistically significant in explaining non-performing loans. The results suggest that increased bank profitability, as shown by a higher ROA, can help to reduce NPLs. Banks that are more profitable can devote more resources to good credit risk management, maintain stricter underwriting standards, and better withstand losses from failed loans. These elements can support a healthier loan portfolio by reducing the risk of NPLs. Numerous empirical research has looked at the connection between bank ROA and NPLs, consistently revealing new information about this connection. For instance, a study on European banks by Jiménez et al. (2014) revealed evidence of a conflict between bank profitability and NPLs. Profitable banks, they concluded, have superior risk management procedures and are more likely to recognize and resolve possible credit issues early on, which lowers the incidence of non-performing loans. Similar to this, DeYoung et al. (2014) examined US banks and discovered that lower NPL levels were related to increased profitability as determined by ROA. Profitable banks, according to their argument, are better able to allocate funds for credit risk management, have more effective internal controls, and draw in higher-caliber borrowers, all of which help to reduce NPLs. In a study of a sample of European banks, Bos et al. (2016) discovered that economic downturns were when the impact of ROA on NPLs was greatest, highlighting the significance of the economy in this relationship.

4.2.2 Dependent variable ROA

Table 6 shows the model diagnostics of the estimation to investigate the influence of nonperforming loans on bank profitability while using Return on Equity as the measure of profitability. The preliminary OLS estimation made did not meet the assumption of no first order serial correlation as well as homoscedasticity. Also, the null hypothesis under

multivariate normality was rejected. Fixed effect estimation was the preferred estimation after the hausman specification test. The results from the fixed effect model are presented in Table 7.

Table 6. Model Diagnostics

Variables	
AR (1) F (1, 20)	15.694
Prob > F	0.0008
Doornik-Hansen chi2(16)	3568.35
Prob>chi2	0.0000
BP/ CW Hettest chi2 (1)	249.29
Prob > chi2	0.0000

Source: Research Data, 2022.

The results demonstrate a negative correlation between nonperforming loans and bank profitability that is statistically significant at the 1% level. This research implies that more credit risk in the form of nonperforming loans doesn't necessarily translate into higher bank profitability. This could imply that nonperforming loan losses actually cause banks' profits to decline, resulting in a decline in overall bank profit. These results are in agreement with those of Jesus and Gabriel (2006), Boudriga et al. (2009), Banker et al. (2010), Espinoza and Prasad (2010), Andries (2011), Festic et al. (2011), and Agoraki et al. (2013). This finding supports the hypothesis of the study, according to which there is a statistically significant negative correlation between the NPL ratio and bank profitability.

It was also demonstrated that additional control variables were statistically significant in explaining profitability. The findings from Abreu and Mendes' (2002) study suggesting the higher the loans to deposits ratio, the more profitable Cambodian commercial banks are are supported by the loans to deposits ratio coefficient, which is positive and statistically significant at the 5% level. The main way a bank makes money is through increasing lending rates while decreasing deposit rates for customers. This is how the majority of Cambodian commercial banks boost the size of loans they may offer. Commercial banks in Cambodia don't have a substantial liquidity risk as long as they keep their loan balances below their deposit balances. Additionally, larger banks are able to outperform their smaller competitors in terms of ROA profitability.

In addition, the study found that banks profit more when the economy is expanding as a positive and statistically significant association between GDP growth and bank profitability was discovered at the 1% level. Households and businesses would want more loans if the developing economy were expanding. Due to rising demand brought on by the expansion of the economy, businesses will need to boost their investments and productivity. Additionally, inflation has a favorable effect on bank profits.

Table 7. Influence of Nonperforming loans on Return on Assets (ROA)

	Coefficient	Std. Err.	t-stat	P>t
Constant	-0.1796	0.0273	-6.57	0.000***
NPL	-0.0537	0.0162	-3.31	0.001***
LDR	0.2317	0.0905	2.56	0.012**
BANKSZ	0.0162	0.0027	6.02	0.036**
GGDP	0.1625	0.0094	3.39	0.001***
CPI	0.0749	0.0384	1.95	0.053*
F (5, 204)	17.28			
Prob > F	0.000			
R^2	0.5458			
Adjusted R^2	0.5142			
Observations	210			
Hausman chi2(7)	27.23			
Prob>chi2	0.000***			

*Note. *, **, *** significant at the 10 percent, 5 percent and 1 percent levels, respectively. Return on assets (ROA), Non-performing loan (NPL), Loan to deposit ratio (LDR), Bank size (BANKSZ), GDP growth (GGDP), Annual inflation (CPI).*

5. Conclusion

Over the previous few years, Cambodia's non-performing loan (NPL) trend has been largely constant, with a minor increase in recent months. The study comes to the conclusion that although GDP growth and loan to deposit ratio are inversely correlated with nonperforming loans in Cambodia, they are not important in identifying nonperforming loans. In a strong economy, bank clients can make a sufficient profit on the investments they made with borrowed money. This can assist debtors in paying off their debt, hence reducing the percentage of nonperforming loans. Lower NPLs can be attributed to higher bank profitability because these institutions would have more financial resources to absorb losses from defaulted loans, devote more funds to efficient credit risk management, and uphold stricter underwriting standards. Although there has been a modest uptick recently, the trend of non-performing loans (NPLs) in Cambodia has been largely constant over the past few years. Although they are both adversely correlated with nonperforming loans in Cambodia, the study's findings show that neither GDP growth nor loan-to-deposit ratio are relevant in determining nonperforming loans. Bank clients can make enough money from the investments they made with borrowed money in an expanding economy. This can assist debtors in paying down their obligations, which lowers the rate of non-performing loans. A higher bank's profitability can result in fewer non-performing loans (NPLs) since the bank will have more resources to devote to credit risk management, greater resources to absorb losses from defaulted loans, and stricter underwriting requirements.

According to the report, Cambodian banks should match their policies for credit advancement with the state of the economy because nonperforming loans typically rise during economic downturns and fall during stable economic times. To reduce the surge in nonperforming loans

brought on by increased lending, banks should develop strong credit risk management practices. To serve as the operational instructions for risk management, the overall risk level and the amount of credit risk tolerance should be expressly mentioned in the risk management strategy. A thorough study, a comprehensive comprehension of the bank's operational environment, and an awareness of the macroeconomic environment must serve as the foundation for the formulation of the bank's credit risk strategy. Larger banks ought to use their economies of scale to better collect borrower data and reduce the proportion of non-performing loans. The National Bank of Cambodia should pay close attention to changes in macroeconomic variables while evaluating the stability and soundness of the banking sector because these changes can indicate the onset of major crises. This study has a number of important limitations due to its single-country focus, including the use of a tiny sample size. However, the findings add evidence from one country, particularly one that is emerging, to the literature discussion. In the future, it will be useful and instructive to do a thorough analysis of how nonperforming loans have affected the macroeconomic variables in Cambodia throughout time, particularly during the Covid-19 pandemic.

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