

Impact of Credit Risk Management on the Financial Performance of Commercial Banks in Mauritius

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Article Info

Volume 82

Page Number: 546 - 559

Publication Issue:

January-February 2020

Abstract

The recent global financial crisis has had many unprecedented costs for numerous financial institutions, mostly banks in nearly all countries. Subsequently, during the past decade, this has led to dramatic changes in most bank's risk management frameworks. Undeniably, credit risk management became one of the most important elements for any commercial bank. This research aims to investigate whether credit risk management has significant impacts on the financial performance of commercial banks in Mauritius. The indicator used to measure the financial performance of commercial banks is return on equity (ROE) while the proxies for credit risk management are nonperforming loans ratio (NPLR), capital adequacy ratio (CAR), loan to deposit ratio (LTDR), bank size. Macroeconomic variables such as inflation and Gross Domestic Product (GDP) have also been used. Moreover, this study is based on a quantitative secondary research. The data are collected from seven (7) commercial banks in Mauritius covering ten years period from 2008 to 2017. Several diagnostic tests and the Ordinary Least Square regression model are performed. The results indicate that only two out of the six variables tested i.e. nonperforming loan ratio and bank size are the main factors having a significant impact on the financial performance of Mauritian commercial banks. The study further explains why CAR, LTDR, inflation and GDP did not radiate any influence on bank performance. This research also holds some recommendations that Mauritian commercial banks can implement better credit collection approach in order to reduce their credit risks. Besides, the policymakers in Mauritius should also take size of the banks into account when formulating credit risk management framework.

Article History

Article Received: 14 March 2019

Revised: 27 May 2019

Accepted: 16 October 2019

Publication: 04 January 2020

Keywords: Credit Risk Management, Nonperforming loan ratio, Bank Size, Financial performance, Commercial Banks

1. Introduction

Around the world, banks are undoubtedly the biggest financial institutions with several branches that reach everyone's life.

Although they are very crucial for any economy, they are also the most vulnerable ones. Generally, these financial institutions are often exposed to a high degree of risks while performing their

daily activities. For any commercial bank, loan issuance has always been the principal income generating activity. However, this credit creation function invites large risks to both the lender and the borrower. According to the communiqué by the Basel Committee on Banking Supervision (1999), *“credit risk is considered to be a germane phenomenon in any banking industry across the whole globe”*. It represents more than 70% of the total risks as it can be found in almost all bank’s activities. Thus, it has become vital for commercial banks to identify the various effects of risks and how they can be minimised or managed effectively.

In any country whether developed or developing, the banking system remains one of the most important pillars of the economy. Nevertheless, over the past years, this sector has become a very complicated and complex market since several bank problems and financial distress were reported. Even in Mauritius, one of the most notorious scandals that have shaken the country so far has been the BAI scam in 2015. Bramer Bank, the bank associated with BAI Group was caught not satisfying the requirements of the banking regulation in force in Mauritius. As per the Bank of Mauritius, *“huge amount of deposits were withdrawn and complication in raising finance in the interbank market had forced it into a problematic liquidity position”* (The Economist, 2015). Several frauds in granting loans without any proper credit assessment were also discovered. Besides, this bank was engaged in a most ignominious Ponzi Scheme which was amounted to 693 million US dollars. As a result, the Bank of Mauritius had to revoke its banking licence and finally the bank collapsed due to huge debts.

By virtue of a bank’s activities, credit risk became the most significant risk. Many

scholars concluded that nonperforming loan has been the main source of credit risk. According to the World Bank, the world average nonperforming loans to total gross loans is 3.1% while its rate in Mauritius is 7% which is 3.9% higher than the world’s average rate. This is a very alarming situation. The high exposure to this risk has been one of the dominant sources of problems in commercial banks. As stated in research made by Laeven & Valencia (2012), there have been more than 145 systemic banking crises from 1970 to 2011, which comprises the infamous 2007-2008 US subprime mortgage crisis. As a result, commercial banks must carry out appropriate credit risk management to balance their risks as well as their returns and secure their survival. This is why since the 2008 financial crisis, the proliferation of satisfactory credit risk management techniques in banks has gained more prominence.

Without credit risk management, the commercial bank’s good performance is unimaginable. A commercial bank has numerous objectives to achieve such as to increase owner’s equity as well as profit by issuing loans, competition in the market, its growth and survival. It can be difficult for commercial banks to maintain good financial performance while managing their credit risk effectively. Banks should emphasize how credit risk can be reduced and take credit risk management as a discipline to tackle any crisis in this highly challenging financial era. Commercial banks must have a vast knowledge of how credit risk management will have influences on not only its performance regarding monitoring the credit risk but also concerning other matters that will have effects on its performance. To better understand and recognize the influential factor on credit risk management’s impacts on bank performance, knowing the different

relationship of various variables with bank performance are crucial.

Many pieces of researches from different countries have been conducted on the impact of credit risk management on the financial performance of banks. However, it has been a hurdle to reach a specific conclusion since the variables affect bank performance differently in every country. From the myriad of literatures, it can be seen that many inconsistencies have been identified about this topic. Some researchers found a significant impact of certain variables on bank financial performance while others concluded that there is no relationship (Mendoza & Rivera 2017; Ndegwa, 2017; Kingu, et al, 2018; Tham Chat Fong, 2018). Due to these gaps, it becomes very difficult to conclude and thus this explains the need for conducting deeper research to determine the impact of credit risk management on commercial banks in Mauritius.

Several researches on the impacts of credit risk management on banks have been carried out in many countries such as India, Malaysia and many African countries. Being far from developed countries like France, the United States of America and UK, this small economy in the Indian Ocean has to some extent failed to adopt the appropriate techniques to reduce bank failures and its risks. It was also reported that not all Mauritian

commercial banks consider credit risk management as a prime assessment of risks and therefore they are prone to several crises. Additionally, considering the studies made in Mauritius few or no in-depth research has been carried to inspect how credit risk management may have impacts on the financial performance of commercial banks in Mauritius. As a result, this study tries to fill this gap and aids to follow the footsteps of the other countries to avoid any future bank demise as well as mitigating the effects of credit risk.

2. Dependent variable – ROE

Traditionally, most financial institutions practise the accounting-driven model and focus more on return on assets (ROA) measurement. However, with the increase in commercial bank's off-balance sheet activities, depending on this approach can be unsafe as it does not consider the risks related to referred assets. Thus, ROE is a better proxy of measuring financial performance because it considers other factors such as profitability and financial leverage which ROA does not. It also measures the amount of net income generated for every dollar of shareholder's equity contributed by the shareholders of the commercial bank.

3. Independent variable

Variable	Definition and literature review	Hypothesis
Nonperforming loan ratio	NPLR ratio provides an indication of how banks control their risks and measures the proportion of loan losses to total loans. <i>Significant – Annor & Obeng (2017) and Kolapo et al. (2012)</i> <i>Insignificant – Kithinji (2010) and Tham Chat Fong (2018)</i>	H ₀ : NPLR does not have an impact on the financial performance of commercial banks in Mauritius. H ₁ : NPLR has an impact on the financial performance of commercial banks in Mauritius.
Capital Adequacy Ratio	CAR is defined as the proportion of a commercial bank's capital to its risk and it is often expressed as a percentage of a	H ₀ : CAR does not have an impact on the financial performance of commercial banks in Mauritius.

	bank's risk-weighted credit exposures. <i>Significant –Isanzu (2017) and Poudel (2018)</i> <i>Insignificant –Li& Zou (2014) and Alshatti (2015)</i>	H ₁ : CAR has an impact on the financial performance of commercial banks in Mauritius.
Bank Size	It measures the size of banks by computing the natural logarithm of total assets. <i>Significant – Kutsienyo (2011) and Kutum (2017)</i> <i>Insignificant – Haron (2004) and Anarfi et al. (2016)</i>	H ₀ : Bank size does not have an impact on the financial performance of commercial banks in Mauritius. H ₁ : Bank size has an impact on the financial performance of commercial banks in Mauritius.
Gross Domestic Product	It measures the total expenditure on the economy's output of goods and services. <i>Significant – Seferli (2010) and Munteanu (2012)</i> <i>Insignificant –Shingjergji (2013) and Touny & Shehab (2015)</i>	H ₀ : GDP does not have an impact on the financial performance of commercial banks in Mauritius. H ₁ : GDP has an impact on the financial performance of commercial banks in Mauritius.
Loan to deposit ratio	The loan to deposit ratio refers to the proportion of a commercial bank's total outstanding loans to its total deposits. <i>Significant – Imad et a. (2011) and Zygmunt (2013)</i> <i>Insignificant –Tsfaye (2012) and Rahman & Saeed (2015)</i>	H ₀ : LTDR does not have an impact on the financial performance of commercial banks in Mauritius. H ₁ : LTDR has an impact on the financial performance of commercial banks in Mauritius.
Inflation	It is a sustained rise in the price of goods and services in an economy for a given time period. <i>Significant – Damena (2011) and Deng (2016)</i> <i>Insignificant – Vong & Chan (2009) and Masood & Ashraf (2012).</i>	H ₀ : Inflation does not have an impact on the financial performance of commercial banks in Mauritius. H ₁ : Inflation has an impact on the financial performance of commercial banks in Mauritius.

4. Methodology

4.1 Research Methods, Sampling Frame and Data

This research focuses mainly on the commercial banks in Mauritius where a quantitative secondary research method is used. According to the latest annual report of Bank of Mauritius (2018), there are currently twenty banks in Mauritius. All these banks are licensed by the Bank of Mauritius (central bank) as well as are controlled by the Bank of Mauritius Act 2004 and the Banking Act 2004. These

banks from different segment orientation perform various types of banking in Mauritius. However, the study emphasised on those major banks that have not been through any type of crisis during the research time frame. Additionally, it did not consider Islamic banks, private bank or any banks whose information (or data) are incomplete. The selected sample comprises of commercial banks that hold more than 50% market share. thus, it gives a broader and concise view of the Mauritian banking industry and also the findings can easily be generalised. Therefore, only seven commercial banks is

selected to conduct this research. The banks are State Bank of Mauritius Ltd (SBM), Mauritius Commercial Bank Limited (MCB), ABC Corporation Ltd, AfrAsia Bank Limited, Bank One Limited, Banque Centrale Populaire (earlier known as Banque des Masareignes) and Investec Bank (Mauritius) Limited. For the past ten years from 2008 to 2017, the seven selected commercial banks' websites were viewed and their annual reports, risk management reports, notes to and disclosures of financial statement were

also analysed thoroughly to extract all relevant information. Other reports were examined from the Registrar of Companies and Bank of Mauritius to cross-check the data collected.

4.2 Conceptual Framework

Several bank specific and some macroeconomic variables have been used in this research. The research framework can be diagrammatically demonstrated as follows in Figure 1:

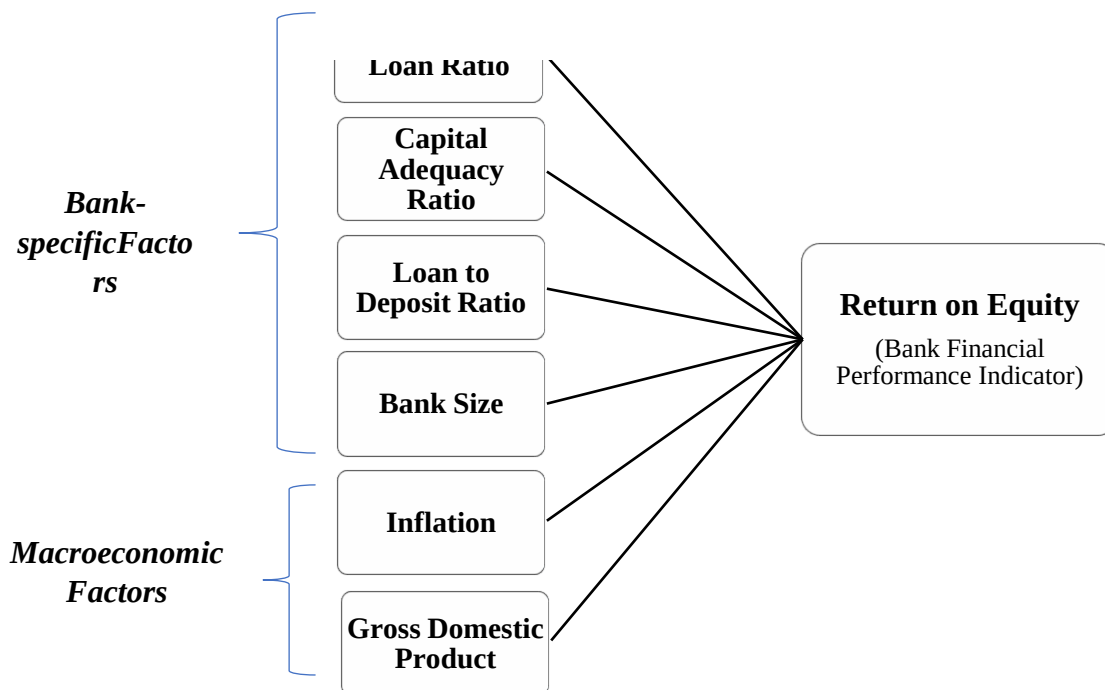


Figure 1: Research model to be used

4.3 Data Analysis Methods

In this research, several diagnostic tests such as normality test, heteroscedasticity test, autocorrelation and multicollinearity test were carried out with the data collected for the 10-years. After determining the suitability and reliability of the data, the Ordinary Least Squares (OLS) regression model was performed to analyse the relationship between bank

financial performance and the six independent variables.

The equation for the multiple regression model of this study will be:

$$Y = c + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \epsilon$$

Whereby,

Y = Return on equity, c = constant, X_1 = Nonperforming loan ratio, X_2 = Capital

Adequacy Ratio, X_3 = Bank Size, X_4 = Gross Domestic Product, X_5 = Loan to deposit ratio, X_6 = Inflation, β = beta (the effect of one-unit change in independent variable on the dependent variable's unit), ε = error term

5. Results and Discussion

5.1 Data Specification Test

The OLS regression method is only reliable when there is no deviation from

the classical linear regression analysis assumptions. Thus, numerous diagnostic tests need to be performed to determine the accuracy of the data collected. If any violation of the assumptions is observed, relevant remedies should be duly applied. As a result, the outcomes of the tests together with its remedial treatment will ensure an unbiased and correct regression model.

Diagnostic Test	Decision Rule All significance level at 5%.	Hypothesis
Normality Test	The p-value should be greater than 5% which indicates that the residuals are normally distributed.	H_0 : The residuals are not normally distributed. H_1 : The residuals are normally distributed.
Heteroscedasticity Test	The p-value of the F-statistic should be more than the 5% significance level, then there is no heteroscedasticity problem.	H_0 : There is no heteroscedasticity problem. H_1 : There is heteroscedasticity problem.
Multicollinearity test	If the correlation coefficient is greater than 0.8, then the multicollinearity problem exists.	H_0 : There is no multicollinearity problem. H_1 : There is multicollinearity problem.
Autocorrelation (Durbin-Watson test)	The Durbin-Watson statistic ranges from 0 to 4, whereby the rule of thumb is the closer the value is to 2 then there is no autocorrelation.	H_0 : There is no autocorrelation problem. H_1 : There is autocorrelation problem.

5.1.1 Normality Test

One of the crucial assumptions is the normality of the residuals (error terms). Any deviation will result in incorrect

outcomes in the parametric analysis (Gujarati & Porter, 2009). Thus, it is important to determine whether the data is normally distributed.

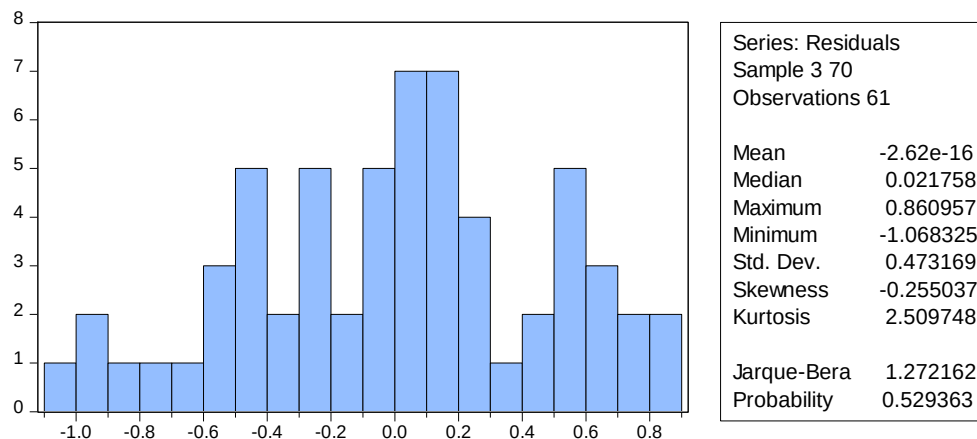


Figure 2: Normality Histogram

Figure 2 indicates that the p-value of Jarque-Bera is around 52.9% which exceeds 5%. Thus, the null hypothesis is rejected while the alternative hypothesis is accepted, concluding the residuals are normally distributed.

5.1.2 Heteroscedasticity Test

Heteroscedasticity Test: Breush-Pagan-Godfrey test			
F-Statistic	0.440279	Prob. F (6,59)	0.8489
Obs *R-Squared	2.828453	Prob. Chi-Square (6)	0.8300
Scaled explained ss	25.36732	Prob. Chi-Square (6)	0.0003

As the probability of F-statistics is 0.8489 which exceeds 5% significance level. The null hypothesis should be accepted and concluded that there is no heteroscedasticity problem.

Heteroscedasticity occurs when the variance of the error terms differs across observations. Its presence needs to be tested to remove any inefficiencies from the OLS model. Breush-Pagan-Godfrey test is used to check the data.

5.1.3 Test of presence of multicollinearity

A correlation test is performed to ensure the reliability of the parameter estimates in the regression model. High multicollinearity problem will tend to cause imprecision in the OLS model. To detect whether a multicollinearity problem exists, the correlation matrix is analysed.

Correlation Matrix							
	ROE	NPLR	Bank Size	CAR	GDP	Inflation	LTDR
ROE	1.000	-0.388	0.542	0.143	0.033	-0.076	-0.029
NPLR	-0.388	1.000	-0.283	-0.499	-0.076	-0.107	-0.075
BANK SIZE	0.542	-0.283	1.000	0.241	-0.092	-0.183	0.103
CAR	0.143	-0.499	0.241	1.000	-0.019	-0.046	0.322
GDP	0.033	-0.076	-0.092	-0.019	1.000	0.491	0.025
INFLATION	-0.076	-0.107	-0.183	-0.046	0.491	1.000	0.232
LTDR	-0.029	-0.075	0.103	0.322	0.025	0.232	1.000

Source: Researcher's Eviews 10 computation

The table above explains the relationship between ROE with its independent variables. Since all the correlation coefficient in the matrix are less than 0.8, it indicates that there is no multicollinearity problem. Furthermore, the correlation matrix explains the linear association between the seven variables of the research. The results should remain

within the range of -1 (perfect negative correlation) to +1 (perfect positive correlation). The closer the correlation coefficient is to 1 or -1, the stronger the correlation will be.

It can be seen that NPLR has a weak and negative correlation with financial performance. It suggests that when NPLR increases, the probability that the

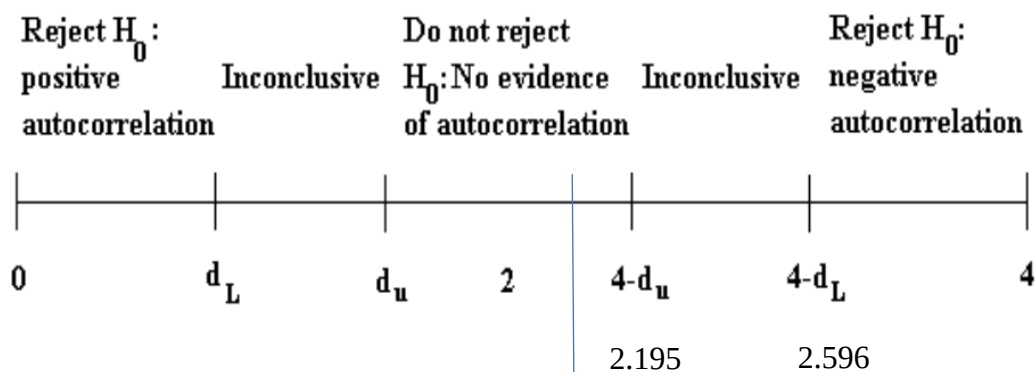
commercial bank's financial performance worsen is high. Bank size has a moderate positive correlation with ROE. This explains that bank size has a high positive effect on financial performance. Moreover, both CAR and GDP has a positive but very weak correlation with ROE, where their coefficients are 0.143 and 0.033 respectively. This illustrates that maintaining proper CAR and an economy with high GDP can both slightly contribute to ameliorate the financial performance of Mauritian commercial banks. Lastly, inflation and LTDR have a very weak negative correlation with ROE. It shows when the LTDR of the commercial bank

increases or when there is a sustained rise in the price level, the ROE will reduce.

5.1.4 Statistical independence of errors terms

This test checks the presence of autocorrelation, i.e. whether the data shows a huge serial correlation among the errors. The most commonly used measure of autocorrelation in residuals from the regression analysis is the Durbin Watson Test. Referring to the Durbin-Watson table, at 5% significance level, the lower bound (d_L) and the upper bound (d_U) are 1.404 and 1.805 respectively. The data below is the output from the regression results.

Number of observations	66 after adjustments
Number of independent variables, k	6
Significance Level	5%
Durbin-Watson stat	2.072235



As illustrated in the diagram above, the Durbin-Watson statistic, 2.072235 lies between 2 and $4 - d_U$ (2.195). This shows that there is no evidence of autocorrelation. Therefore, the alternative hypothesis should be rejected and accept the null hypothesis.

5.2 OLS Regression Model

After conducting the required tests and remedying the violations, the multiple regression can now be performed. The table below is an extract from the model summary in the regression analysis:

R-Square	0.373386
F-Statistics	5.859468
Prob (F-statistics)	0.000077

Source - Researcher's Eviews 10 computation

R-Square of 0.373386 means that 37.34% of the variation in ROE can be explained by the six independent variables. The balance of 62.66% of the variation in ROE can be explained by other factors that are not included in the model. Such a low R-Square has also been reported by Nyabicha (2017) and Saeed & Zahid (2016) who claimed that their regression model is effective and accurate. Additionally, F-test is commonly used to investigate if the overall regression model is statistically significant. As the p-value is less than 5% ($=0.000077$), it clearly shows that the overall model is adequate and statistically significant.

5.2.1 Nonperforming Loan Ratio

The findings of this study are consistent with the studies of Kolapo et al. (2012) and Annor & Obeng (2017) who demonstrated that NPLR was negatively correlated with bank financial performance in their researches. It shows that a rise in the level of non-performing loans will ultimately decline the ROE of the banks. Possible reasons can be when customers default on the borrowed funds i.e. unable to repay the interest and principal payments, it affects both the income statement and balance sheet. The failure of the borrowers to repay their money will reduce the bank's asset base. Secondly, the principal amount will be recorded as expenses (or loss) in the income statement which will reduce the overall profits. These findings support the information theory and credit risk theory. Likewise, the inability to pay the interest on loan will diminish the income which, in turn, reduces profits (Kingu, et al., 2018). Controversially, PWC explained that some commercial banks want to increase their customer's confidence and clear out their fears. Thus, these banks tend to remove

their bad debts and non-performing loans by attempting to sell them. This is normally done by reallocating the funds to entities which are more efficient and effective to improve the liquidity position of the commercial bank. Consequently, it shows that nonperforming loans may not have a huge impact on the bank's financial performance, resulting in an insignificant relationship.

5.2.2 Capital Adequacy Ratio

The past studies by Abdelrahim (2013) and Rundassa & Batra (2016) are seen to be in conformity with this current study. Such a positive but insignificant result can be because the sample used was too small. Mauritius has around 20 banks in total but only 7 commercial banks were tested in this research. Thus, this made it difficult to obtain a significant relationship. Another reason can be that certain countries including Mauritius have a different economic level compared to other countries. The negative relationship indicates that a too high CAR means a commercial bank is not using its large sum of funds efficiently which could otherwise be used to earn higher returns through investments. Conversely, other scholars such as Annor & Obeng (2017) posited that CAR has a positive impact on bank performance. The author added that high CAR means the banks are well-capitalised which suggest that they have the ability to face a reduction in their cost of funding and the chances that they will go bankrupt is very low. Additionally, a positive association with bank performance builds confidence to the customers and thus they are more ready to deposit their funds in those banks. A good balance of total capital and the risk-weighted assets which will in turn help from any uncertain economic environment. This shows that a

good CAR can improve the financial performance of a commercial bank.

5.2.3 Bank Size

The positive and significant association between bank size and financial performance can be attributed to the fact that when commercial banks expand their activities, they receive more opportunities to improve their profitability, thereby increasing their ROE. Kutum (2017) claimed that the more a bank stays in the industry and grows gradually, their credit risk management approaches allow it to have less credit risk exposure. Thus, it can be said that larger banks earn more profits and perform better than small ones. A large bank can operate more efficiently and benefit from economies of scale which helps it to cut down costs (Alexiou & Sofoklis, 2009). Contradicting to this study, some researchers like Nataraja et al.(2018)found that the larger the banks, it becomes more difficult to manage. Big banks become too diversified that they lose control over efficiency, resulting in reducing the profitability of commercial banks. This may lead to diseconomies of scale where the commercial banks may not benefit from the low cost of production. The total costs such as agency costs and the overhead incurred in the bureaucratic process will undoubtedly increase hugely.

5.2.4 Gross Domestic Product

Such a positive insignificant result has been specifically consistent with the findings of a few researchers like Simiyu and Ngile (2015) and Djalilov & Piesse (2016). This indicates that GDP is not important or less impactful on the financial performance of commercial banks. It can be explained by the fact that the demand for credit is not or minimally affected by the changes in GDP prevailing in a

country. Additionally, a low GDP will reduce the deposits and loans as well as their managing costs. However, these conditions might also increase the costs of collecting loan payments, thereby causing an ambiguous relationship (Bolt, et al., 2012). As a result, this clarifies why might GDP has an insignificant impact on a commercial bank's financial performance. However, other scholars such as Petria, et al. (2015) explained that GDP does have an impact. A high GDP rate will increase the amount of loans and deposits in a period of economic expansion. This will, in turn, increase the net interest income, improve the amount of nonperforming loans and decrease operating costs, thereby improving the financial performance of the commercial banks. Additionally, an increase in GDP also means a rise in disposable income which indicates the probability of default on loans by consumers is reduced (Combey & Togbenou, 2017).

5.2.5 Loan to deposit ratio

The findings of this study are also in conformity with that of Nireesh (2012) and Raharjo & Hakim (2014), whose studies evinces an insignificant relationship. Such results are obtained because of the commercial banks' lending policies. This is where the LTDR is at a moderate level i.e. neither too high nor too low. On the other side, several researchers such as Taiwo, et al. (2017)suggested that any rise in the loan to deposit ratio will result in an increment in return on equity.Researchers exhibited in his research that sufficient liquidity avoids the occasion of a financial crisis when huge withdrawals are made by people. He added that it becomes easier for banks to obtain funds by just converting their assets into immediate cash without any increase in their liabilities. Thus, they

will be able to meet any probable future needs, thereby improving the financial performance of the banks. Similarly, a low LTDR may indicate that a bank has excessive liquidity that will potentially lower the performance of the bank (Islam, 2014). It proves that the loan to deposit can still have a positive and significant effect on bank performance.

5.2.6 Inflation

Coming to inflation, its insignificant result was the same in Evans & Kiganda (2014) and Ongore & Kusa (2013). This shows that although there is a rise or decline in the inflation rate, the demand and supply for loans and deposits are not massively affected. Even though as the rate of inflation increases, the probability for borrowers to default becomes high, this insignificant relationship proves it wrong. Another reason might be that the commercial bank did not anticipate fluctuations in the inflation rate. Thus, showing that inflation has a more major impact on the economy and price levels rather than on bank performance. In contrast, many researchers such as Capraru and Ihnatov (2014) and Petria et al. (2015) have concluded that inflation has a positive impact on the bank financial performance. Such results may be when inflation is anticipated, the management of the commercial banks may alter their interest rates appropriately in the view to make their profits higher than they expected to lose from the rise in costs by the inflation. A second reason might be because of asymmetric information about the inflation expectation.

6. Conclusion and recommendation

It has been seen from numerous empirical researchers that improper credit risk management is the primary reason for

commercial banks to go into bank failures or even in financial crisis. The finding of this research discovered that only nonperforming loan ratio and bank size are significant factors while the other four variables namely CAR, LTDR, GDP and inflation do not have an effect on bank performance on Mauritian commercial banks. Thus, there exist many other factors which are equally important as the two significant variables. Consequently, to enhance the understanding of how commercial banks can improve their financial performance, some general recommendations are proposed. All banks should have a proper risk committee that precisely focus on credit risk. The committee should consist of experts, qualified risk analysts and trained managers that will efficiently assess and control the competencies of credit risk management methods. Any loopholes should be swiftly identified and the strategies should be changed accordingly. Moreover, in this digitised world, information technology is playing a crucial role in transforming the banking sector. These recent trends require traditional commercial banks to raise their fintech's investments by adopting new credit risk management techniques. One choice is to opt for machine learning in their credit risk management framework. Lastly, commercial banks can collaborate with RegTech, which is a large range of fintech services for regulatory reporting and compliance purposes. It can provide helpful solutions to several fields such as risk data reporting abilities, know-your-customer (KYC), risk management, regulatory reporting, financial crime, operational risk and consumer protection. Also, future researchers can opt to increase their sample size, use more indicators as well as perform more diagnostic tests to

have a broader and clearer understanding of the banking system in Mauritius.

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