Credit Risk and Profitability of Banking Sector in Sri Lanka

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ARTICLE INFORMATION	ABSTRACT
	This paper aims to investigate the impact of credit risk on the profitability of the banking sector in Sri Lanka. The profitability is measured with and Return on Assets. At the same time, credit risk is quantified with four indicators: Non-performing loan Ratio (NPLR), Loan to Deposit Ratio (LDR), Net Charge off Ratio (NCOR), and Capital Adequacy Ratio (CAR). Data from thirteen banks over eight years from 2010 to 2017 was analyzed using panel data regression analysis. The finding shows that the Profitability of the Banking Sector in Sri Lanka has been determined by important determinants such as credit risk. The study further finds that non-performing loans have negative and significant return on assets. However, the net charge-off ratio and the loan to deposit ratio are not important variables for expanding the bank's profitability. On the other hand, the CAR positively impacts returns on assets. The study suggested the need to strengthen the management of credit risk in order to preserve Sri Lankan banks' current profitability.

1. Introduction

In order to maximize returns and wealth, the bank sector offers capital to the business sector and, on the other hand, alternative investment opportunities for private and institutional investors, both national and international. The profitability of banks is a concern of both investors and banks in deciding their investments. However, banks generally face different risks in achieving those profits: credit risk, credit deficiency risk, portfolio risk, interest risk, operational risk, and trade union risk (Muthee 2010). Credit arrangements are every bank of the world's leading business activity.

Even while banks provide various services (checking accounts, money orders, and cash checks), lending is the core function of all banks in the world (Olalere & Omar 2017). Defaults in loans and advances. Therefore, mainly affect creditors, creditors, and the economy as a whole. During the worldwide financial crisis, most banks become bankrupt through loans and advances (Boahene et al.,2012).

Further, Saeed and Zahid (2016) stated that the quality of the loans and portfolios of many countries worldwide was relatively stable before the 2007/2008 global financial crisis. However, then, because of a worldwide economic downturn, the rate of bank assets quickly declined. This is because the performance of the loan is closely related to the economy of the country.

Based on these facts, several empirical studies have determined that credit risk is correlated to the profitability of the banking sector. The results of these studies are, however, inconclusive. There are preferably notable differences in the relationship between credit risk and profit. Besides, there is limited research undertaken in the SriLankan context to investigate the relationship between credit risk and the profitability of banks over the years. To fill the research gap, it is thus essential to investigate the association between credit risk and banks' profitability.

Thus, this research aims to explore the impact of credit risk on the profitability of the banks in Sri Lanka. Understanding the credit risk measured in terms of various ratios such as non-performing loans, CAR, LDR, and NCOR can be valuable for depositors, investors, policymakers, and bankers for their timely decisions.

The remaining of this article includes the review of the literate, research design and methodology, results and discussion, and conclusion.

2. Review of Literature

The study on credit risk and profitability of banks becomes an emerging interest among developing and developed countries. The literature review of recent studies on the subject matter under investigation is presented in this section.

Laryea et al. (2016) studied the relationship between non-performing and profitability of selected banks in Gahan throughout the period from 2005 to 2010. The study finds that non-performing loans negatively and significantly influence the profitability measured in terms of return on equity and return in assets employing the panel data analysis. Mwinlaaru et al. (2016) explored the effect of non-performing and profitability of universal banks. They considered the Gross Domestic Product (GDP), unemployment rate, and lending rate as control variables and employed regression analysis over the quarterly data from 2000 to 2014. The study found that non-performing loans were negatively related to profitability.

Boahene et al. (2012) tested the association between Non-Performing Loan (NPL)s measured in terms of NPLR, NCOR, and the pre-provision profit as a percentage of net total loans and advances and banks profitability. The result indicates that NPLs are significantly and positively associated with banks' profitability. The study further shows that NPLR is the most significant NPL indicator of the profitability of banks. Boahene et al.(2012) also investigated the relationship between three variables of credit risk and performance of banks in Gahanna through panel data analysis model. Selected credit risk variables were net charge-off rate, NPL rate, and the pre-provision profit as a percentage of net total loans and advances from 2005-2009. The study found a positive impact of credit risk and performance of banks measured in terms of return on equity.

Alexiou and Vogiazas (2009) studied the relationship between Greek banks' specific and macroeconomic variables: size, liquidity, efficiency, and credit risk and profitability measured in terms of return on equity and return on assets using a panel data approach. The finding of this study indicates that banks' specific and macro-economic variables have a negative effect on profitability. Adullah and Jahan (2014) examined the impact liquidity and profitability of five private commercials banks in Bangladesh for five years employing regression analysis. They used the LDR, deposit to assets ratio, and cash deposit ratio as the measure of liquidity, while return on assets and return on equity as the measure of profitability. The study found that there is no relationship between the variables.

Marozva (2015) studied the relationship between liquidity measured using the proxies of current ratio, long-term deposit rate, and provision for NPLs and banks' profitability in South Africa throughout the period from 1998 to 2014. The study reveals that proxies of liquidity and profitability of banks are significantly and positively related. Crowe et al. (2014) examined the performance measurement and profitability of regional banks in the U.S with the GMM estimator technique and the yearly data of those variables during the period 1994 to 2011. Both NPLs and net charge-off ratios were utilized to quantify the performance measurement. The study claimed that performance measurement had a significant negative relation to the banks' profitability.

Gizaw et al. (2015) examined the effect of credit risk factors on the profitability of commercial banks in Ethiopia, covering twelve years from 2003-2014. The credit risk factor was the CAR, while printability was measured with return on equity. The result shows that a significant negative impact exists between CAR and the Profitability of Ethiopian banks by employing the panel data analysis. Kristijadi (2018) identified the effect of credit risk on bank profitability in Indonesia. Credit risk was measured with variables of net charge off (impairment) and NPL rate. Multiple regression and path analysis were used to analyze the data. The study results evidenced that the NPL rate insignificantly affects profitability while the allowance for impairment losses ratio positively and significantly impacts profitability.

Saeed and Zahid (2016) analyzed the impact of credit risk on the profitability of five large U.K commercial banks over the data from 2007 to 2015. They measured profitability using the return on assets and return on equity, while credit risks included a net charge off (or impairments) and NPLs. The study concludes that NCOR positively responds to the profitability of banks in the U.K. Almazari (2014) tested whether credit risk measured in terms of CAR has explanatory power on Profitability in Saudi Arabian Commercial Banks for six years. The study revealed that there is a significant relationship between CAR and bank profitability.

Udom and Onyekachi (2018) explore the association between three CAR variables and profitability of banks in Kenya through the ordinary least regression model. Selected capital adequacy variables were total qualifying capital, adjusted shareholders fund, and capital to risk-weighted assets. The finding reveals a strong positive impact of CAR on profitability measured in return on investments in Kenyan banks.

3. Research Design and Methodology
A quantitative study design was used to examine the credit risk. The credit risk is measured in terms of various ratios such as NPLs Ratio (NPLR), LDR and NCOR, and CAR. Also, profitability is measured using Returns on Asset (ROA) as the measure of profitability. This study uses secondary data covering eight years from 2010 to 2017 extracted from audited annual reports of 10 licensed commercial banks in Sri Lanka.

(a)   Model Specification

In order to investigate the viability of the bank's credit risk on profitability, the present study employed a panel data model. The ROA is therefore assumed as a function of NPLR, LDTR, NCOR, and CAR, and it is expressed mathematically as:

ROA = f(NPLR, CAR, LDTR and NCOR)   (01)

ROA denotes to the percentage of the net income to total assets. NPLR is one of the significant indicators of credit risk. It is the ratio of NPLs to total loans and advances (Boahene et al., 2012; Olalere & Omar 2015). The LDTR refers to the proportion of total loans to total deposits, which measures the banks' liquidity and profitability (Rangasamy, 2014). The NCOR refers to the proportion of the net charge offs to the total loans of the banks. It indicates the bad loans and cleaning up the bank's loan book. This ratio is not a highly uses ratio. Sometimes written off comes from future adjustment or remedial actions (DeBruine et al., 2015). CAR refers to the percentage of total owners' equity and reserves that the banks are expected to hold against risky assets. CAR is measured as core capital (tier 1) plus supplementary capital (tier 2) capital divided by risk-weighted assets (Abba et al., 2018).

(b). Model Estimation
The present study employs the panel data analysis, which can be estimated in two different specification models, the Fixed Effect Model and the Random Effect Model. Fixed Effect model applies to analyze the impact of independent and dependent variables over time. The fixed-effect model estimates the net effect of independent variables to determine the dependent variables by ignoring time-invariant characteristics. Time-invariant characteristics should be unique to use the fixed-effect model and should not be correlated within companies. The random effect model applies when the error terms are associated. Random effects assume that the entity's error term is not correlated with the predictors, allowing time-invariant variables to play a role as explanatory variables. The fixed effect model is presented using equation 03 and the Random effect model given in equation 04

$$ROA_{it} = \alpha_i + \beta_1 NPLR_{it} + \beta_2 LTDR_{it} + \beta_3 NCOR_{it} + \beta_4 CAR_{it} + \varepsilon_{it} \qquad (02)$$

$$ROA_{it} = \alpha_i + \beta_1 NPLR_{it} + \beta_2 LTDR_{it} + \beta_3 NCOR_{it} + \beta_4 CAR_{it} + u_{it} + \varepsilon_{it} \qquad (03)$$

From equation: ROA refers to profitability; α_i refers to the cross-sectional units representing the intercept values for each cross-sectional unit and i is the entity; β_1, β_2, β_3 and β_4 are coefficients of explanatory variables to be estimated *NPLR, LTDR, NCOR, and CAR* respectively and e_{it} is the error term assumed to be normally and independently distributed with zero mean; u_{it} is errors within entities.

Panel data may have an individual effect, time effect, or both, analyzed using the fixed-effect model and the random effect model. The Hausman test is performed to select the fixed effect model or random-effect model. The Hausman test's null hypothesis is a random effect model, which is appropriate and an alternative hypothesis of the fixed-effect model. Suppose the resulting outcome is statistically significant. Hence, we use the result of the fixed-effect model to analyze. Otherwise random effect model is suitable.

4. Results and Discussion
(a). Descriptive Analysis
Table 1 presents descriptive statistics of the respective variable for 13 banks in Sri Lanka for the data covering eight years from 2010 to 2017 with 104 observations. According to that, Sri Lankan banks were maintaining a stable profit for the last four year period. Sri Lankan banks have been able to keep 4.25% NPLs. In addition to that, the LTDR level of the Sri Lankan banks was 97.5%, further loan impairments were maintained at around 0.78% level. Finally, banks were maintaining CAR at a 10% level. Therefore, banks have been able to maintain a stable profit.

(1)   Table 01 Descriptive Statistics

variable	Mean	Standard Deviation	Min	Max
ROA	1.718	1.239	0.190	12.270
NPLR	4.245	3.327	0.920	25.070
LTDR	97.559	15.681	72.900	162.450
NCOR	0.785	1.263	0.010	5.000
CAR	14.574	2.857	9.020	23.190

2) *Where, ROA = Return on Assets, NPLR = NPL Ratio, LTDR = Loan to Deposit Ratio, NCOR = Net Charge Off Ratio* *Correlation is significant at the 0.01 level, **. Correlation is significant at the 0.05 level.*

(b). Correlation Analysis

(1)   The correlation analysis is used for exploring how variables are associated with each other. It is also a way of gauging those two factors'; a close association between two or more variables suggests that a strong correlation exists the variables have bad or no interaction

(2)   Table 2 Correlation Matrix

	ROA	NPLR	LTDR	NCOR	CAR
ROA	1				
NPLR	-0.193**	1			
LTDR	0.139	-0.176	1		
NCOR	-0.008	0.015	-0.208**	1	
CAR	0.331*	0.065	0.296*	-0.220**	1

Where, ROA = Return on Assets, NPLR = NPL Ratio, LTDR = Loan to Deposit Ratio, NCOR = Net Charge Off Ratio *Correlation is significant at the 0.01 level, **. Correlation is significant at the 0.05 level

Table 02 present the results of correlation analysis between variables. The correlation coefficient between NPLR and ROA negative and significant with the ROA, while having a positive between LTDR and ROA. On the other hand, the correlation coefficient of CAR and ROA is positive and significant, reporting the highest correlation as 0.331 percent compared with other variables.

(c). Testing of Multicollinearity
We checked whether the independent variables are collinear, the variance inflation factor (VIF) test for each variable entering the regression model was performed. Multicollinearity can be defined as a perfect or exact linear relationship among some or all the regression model's explanatory variables. If the VIF is more than ten or the tolerance (1/VIF) is 0.1 or less, there may be a multicollinearity problem. The VIF value of each variable is presented in table 04. Accordingly, The VIF value for NPLR was 1.05, and for variables ratio of LTDR, NCOR and CAR has VIF value of 1.17, 1.08, and 1.15, respectively. And also, the mean VIF score was 1.11. The scores of these statistical tests are accepted, implicating that there is no presence of multicollinearity in the data.

Table 03 Collinearity Statistics

Models	variables	VIF	1/VIF(Tolerance)
ROA	NPLR	1.05	0.953
	LTDR	1.17	0.853
	NCOR	1.08	0.928
	CAR	1.15	0.872

Where, ROA = Return on Assets, NPLR = NPL Ratio, LTDR = Loan to Deposit Ratio, NCOR = Net Charge Off Ratio; CAR

(d). Regression Results

Regression analysis is a tool used to track changes in variables over time. It requires a multitude of variables when interacting with a dependent variable. We employed pooled and panel regression analysis over the annual data from 2010 to 2017. We tested the Hausman test over the random effect model regression results to select whether the fixed effect model was appropriate or the random model suitable in the analysis. Table 04 presents pooled regression results, random effect regression model, and fixed effect regression model with the Hausman test results. Accordingly, the Hausman test chi-square value is 3.99, with a p-value of 0.4078 (P>0.05), higher than 0.05. As a result, the random effect model hypothesis is accepted, and the fixed-effect model hypothesis is rejected. Hence, the random effect model is the most appropriate model than other models in this study. This result indicates that homogeneity exists among the banks in Sri Lanka. Standard errors are provided to account for the effect of autocorrelation and heteroscedasticity in the variables. As indicated in table 04, the R^2 for the model is 25% which shows that the Credit risk indicators, thus the independent variables in the model (NPLR, LDTR, NCOR CAR) of change in profitability performance of measured by ROA.

Table 04 Fixed Effect and Random Effect Regression Results

Variables	Fixe Effect Model	Random Effect Model
Constant	-0.460	-0.388
	(0.566)	(0.488)
NPLR	0.009	-0.082
	(0.628)	(0.043)**
LTDR	-0.002	0.001
	(0.718)	(0.805)
NCOR	-0.061	-0.007
	(0.290)	(0.878)
CAR	0.048	0.053
	(0.035)**	(0.006) *

Hausman Test chi-square =3.99
Prob> chi- square =0.4078
F statistics = 4.880 (p=0,001)
R^2 =0.249
Adjusted R^2 =0.219
Breusch-Pagan/ Heteroscedasticity Test 3.18 (p=0.0856)

Where, ROA = Return on Assets, NPLR = NPL Ratio, LTDR = Loan to Deposit Ratio, NCOR = Net Charge Off Ratio; CAR. *, ** are significant at 1% and 5% significant levels respectively.

(e). Result Discussion

As explained above, the Hausman test rejects the fixed-effect model and accepts the random effect model. As a result, we discuss the results based on the random effect model presented in table 04. The coefficient between NPLR and ROA is significantly negative, indicating that NPLR decreases banks' ROA, showing that NPLR contributes to predicting the banks' profitability. The results further show that a one-unit rise in NPLR decreases ROA by -0.082 units. This finding is consistent with Rahman et al. (2017), who investigated Bangladesh data and is compatible with Mwinlaaru et al. (2016). On the other hand, LTDR has a positive relationship with ROA, and the p-value (p>0.05) is reported as insignificant. The result indicates that the LTDR ratio has no impact on the banks' profitability in Sri Lanka. This finding consistent with the findings (Rengasamy,2014; Christaria & Kurnia,2016). The coefficient of the NCOR is insignificantly negative (p>0.05). The results suggest that there is no impact of NCOR on the banks' profitability in Sri Lanka. This finding inconsistent with the findings of Saeed and Zahid (2016), who found a positive relationship between NCOR and profitability.

On the other hand, the regression coefficient of the CAR is positive with a value of 0.053 and significant at the 1% significant level, indicating that CAR positively impacts the banks' profitability in Sri Lanka. If the CAR increases by one unit, then ROA will decrease by 0.053 unit with all other variables held constant. This finding supports the findings of El-Ansary and Hafes (2015), Githaiga (2013), and Tuladhar (2017), who also found a positive and significant relationship between CAR and bank profitability.

5. Conclusion

The objective of this study was to find the between banks' credit risk and profitability performance in Sri Lanka to fill the gap identified from the past studies. We employed panel data regression analysis over the data from 2010 to 2017 for ten banks in Sri Lanka. We tested the Hausman test to detect which model is appropriate from random and fixed effect models and found as the random effect model was most suitable for the data analysis.

The study finds that the credit risk affects the banks' profitability in Sri Lanka as the variables NPLR negatively affect profitability at 5%. Further, CAR having a positive effect with profitability at 1% significant level.

This study also indicates that increased capital requirements for credit risk and the existence of a robust credit control mechanism will benefit profitability. Additionally, management is recommended to use a new credit risk-mitigation strategy. Banks should be vigilant about their growth since it is both a support and a hindrance to their companies. The government must collaborate with the central bank to manage the macroeconomic variables, including inflation and the exchange rate. For Sri Lankan banks to achieve enhanced and sustained profitability through interest income, appropriate credit risk strategies to be instituted from loans and advances. Therefore, they need adequate and accurate information from both internal and external sources to assess the credit risks they face when presented with a loan proposal. Banks should develop and implement a sound credit policy to properly manage the credit risk, including maximum credit limit, Maximum credit period, and an effective recovery team to collect the customer outstanding. Furthermore, follow up the implementation of credit policies and standards that conform to regulatory requirements and the financial institution's overall objectives. Furthermore, advise banks to design and formulate strategies to minimize the banks' exposure to credit risk and increase profitability.

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