THE IMPACT OF CREDIT RISK ON THE FINANCIAL PERFORMANCE OF LICENSED COMMERCIAL BANKS IN SRI LANKA

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Abstract

This study investigates the impact of credit risk on the financial performance of licensed commercial banks in Sri Lanka during the period of 2013 to 2022, a time marked by significant macroeconomic challenges. The research employs panel data regression analysis using data from 12 commercial banks listed on the Colombo Stock Exchange. The findings reveal that credit risk, measured by the non-performing loan ratio and loan loss provisions to total loans, has a significant negative impact on bank profitability, as proxied by return on assets. Specifically, higher levels of non-performing loans and loan loss provisions adversely affect profitability, aligning with prior research. Interestingly, the capital adequacy ratio does not exhibit a statistically significant influence on bank profitability during the study period. Results also highlight the importance of bank-specific factors in determining profitability. While bank size is negatively related to the profitability, the bank age is positively associated with profitability, potentially due to economies of scale, diversification benefits, established customer relationships, and brand recognition. The differences in the significance of variables between the results of two models could be due to the distinct focus on assets versus equity in the generation of banks' profits. That is, the sources of banks' profitability are more dependent upon the asset base of the banks than that of the equity. The findings contribute to the ongoing debate on the impact of credit risk on different profitability ratios.

Keywords: Capital adequacy, credit risk, financial performance, loan loss provisions, non-performing loan

Introduction

Sri Lanka has faced an unprecedented crisis due to a series of unexpected events and policy errors. The country's debt became unsustainable because of significant fiscal imbalances, exacerbated by substantial tax reductions and the onset of the COVID-19 pandemic. This led to Sri Lanka losing its ability to borrow from international financial markets, depleting its foreign currency reserves and causing a significant drop in the exchange rate value. Consequently, the country ceased making debt payments in the late of 2022, resulting in a surge in inflation due to substantial monetary support aimed at meeting fiscal obligations. This has plunged the Sri Lankan economy into a deep recession, posing a threat to financial stability given the tight financial sovereign nexus (International Monetary Fund, 2023).

In such challenging circumstances, it is crucial to closely monitor a nation's commercial banks and institutions, which form the foundation of the economy and its future prospects. Within the Sri Lankan financial system, banks play a critical role by providing liquidity across the economy and influencing the risk profile of assets (Central Bank of Sri Lanka, n.d.). The banking sector in Sri Lanka is notably significant, with banks holding nearly half of the financial system's assets, making them key players in the financial landscape (Ariyadasa, et al., 2016). Licensed Commercial Banks (LCBs) and Licensed Specialized Banks (LSBs) lead the banking sector in Sri Lanka, exerting substantial control over the financial system with the largest share of assets. The Central Bank of Sri Lanka oversees and regulates banks, finance companies, and primary dealers to ensure the robustness and security of the financial system. This regulatory framework, guided by the Banking Act and Monetary Law Act, adheres to international standards set by the Basel Committee. The Central Bank employs a risk-focused supervisory approach, focusing on identifying, managing, and evaluating risk mitigation capacities of banks in line with global trends (Central Bank of Sri Lanka, n.d.).

The banking sector in Sri Lanka plays a crucial role in enhancing returns and wealth by providing capital to businesses and offering various investment opportunities to private and institutional investors. Both investors and banks are concerned about bank profitability, facing distinct risks in their pursuit of generating profits (Bandara, et al., 2021). Banks encounter various financial and non-financial risks, including credit, market, and

operational risks. Credit risk, stemming from borrowers' failure to meet obligations in direct lending and commitments, is a significant concern for banks (Commercial Bank of Ceylon, 2022). The implementation of Basel III by the Bank of International Settlements (BIS) has led to strengthened capital requirements for banks, enhancing the quality and amount of capital needed and improving risk coverage within the capital framework (Gunawardhana & Damayanthi, 2019). Basel III has implications for Sri Lankan banks, requiring them to maintain more capital and liquidity, which can impact returns on equity (ROE) due to increased costs. Compliance with Basel III may lead to reduced profitability for banks, depending on how lending rates respond to changes in the capital structure and the sensitivity of credit growth to lending rates (Gunawardhana & Damayanthi, 2019).

Despite prior studies on credit risk and financial performance of commercial banks, conducted before the pandemic and economic crisis, there is significant controversy in the findings. Some studies suggest that credit risk impacts the financial performance of commercial banks, while others conclude that credit risk does not significantly influence loan performance (Bandara, et al., 2021; Sun & Chang, 2022; Liyanage, et al., 2021; and others). Notably, there is a scarcity of studies conducted during the pandemic and economic crisis. *Therefore, this research aims to provide a more comprehensive understanding of how credit risk affects the financial performance of Licensed Commercial Banks (LCBs) in Sri Lanka, both during and after the pandemic-induced economic crisis.*

Research Problem

Some studies have shown a significant influence of credit risk on the financial performance of commercial banks (Bandara et al., 2021; Sun & Chang, 2018; Liyanage et al., 2021; Perinpanathan, & Vijeyaratnam, 2015; Rasika & Hewage, 2015; Kodithuwakku, 2015; Singh & Sharma, 2018; Poudel, 2012; Charles & Kenneth, 2013; Lawrence et al., 2020). Conversely, other studies have concluded that credit risk does not significantly affect the financial performance of commercial banks (Lebbe et al., 2016; Kithinji, 2010). *This contradictory evidence highlights a significant research gap necessitating further investigation.*

A research gap is evident in the examination of Capital Adequacy Ratio (CAR) and its impact on bank profitability, with prior studies from Sri Lanka and internationally, showing a diverse and conflicting relationship between CAR and financial performance (e.g. Weersainghe & Perera, 2013; Swarnaplai, 2014; Rasika & Hewage, 2015; Perinpanathan, & Vijeyaratnam, 2015; Suganya & Kengatharan, 2018; Poudel, 2012; Charles & Kenneth, 2013; Gizaw, et al., 2015; Singh, et al., 2020). Similarly, the Non-Performing Loan Ratio (NPLR) presents contradictory findings on its influence on bank profitability, with studies from various countries, including Sri Lanka, highlighting the need for further research to study the contextual factors shaping this intricate relationship (See e.g. Kithinji, 2010; Charles & Kenneth, 2013; Kodithuwakku, 2015; Perinpanathan, & Vijeyaratnam, 2015; Swarnaplai, 2014; Wijewardana & Wimalasiri, 2017; Shrestha, 2019; Singh, et al., 2020; Bandara, et al., 2021). Furthermore, the area of Loan Loss Provision to Total Loan (LLPTL) also exhibits conflicting connections with bank profitability, as studies both within Sri Lanka and globally offers contrasting findings. These studies emphasize the necessity for additional research to uncover the contextual elements influencing this complex relationship (Charles & Kenneth, 2013; Kodithuwakku, 2015; Gizaw, et al., 2015; Serwadda, 2018; Gunathilaka & Wijesingha, 2021; Sun & Chang, 2018; Ruwanthika, et al., 2018).

The period from 2013 to 2022 in Sri Lanka highlights a crucial period marked by significant challenges. This timeframe coincided with security threats, political instability, pandemics, and economic crises, emphasizing the need for in-depth exploration (Fitch Rating, 2023). *The macroeconomic impact on Sri Lanka's banking sector during this period remains largely unaddressed.* From 2013 to 2022, Sri Lanka faced significant challenges, including security threats, political instability, pandemics, and economic crises (Fitch Rating, 2023). These events impacted the banking sector, particularly from 2019 to 2022, when economic difficulties tested the sector's resilience. The Easter Sunday attacks and political instability in 2019 slowed growth, and the COVID-19 pandemic in 2020 further stressed the financial system (Central Bank of Sri Lanka, 2018, 2019). In 2022, Sri Lanka's most severe economic crisis since independence led to a sovereign rating downgrade, banking sector exposure, economic contraction, foreign exchange scarcity, high inflation, and a temporary halt on external debt repayments. These factors severely impacted the financial sector (Central Bank of Sri Lanka, 2022). Following the downgrade, Fitch Ratings downgraded the ratings of ten Sri Lankan banks in 2023 (Fitch Rating, 2023). Reports from the Central Bank highlight a decline in profitability from 2018 to 2019, with loan portfolio expansions increasing risk-weighted assets and non-performing loans. Moratoria from 2020 to 2022 temporarily froze loan classifications, yet non-performing loans continued to rise. By 2022, credit growth slowed, and impairments increased, indicating systemic risks that policymakers aim to mitigate through macroprudential tools.

The research gap of this study lies in the need to clarify the contradictory findings regarding the impact of credit risk on the financial performance of commercial banks in Sri Lanka. While some studies have shown a significant influence, others have concluded that credit risk does not significantly affect bank profitability. This inconsistency necessitates further investigation to establish a clear understanding of the relationship between credit risk and bank performance in the Sri Lankan context. The main research question of this study is whether there is an impact of possible factors that determined financial leverage such as Non-Performing Loan Ratio, Capital Adequacy Ratio, Loan Loss Provision to Total Loans, Bank Size, Bank Age, Interest Rate, and Inflation Rate on the financial performance of licensed commercial banks in Sri Lanka from 2013 to 2022. This study aims to investigate the impact of various factors, including Non-Performing Loan Ratio, Capital Adequacy Ratio, Loan Loss Provision to Total Loans, Bank Size, Bank Age, Interest Rate, and Inflation Rate, on the financial performance of licensed commercial banks in Sri Lanka from 2013 to 2022.

Literature Review

Financial Performance

Financial intermediation is a process where banks and other financial institutions collect funds from customers and then lend those funds to borrowers (Perera & Morawakage, 2016). The performance of institutions is influenced by a combination of strengths, weaknesses, opportunities, and threats stemming from internal and external environments. Therefore, a bank's efficiency is shaped by factors from both its specific operations and the broader environment (Swarnaplai, 2014).

Profitability holds significant importance in the banking sector, particularly in ensuring its continued existence. Profitability serves as a crucial indicator of a bank's future potential, with every bank striving to enhance its profitability. Higher profitability levels reflect superior bank performance, indicating effective and efficient operations (Suryaningsih & Sudirman, 2020). Over time, the profitability of banks has been impacted by various internal and external factors. Profitability is essential for banks to sustain their activities and for shareholders to receive fair returns (Weersainghe & Perera, 2013). While the definition of profitability varies across studies, previous literature extensively explores the determinants of profitability, offering empirical insights into this area. Bank profitability, often measured through ratios such as return on assets (ROA) and return on equity (ROE), is commonly identified as a function of both internal and external determinants (Weersainghe & Perera, 2013). ROA acts as an indicator of efficiency in using assets for income generation, with higher values indicating better efficiency. Despite its limitations in capturing off-balance-sheet activities, ROA is considered a robust measure of bank performance and profitability (Weersainghe & Perera, 2013). Many studies recommend using Return on Assets (ROA) as a method to measure bank profitability, as evidenced by various researchers (Kodithuwakku, 2015; Suganya & Kengatharan, 2018; Liyanage, et al., 2021). Return on equity (ROE) is also widely recognized as a key indicator for measuring profitability, as indicated by studies such as (Alshatti, 2015; Wijewardana & Wimalasiri, 2017; Hunjra, et al., 2020).

Non-Performing Loan Ratio

The quality of assets reflects the level of credit risk associated with a bank's loan and investment portfolio (Suganya & Kengatharan, 2018). The Basel Committee on Banking Supervision (BCBS) acknowledges the importance of asset quality in effectively supervising the banking system, including overseeing the bank's loan risk (Perinpanathan, & Vijeyaratnam, 2015). The Non-Performing Loans Ratio (NPL) is a critical measure of a commercial bank's credit risk. Non-Performing Loans (NPLs) are defined as the total borrowed funds for which the debtor has failed to make scheduled payments for at least 90 days (Nwude & Okeke, 2018). This ratio is calculated by dividing the Gross Non-Performing Loans by the Total Gross Loans, as supported by various studies (Weersainghe & Perera, 2013; Kodithuwakku, 2015; Wijewardana & Wimalasiri, 2017; Sun & Chang, 2022). Research indicates that financial and banking crises in East Asian and Sub-Saharan African countries were preceded by an increase in non-performing loans (Vatansever & Hepşen, 2013). When borrowers miss scheduled payments, it can lead to higher collection and borrowing costs. A significant portion of non-performing investments can negatively impact a bank's ability to invest in new profitable opportunities and repay depositors (Poudel, 2018).

The Non-Performing Loan ratio is expected to have a negative impact on profitability as non-performing loans do not generate interest income. Additionally, the need to make provisions for potential loan losses, dependent on the value of non-performing loans, affects a bank's profits (Weersainghe & Perera, 2013). An increasing ratio signals a higher risk of not recovering a significant portion of a bank's major assets (Kodithuwakku, 2015).

While some studies show a significant influence of the non-performing loan ratio on bank profitability (Rasika & Hewage, 2015; Swarnaplai, 2014; Liyanage, et al., 2021), others suggest otherwise (Weersainghe & Perera, 2013; Ariyadasa, et al., 2016). This variation in findings highlights the importance of further exploration into the role of the NPLR as a key credit risk indicator.

Loan-Loss Provision to Total Loan

The level of loan loss provisions in banks is a crucial indicator of credit risk and asset quality, impacting the future performance of banks (Menicucci & Paolucci, 2016). Loan loss provisions, which are recognized on income statements, represent anticipated losses associated with specific loan portfolios. According to Basel II regulations, Loan Loss Provisions (LLP) can be integrated into a bank's capital, reflecting management's confidence in asset quality (Gizaw, et al., 2015). These provisions serve as protective buffers for a bank's capital (acting as a strong defense against insolvency risks) particularly when a bank encounters significant asset quality challenges and existing reserves are insufficient, leading to losses absorbed by shareholders' equity (Golin, 2001).

Several studies have shown that the loan loss provision to total loan ratio significantly influences bank profitability (Kodithuwakku, 2015; Gunathilaka & Wijesingha, 2021; Sun & Chang, 2022; Ruwanthika, et al., 2022; Gizaw, et al., 2015; Serwadda, 2018). However, other research has indicated that the loan loss provision to total loan ratio does not have a substantial impact on bank profitability (Charles & Kenneth, 2013). The conflicting findings regarding loan loss provisions to total loans highlight the need for further comprehensive investigation.

Capital Adequacy Ratio

In Sri Lanka, the Central Bank introduced the internal capital adequacy assessment process in 2013, facilitating the implementation of Basel III requirements. Subsequently, in June 2017, capital adequacy requirements conforming to Basel III were put into effect (Chandrasegaran, 2020). Capital adequacy is a crucial indicator of the financial stability of the banking industry, acting as a safety mechanism to safeguard depositors and enhance stability and efficiency in the overall financial system of a country (Herath, 2015). The capital adequacy ratio (CAR) is a metric that evaluates a bank's financial robustness by leveraging its capital and assets (Chandrasegaran, 2020). A well-capitalized bank, capable of seizing unexpected opportunities and managing unforeseen losses, tends to exhibit higher profitability. The CAR, as an endogenous variable, is instrumental in assessing profitability.

Moreover, a bank's capital strength signifies its ability to absorb unexpected losses, suggesting that capital is expected to positively impact profitability. However, theoretically, the relationship with capital should be negative, given that equity financing typically involves higher costs compared to funding sources such as customer deposits and short-term debt, which carry less risk (Ariyadasa, et al., 2016). The CAR is defined as the ratio of the capital base to total risk-weighted assets, where assets are adjusted for credit, operational, and market risk. This definition of CAR has been utilized in various prior studies (Weersainghe & Perera, 2013; Ariyadasa, et al., 2016; Shrestha, 2019; Ruwanthika, et al., 2022).

Some studies have shown a significant influence of the capital adequacy ratio on bank profitability (Weersainghe & Perera, 2013; Rasika & Hewage, 2015; Ariyadasa, et al., 2016; Liyanage, et al., 2021; Bandara, et al., 2021; Ruwanthika, et al., 2022), whereas the other studies have concluded that there is an insignificant relationship between capital adequacy ratio and bank profitability (Sun & Chang, 2022; Gizaw, et al., 2015; Singh, et al., 2020). The literature highlights the context-specific nature of the relationship between CAR and bank profitability, with findings differing across various countries.

Bank Size

Bank size plays a crucial role in determining bank profitability. The relationship between bank size and profitability can vary based on economies of scale and risk diversification. Larger banks may benefit from economies of scale, leading to increased profitability due to cost efficiencies and greater operational capacity. Conversely, smaller banks might excel in risk diversification, potentially reducing credit risk and enhancing returns. A handful of Sri Lankan studies such as Weersainghe & Perera (2013), Kaaya & Pastory (2013) have explored this relationship, highlighting the complex interplay between bank size, economies of scale, and profitability in the banking industry.

Bank Age

Established banks typically experience rising profits, improved productivity, and expanded size. The age of a bank significantly influences its financial performance, indicating that older banks, with their accumulated experience, tend to achieve higher profitability. Older banks often provide a diverse range of products and services, attracting more customers and leading to enhanced financial performance. These assertions align with the research findings of Hunjra et al. (2020) and are further supported by the work of Lawrence et al. (2020).

Macro-Economic Factors

The inflation and interest rates have a significant impact on banks' performance as these variables impact the aggregate borrowing of an economy. Inflation can be defined as continuous increase in the prices of goods and services of an economy that can have a mixed effect on banks' performance. In order to generate higher returns, banks can raise their lending rates in the course of inflation but central banks may respond to that by raising policy interest rates so as to limit excessive credit creation and increase borrowing costs for consumers. The overall impact of inflation on banks' performance depends on how banks respond to inflationary conditions, leading to potentially positive or negative outcomes (Ariyadasa, et al., 2016). The impact of interest rates on banks' performance can be positive or negative, with varying findings across studies. Some studies show a significant influence of interest rates on bank profitability, while others suggest no significant impact (Poudel, 2018). The conflicting results regarding inflation rates and interest rates emphasize the complexity of these factors and the need for further research to understand their specific impact on bank profitability in Sri Lanka.

The existing literature on the impact of credit risk factors on the financial performance of commercial banks in Sri Lanka presents conflicting findings. Some studies have found a significant influence of credit risk, as measured by non-performing loan ratio (NPLR), loan loss provision to total loan (LLPTL), and capital adequacy ratio (CAR), on bank profitability (Bandara et al., 2021; Sun & Chang, 2022; Liyanage et al., 2021). However, other studies have concluded that these credit risk factors do not significantly impact the financial performance of commercial banks (Lebbe et al., 2016; Kithinji, 2010).

This contradictory evidence highlights a significant research gap that necessitates further investigation. The relationship between CAR and bank profitability is particularly contentious, with prior studies from Sri Lanka and internationally showing diverse and conflicting findings (Weersainghe & Perera, 2013; Suganya & Kengatharan, 2018; Poudel, 2012; Gizaw et al., 2015). Similarly, the influence of NPLR and LLPTL on bank profitability also presents contradictory results, emphasizing the need for more research to understand the contextual factors shaping these complex relationships (Kithinji, 2010; Kodithuwakku, 2015; Gunathilaka & Wijesingha, 2021; Sun & Chang, 2018).

Conceptual Framework

Researchers such as Poudel, (2012), Rasika & Hewage, (2015), Kodithuwakku, (2015) & Mulwanda, (2021) identify Non-Performing Loan Ratio, Capital Adequacy Ratio, average inflation, total assets to GDP, total loans to deposit ratio, natural log of total assets, provision for loan losses, total loans to total assets, growth of GDP, Default rate, Cost per loan asset, NPAs to Net Advances, Profit per Employee (PPE), Credit-deposit Ratio (CDR), Investment-deposit Ratio (IDR), and Lending to the Sensitive Sector (SEN) as indicators of credit risks of banks. They also identify Return on Equity and Return on Assets as indicators of bank performance.

These research articles discuss the impact of non-performing loans (NPLs) on the banking industry, particularly focusing on loan loss provisions and capital adequacy ratios. Non-performing loans can significantly affect the loan loss provisions of banks, impacting their soundness and ability to lend. The studies highlight that NPLs reduce banks' earnings, cause losses, and hinder their lending capacity, which can have negative implications for the overall economy. Banks prepare for potential losses by estimating future losses on loans and booking provisions accordingly. The NPL coverage ratio indicates the extent to which a bank has recognized expected losses from non-performing loans. Timely coverage of non-performing loans is crucial, with mechanisms like a provisioning calendar in place to guide banks in adequately covering potential losses over time.
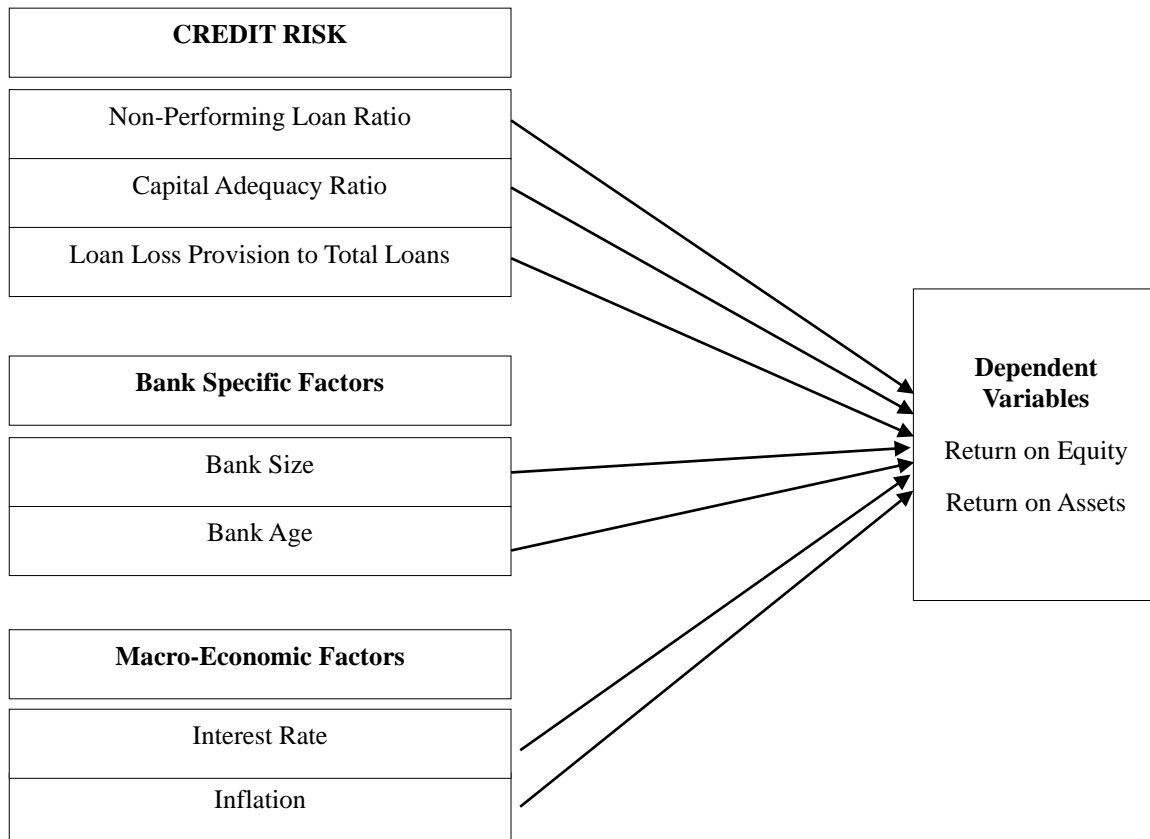
Figure 01. Conceptual Framework

Methodology

The study targets twelve registered commercial banks listed on the Colombo Stock Exchange (CSE) as the population for the study. Namely Amana Bank PLC, Commercial Bank of Ceylon PLC, DFCC Bank PLC, Housing Development Finance Corporation PLC, Hatton National Bank PLC, National Development Bank PLC, National Trust Bank PLC, Pan Asia Banking Corporation PLC, Sampath Bank PLC, Sanasa Development Bank PLC, Seylan Bank PLC, Union Bank of Colombo PLC were selected. All twelve registered commercial banks in Sri Lanka listed on the CSE is included in the sample. Therefore, the sample size is identified as twelve, utilizing a census sampling approach.

This study adopts a quantitative approach, focusing on collecting quantitative data. The data will be sourced from the audited financial statements published in the annual reports of the commercial banks, and the annual reports of the Central Bank from a period of 2013 to 2022. The data will be analyzed using descriptive statistical and inferential statistical techniques such as regression analysis that includes diagnostic tests for regression analysis. The data are processed and regressions are run on EViews software. In order to ensure free from scaling issues, robustness and efficiency of linearization of non-linear relationship, the natural algorithms of variables were taken in the model estimation. However, actual values of bank age, interest rate and inflation rate were presented in Table 1 (e.g. descriptive statistics) for better understanding of the readers.

The regression models utilized in the study are as follows:
$$Y_i = \alpha + \sum \beta_i X_j + \varepsilon_i \dotfill 01$$

Where:
Y_i represents the financial performance measure for the banking sector firm i.
α denotes the constant term if the regression i.
Two dependent variables considered are Return on Assets (ROA) and Return on Equity (ROE).

The explanatory variables Xi to Xj are categorized into specific and bank-level variables based on the above discussion.

Model (1):
$$ROA_{it} = a + \beta_1 NPL_{it} + \beta_2 LLP_{it} + \beta_3 CAR_{it} + \beta_4 SZE_{it} + \beta_5 AGE_{it} + \beta_6 INT_{it} + \beta_7 INF_{it} + \varepsilon_i \dotfill 02$$

Model (2):
$$ROE_{it} = a + \beta_1 NPL_{it} + \beta_2 LLP_{it} + \beta_3 CAR_{it} + \beta_4 SZE_{it} + \beta_5 AGE_{it} + \beta_6 INT_{it} + \beta_7 INF_{it} + \varepsilon_i \dotfill 03$$

Where;
ROA: Return on Assets
ROE: Return on Equity
a: Constant term
β: Coefficient of the independent variables
NPL: Non-performing Loan Ratio
LLP: Loan Loss Provision to Total Loan Ratio
CAR: The Capital Adequacy Ratio
SZE: Bank Size
AGE: Bank Age
INT: Interest Rate
INF: Annual inflation rate
ε: Error term

Results and Discussion

Descriptive statistics of sample data

The findings from the updated sample data show that the mean Return on Assets (ROA) for the commercial banks in Sri Lanka is 1.3%, with a low standard deviation of 0.008, indicating minimal variability in ROA across the banks. The mean Return on Equity (ROE) is 14.2%, with a standard deviation of 0.094, suggesting some variability in ROE among the banks. Regarding the key independent variables, the mean Non-Performing Loan Ratio (NPLR) is 5.3%, with a moderate standard deviation of 0.047, implying an average of 5.3% non-performing loans in the banks' portfolios. The mean Loan Loss Provision to Total Loan (LLPTL) ratio is 1.5%, with a low standard deviation of 0.019, indicating little variability in loan loss provisions relative to total loans. The mean Capital Adequacy Ratio (CAR) is 15.9%, with a relatively low standard deviation of 0.036, suggesting that banks maintain capital well above regulatory thresholds with little variability.

The descriptive statistics also show that the mean bank age is 31.5 years, with a standard deviation of 24.45, indicating some variability in the ages of the commercial banks. The mean bank size, measured by total assets, is 11.38, with a standard deviation of 0.496, signifying variability in the sizes of the banks. The mean interest rate charged by the banks is 7.98%, with a standard deviation of 8.31, indicating variability in interest rates over time. Additionally, the mean inflation rate is 10.27%, with a standard deviation of 2.270, suggesting some variability in the economic environment where these banks operate. A significant variability was observed only during 2022 but the effect was negligible when taking the averages and calculating the standard deviation.

The Levin, Lin & Chu (LLC) test results show that all variables are stationary, as the test statistics are negative and statistically significant at the 1% level (i.e., does not have a unit root). As results show all the variables appear to be stationary based on the negative and statistically significant LLC test statistics.

Table 1: Descriptive statistics of sample data

Description	Min	Max.	Mean	Std. Dev.	LLC*
ROA	-0.019	0.044	0.013	0.008	-4.218
ROE	-0.016	0.676	0.142	0.094	-6.753
NPLR	0.009	0.330	0.053	0.047	-7.433
LLPTL	0.001	0.096	0.015	0.019	-7.897
CAR	0.103	0.409	0.159	0.036	-9.403
BANK AGE	3.000	125.00	31.50	24.45	-7.979
BANK SIZE	10.369	12.385	11.379	0.496	-17.84
INT. RATE %	4.50%	15.50%	7.98%	8.310	-7.044
INFLATION %	-0.90%	21.50%	10.27%	2.270	-6.201

Note: *LLC is the Levin, Lin & Chu t test where p-value is less than 1% in all variables. Inflation rate and the interest rates were counted upto March, 2022 from the year 2013.

Panel Data Model Selection Test

The test results of panel specification are outlined in Table 2 and Table 3 (for the two regression specifications) to determine the most suitable model for assessing the determinants of profitability of commercial banks Sri Lanka. Specifically, if the p-value of the Hausman test is less than the significance level, it implies that the pooled OLS model should be rejected in favor of the fixed effects model. Conversely, if the p-value exceeds the significance level, one should retain the fixed effects model. The Hausman test results presented in Table 2 show a Chi-square statistic of 0.00 with 7 degrees of freedom and a probability of 0.999 for the cross-section random test. This statistical analysis indicates that there is no significant difference between the fixed effect and random effect models at the 0.05 significance level. The low Chi-square value and the very high p-value of 0.999 suggest that the null hypothesis, which states that the preferred model is the random effects model, cannot be rejected. This implies that the choice between fixed effects and random effects models does not significantly impact the results for the variables ROA/ROE, NPLR, LLPTL, CAR, Bank Age, Bank Size, Interest Rate, and Inflation. Therefore, based on these Hausman test results, the random effects model appears to be the more appropriate and statistically comparable model for capturing the relationships between the variables in the analysis. The high p-value of 0.999 indicates a very strong statistical evidence in favor of the random effects model, suggesting that this model is the preferred specification for the given data and variables.

Table 2. Hausman Test – Model I &II

Test Summary	Chi-square statstic	Chi-sq.df	Probability
Cross-section Random			
Model I	0.000	7	0.999
Model II	0.000	7	0.999

Model I - Null hypothesis: the preferred model is random effects, Alternate hypothesis: the model is fixed effects. Variable list: ROA (Return on Assets), NPLR (Non-Performing Loan Ratio), LLPTL (Loan Loss Provision to Total Loans), CAR (Capital Adequacy Ratio), Bank Age (BA), Bank Size (BS), Interest Rate (IR), Inflation (INF). Model II - Null hypothesis: the preferred model is random effects, Alternate hypothesis: the model is fixed effects. Variable list: ROE (Return on Equity), NPLR (Non-Performing Loan Ratio), LLPTL (Loan Loss Provision to Total Loans), CAR (Capital Adequacy Ratio), Bank Age (BA), Bank Size (BS), Interest Rate (IR), Inflation (INF).

The panel cross-sectional heteroskedasticity LR test results provide strong evidence of the presence of heteroskedasticity in the panel dataset used to investigate the impact of credit risk on the financial performance of commercial banks in Sri Lanka from 2013 to 2022. The highly significant likelihood ratio statistics suggest that the null hypothesis of homoscedasticity can be rejected. The substantial differences in log-likelihood values between the restricted and unrestricted models further corroborate this finding, suggesting that the unrestricted model, which allows for heteroscedastic errors, fits the data significantly better. The presence of panel cross-sectional heteroskedasticity implies that the error variances are not constant across the cross-sectional units (i.e., the banks in the sample). This violation of the classical linear regression assumption of homoscedasticity can lead to biased and inefficient parameter estimates if not properly addressed. Consequently, the researchers must account for the heteroskedasticity in the subsequent regression analysis, using appropriate methods such as robust standard errors or weighted least squares, to ensure the validity and reliability of the research findings. Thus, the model was estimated suing weighted least squares.

Regression Results

Regression Model I

The regression analysis examining the impact of credit risk on the financial performance proxied by Return on Assets (ROA) of licensed commercial banks reveals several key findings. Credit risk as measured by NPLR has a significant negative impact on bank profitability. This indicates that higher levels of non-performing loans adversely affect the profitability of banks, as measured by ROA. This finding is consistent with prior research by Khanal and Sapkota (2023), Seetharaman et al. (2017), Al Zaidanin and Al Zaidanin (2021), Alshatti (2015), Anita et al. (2022), Bhuiya et al. (2023), Poudel (2012), Perera and Morawakage (2016), Rajkumar and Hanitha (2015), Rasika and Madushani (2019), Shrestha (2019), Serwadda (2018), Sewwandi and Karunarathne (2022), and Tuladhar (2017).

Loan loss provisions, which are set aside to cover potential loan defaults, significantly and negatively impact bank profitability. This suggests that higher loan loss provisions, which are set aside to cover potential defaults, reduce the profitability of banks. This finding is supported by previous studies by Ajayi et al. (2019), Badawi

(2017), Bahattai (2017), Ekanayake and Azeez (2015), Fernando and Ekanayake (2015), Gowthaman and Kengatharan (2023), Jayalath and Palihena (2017), and Weerasinghe and Sun & Chang (2021).

Bank size is significantly and negatively associated with bank profitability. Larger banks tend to have lower profitability, as measured by ROA, potentially due to the inefficiencies that can arise from increased complexity and the potential for decreased customer relationships and loyalty. This contradicts the findings of Ariyadasa et al. (2016), Chandrasegaran (2020), and Suganya and Kengatharan (2018), which suggest a positive relationship between bank size and profitability. Bank age is however significantly and positively related to bank profitability, corroborating the research of Ariyadasa et al. (2016). Older and more established banks tend to have higher profitability compared to younger banks, likely due to their experience, customer relationships, and brand recognition.

The regression analysis provides important insights into the key drivers of bank profitability, as measured by ROA, in the Sri Lankan banking sector during the 2013-2022 period marked by significant macroeconomic challenges. These findings highlight the critical role of credit risk, bank size, and bank age in determining the financial performance of licensed commercial banks in Sri Lanka.

Table 3. Regression Results of Model I

Variable	Coefficient	t-Statistics	Probability
NPLR	-0.0006**	-1.979	0.0505
LLPTL	-0.0011*	-1.791	0.0763
CAR	-0.0002	-0.069	0.9450
BS	-0.0222**	-4.678	0.0000
BA	0.06999**	6.212	0.0000
INR	-0.0011	-0.883	0.3789
INF	0.00365	0.003	0.9971
C	0.15507	3.438	0.0009

Note: Dependent variable: ROA (Return on Assets) & independent variables: NPLR (Non-Performing Loan Ratio), LLPTL (Loan Loss Provision to Total Loans), CAR (Capital Adequacy Ratio), Bank Age (BA), Bank Size (BS), Interest Rate (INR), Inflation (INF). *, ** significant at 10 % and 5 % respectively

The results from regression I above show that interest rate (INR) does not have a statistically significant impact on ROA. This suggests that changes in interest rates do not have a significant direct effect on the profitability of commercial banks in Sri Lanka, as measured by ROA, during the study period. The non-significant relationship between interest rates and ROA aligns with findings from prior studies, such as Weersainghe and Perera (2013) and Ariyadasa et al. (2016). The regression results also indicate that inflation rate (INF) does not have a statistically significant impact on ROA. This implies that fluctuations in the inflation rate do not directly translate into significant changes in the profitability of commercial banks in Sri Lanka. The non-significant relationship between inflation and ROA is consistent with the findings of Ruwanthika et al. (2022).

Regression Model II

The regression results for the impact on Return on Equity (ROE) show some differences. CAR, NPLR and LLPTL do not exhibit statistically significant direct effects. Similar to the ROA findings, Bank Age has a significant positive impact on ROE. This indicates that older, more established banks tend to have higher profitability as measured by ROE compared to younger banks but Bank Size does not have a significant influence. Interestingly, the control variables of Interest Rate and Inflation Rate do not have significant impacts on either ROA or ROE during the study period. This indicates that changes in macroeconomic factors such as interest rates and inflation do not directly translate into significant changes in the profitability of commercial banks in Sri Lanka.

The regression analysis examining the impact of credit risk management on the Return on Equity (ROE) of licensed commercial banks in Sri Lanka reveals some findings that are consistent with prior studies in this area. The insignificant negative impact of Non-Performing Loan Ratio (NPLR) on ROE found in this study aligns with the findings of Ruwanthika et al. (2022). Their studies also reported an insignificant relationship between non-performing loans and bank profitability as measured by ROE in the Sri Lankan context. This suggests that the level of non-performing loans may not have a direct significant effect on the return generated for shareholders. Similarly, the insignificant negative impact of Loan Loss Provision to Total Loan Ratio (LLPTL) on ROE is consistent with the results reported by Kodithuwakku (2015) and Perinpanathan, & Vijeyaratnam

(2015). These researchers also found that loan loss provisions do not have a significant direct influence on the ROE of commercial banks in Sri Lanka. In contrast, the finding of an insignificant impact of Capital Adequacy Ratio (CAR) on ROE is supported by studies such as Sun & Chang (2022) and Liyanage et al. (2021).

Table 4. Regression Results of Model II

Variable	Coefficient	t-Statistics	Probability
NPLR	-0.0141	0.1337	0.8939
LLPTL	0.00056	-1.5700	0.1195
CAR	-0.0267	-0.6262	0.5326
BS	-0.0402	-0.6292	0.5306
BA	0.26070*	1.72015	0.0885
INR	-0.0109	-0.6199	0.5367
INF	-0.0064	-0.5144	0.6081
C	0.1047	0.1725	0.8633

Note: Dependent variable: ROE (Return on Equity), NPLR (Non-Performing Loan Ratio), LLPTL (Loan Loss Provision to Total Loans), CAR (Capital Adequacy Ratio), Bank Age (BA), Bank Size (BS), Interest Rate (INR), Inflation (INF). *, ** significant at 10 % and 5 % respectively

Interest Rate (INR) does not have a statistically significant impact on ROE. This suggests that changes in interest rates do not have a meaningful effect on the profitability of banks as measured by ROE. Inflation Rate (INF) does not have a statistically significant impact on ROE. This indicates that the level of inflation does not have a significant influence on the profitability of banks as measured by ROE. The regression results for ROE are consistent with some of the existing literature, providing further evidence on the complex relationship between credit risk management and bank financial performance in the Sri Lankan context.

The significant differences between the two regression outcomes in terms of the significance of the variables

The significance difference between the two regression outcomes in terms of the significance of the variables can be attributed to several factors. The measurement of profitability, with ROA focusing on assets and ROE on equity, could influence the results. Additionally, the inclusion of different credit risk factors in each model, such as NPLR and LLPTL in Model I & Model II, could contribute to the differences in significance. Bank-specific factors such as Bank Size and Bank Age, as well as macroeconomic factors such as Interest Rate and Inflation Rate, could also have distinct effects on the profitability ratios at different magnitudes. The key take-away from this observation of differences is that the differences in the significance of variables between the two models could be due to the *distinct focus on assets versus equity* in the generation of profitability. That is, the sources of profitability is more dependent upon the asset base of the banks than that of the equity

Diagnostics Check

Regression Model I

The Jarque-Bera statistic of 51.09 with a probability of 0.00 indicates that the residuals are not normally distributed. The Durbin-Watson statistic of 1.144 falls in the inconclusive range, so we cannot definitively conclude whether autocorrelation is present or not. The Breusch-Pagan LM, Pesaran scaled LM, and Bias-corrected scaled LM tests all have *p*-values less than 0.05, suggesting the presence of cross-sectional dependence (correlation) in the residuals. However, the Pesaran CD test has a *p*-value of 0.516, which fails to reject the null hypothesis of no cross-sectional dependence. In contrast, the cross-section F and Chi-square tests both have p-values of 0.00, indicating that the fixed effects in the model are statistically significant, which imply that there is cross-sectional dependence in the model.

Regression Model II

The Jarque-Bera statistic of 1921.16 with a probability of 0.000 clearly shows that the residuals are not normally distributed, which violates a key assumption of classical linear regression models. The Durbin-Watson statistic of 1.789 falls in an inconclusive range, so it's unclear whether autocorrelation is present or not. While the Breusch-Pagan LM, Pesaran scaled LM, and Bias-corrected scaled LM tests suggest cross-sectional dependence (correlation) in the residuals with *p*-values less than 0.05, the Pesaran CD test fails to reject the null hypothesis of no cross-sectional dependence with a *p*-value of 0.8448. However, the cross-section F and Chi-square tests both have *p*-values of 0.000, clearly indicating the presence and significance of fixed effects in the model.

Conclusion

The study examines the impact of credit risk on the financial performance of licensed commercial banks in Sri Lanka during the period from 2013 to 2022, which was marked by significant macroeconomic challenges including the COVID-19 pandemic and an unprecedented economic crisis. The analysis reveals that credit risk, as measured by the non-performing loan ratio (NPLR) and loan loss provisions to total loans (LLPTL), has a significant negative impact on financial performance, measured by return on assets (ROA). Specifically, higher levels of non-performing loans and loan loss provisions are found to adversely affect the profitability of banks.

Interestingly, the capital adequacy ratio (CAR) does not exhibit a statistically significant impact on bank profitability during the study period. This may be attributed to the unique economic conditions faced by Sri Lanka's banks in this difficult period, which could have contributed to differences from previous studies. The findings suggest that economies of scale may allow larger banks to benefit from cost efficiencies and increased operational capacity, resulting in improved profitability. On the other hand, smaller banks could be able to diversify their risk portfolios and reduce credit risks, leading to increased returns. The importance of strategy growth and longevity to the banking sector is underscored by these findings.

During the study period, bank profitability is not significantly affected by macroeconomic factors such as interest rates or inflation. This may be due to Sri Lanka's extraordinary circumstances, where the impact of these factors might have been overshadowed by the larger financial crisis. A difference in the significance of variables between these two models can be explained by a particular focus on assets versus equity when generating banks' profits. This means that the banks' asset base is more important in terms of sources of profitability than their equity. These findings will contribute to a continuing debate on the impact of credit risk for various profitability ratios.

Implications of the Study

Theoretical Implication

The study emphasizes the significance of credit risk, particularly non-performing loan ratios and loan loss provisions, in determining bank profitability. This aligns with existing theories on credit risk, such as capital structure theories, which highlight its impact on financial performance. The study also suggests a negative relationship between bank size and profitability, potentially due to the inefficiencies that can arise from increased complexity and the potential for decreased customer relationships and loyalty. This has significant theoretical implications for the banking industry and its regulatory frameworks, indicating that there may be a point of diminishing returns in bank size beyond which further growth does not necessarily lead to increased profitability. This challenges the traditional view of economies of scale and diversification benefits and highlights the importance of considering the potential drawbacks of large bank size in policy and regulatory decisions. Furthermore, the study implies a positive association between bank age and profitability, which is rooted in the advantages that older banks tend to have due to their experience, established customer relationships, and brand recognition. This relationship supports theories that suggest older banks are more profitable due to the benefits that come with their age. The experience of older banks can lead to improved operational efficiency, better risk management, and more effective decision-making processes. This experience can also translate into a deeper understanding of the market and customer needs, allowing older banks to adapt more effectively to changing conditions and maintain a competitive edge.

Managerial Implications

The findings of this study have several important practical implications for bank management and policymakers in Sri Lanka. For bank management, the significant negative impact of non-performing loans (NPLR) and loan loss provisions (LLPTL) on bank profitability, as measured by ROA, underscores the critical importance of effective credit risk management. Bank management should prioritize robust credit assessment, monitoring, and recovery processes to minimize the accumulation of non-performing assets and the need for high loan loss provisions. Additionally, the lack of a significant relationship between the capital adequacy ratio (CAR) and bank profitability suggests that banks should not solely focus on increasing capital levels to boost financial performance. Instead, they should strike a balance between maintaining adequate capital buffers and optimizing their asset-liability management to enhance overall profitability. The negative relationship between bank size and ROA indicates that larger banks may face challenges in maintaining operational efficiency, and bank

management should explore strategies to streamline operations, leverage technology, and enhance customer relationships to improve profitability, even as they grow in size. The positive impact of bank age on both ROA and ROE highlights the importance of experience and diversification in the banking sector, and younger banks should focus on building their expertise, customer base, and product offerings to emulate the profitability of more established institutions.

Bank managers should prioritize effective credit risk management, such as robust loan underwriting, monitoring, and recovery processes, to minimize non-performing loans and maintain profitability. Adequate loan loss provisions should be maintained to cover potential defaults and protect the bank's capital position. Strategies for growth and consolidation should be considered to leverage the benefits of larger size and economies of scale. Established banks should capitalize on their experience, customer relationships, and brand recognition to maintain profitability advantages over newer entrants. While macroeconomic factors may have a negligible impact during crises, bank managers should still monitor and adapt to changes in interest rates and inflation to mitigate potential risks.

Policy Implications

The results indicate that factors related to credit risk, such as non-performing loans and provisions for loan losses, have a notable effect on the financial performance of commercial banks in Sri Lanka. It is important for policymakers to enhance the macroprudential supervisory framework to closely track these risk indicators and enforce suitable regulatory actions to maintain the stability and strength of the banking industry. The absence of a substantial correlation between the capital adequacy ratio (CAR) and bank profitability might necessitate a reassessment of the current capital adequacy regulations to ensure they achieve the right equilibrium between financial stability and bank profitability. Policymakers should also explore ways to facilitate the merging of banks, acquisitions, and the entry of new participants to encourage a more varied and competitive banking environment. Furthermore, the research shows that macroeconomic elements such as interest rates and inflation did not significantly impact bank profitability directly during the study period. This highlights the importance of policymakers addressing broader macroeconomic issues, such as the current economic crisis in Sri Lanka, to establish a conducive environment for the growth of the banking sector.

Regulatory authorities should ensure that banks maintain robust credit risk management frameworks and adhere to prudential norms for non-performing loan ratios and loan loss provisions. Policies promoting consolidation and growth in the banking sector could enhance profitability and stability, given the disadvantage of size and advantage of age. To foster strategic growth and longevity in the banking industry, policymakers could consider initiatives that support smaller banks, such as targeted financial assistance, regulatory relief, or tax incentives. Larger banks, benefiting from economies of scale, could be encouraged through measures that facilitate mergers and acquisitions. Risk management and diversification are crucial, and regulations could be implemented to promote these practices. Regulatory frameworks should also provide flexibility for smaller banks to innovate and adapt to market changes. Continuous monitoring and stress testing of banks' credit portfolios and capital adequacy should be undertaken to ensure financial stability and resilience. Policies encouraging transparency and disclosure of credit risk management practices could enhance market discipline and public confidence in the banking system.

Limitations and Directions for Future Research

This study encounters some limitations as well. The data availability limits the study to the period from 2013 to 2022, which aligns with substantial macroeconomic difficulties in Sri Lanka. The results may not completely reflect the banking sector's performance during periods of greater economic instability. The study does not specifically consider the influence of regulatory modifications, such as the adoption of Basel III, or institutional aspects, such as corporate governance standards, on the correlation between credit risk and bank profitability.

For future research, expanding the time period and sample size, incorporating alternative profitability measures could provide a more comprehensive understanding of the relationship between credit risk and bank profitability in Sri Lanka. Additionally, including a broader range of macroeconomic and regulatory factors, conducting comparative analyses with other regional or global banking sectors, and incorporating qualitative insights from industry experts could offer valuable insights into the complex interplay between external factors and the banking sector's financial performance, particularly during periods of economic turmoil and crisis.

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