UNIVERSITY OF BOTSWANA

DEPARTMENT OF ECONOMICS

THE DETERMINANTS OF CREDIT RISK OF COMMERCIAL BANKS IN BOTSWANA

BY

TEBOGO KEITSHOKILE

SUPERVISOR: DR M. NTSOSA AND MS M. SEEMULE

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DECLARATION

I Tebogo Keitshokile hereby confirm that the work contained in this dissertation is my original work. Sources used herein are acknowledged and are on the reference section.

Signature:…….. Date:……..

APPROVAL

This dissertation has been examined and approved as meeting the requirement for the partial fulfilment of Masters of Arts Degree in Economics

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DEDICATION

I dedicate this thesis to the loving memories of my mother Tsholofelo Keitshokile, my siblings, family and friends for the support and motivation they accorded me during the study period.

ACKNOWLEDGEMENT

I am truly thankful to God's grace and patience he has given me throughout my M.A Economics programme. I also would like to extent my appreciation to my supervisors Dr M. Ntsosa and Ms M. Seemule for investing their time to guide and ensure that the research paper is successful.

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ABSTRACT

The study investigated the determinants of credit risk of commercial banks in Botswana from 2005 to 2017. The study used fixed effects model to meet the objectives. Commercial banks used in the study are Barclays Bank of Botswana, Standard Chartered Bank of Botswana and First National Bank of Botswana. Variables used are non-performing loan ratio as a proxy for credit risk and the dependent variable whereas the independent variables are management efficiency, capital adequacy ratio, return on asset, loan to deposit, inflation rate, unemployment rate and GDP growth rate.

Bank specific factors were sourced from bank audited financial statements while macroeconomic variables are taken from the Bank of Botswana, Statistics Botswana and World Bank Group. Furthermore, fixed effects model was appropriate to examine the determinants of credit risk as per the Wald test undertaken. The study used lagged variables as the effect of the shock may not be transmitted immediately to other variables.

The results from the regression showed that management efficiency, capital adequacy ratio, loan to deposit, return on asset, inflation rate and unemployment are statistically significant. Inflation, unemployment, management efficiency and capital adequacy ratio have negative relationship with credit risk whereas return on assets and loan to deposit have a positive relationship. Furthermore, only GDP growth rate is statistically insignificant in influencing credit risk. Based on the findings, the study suggest that banks should be focused on the key drivers of credit risk such as return on asset, inflation rate, unemployment, management efficiency, loan to deposit and capital adequacy ratio in order to reduce the probability of default in the Botswana commercial banks. Capitalized banks are good in absorbing more losses, which resulted from defaults. The study notes that poor credit evaluation; monitoring and wrong collateral evaluation can lead to future growth in non-performing loans. Additionally, banks should diversify their lending activities to productive sectors in the economy as a way to mitigate credit risk. Furthermore, banks should diversify their income stream from interest income to non-interest revenue.

CHAPTER 1

1.0 INTRODUCTION

The main role of commercial banks is financial intermediation. The critical role they play in the economy is pooling funds from savers and lending them to creditworthy individuals and firms (Bank of Botswana, 2017). Additionally, financial intermediation is important for the welfare of the economy as it is central to economic growth. However, this function exposes banks to credit risk. The risk arises from borrowers not being able to pay back their loans (Dessie, 2016). According to (Addae-Korankye, 2014), causes of loan default include high interest rates, poor appraisal and lack of monitoring and improper client selection. Furthermore, Flamini, et al (2009) noted that, the main source of bank specific risk in Sub Saharan Africa is credit risk. Berger and DeYoung (1997) outlined that the cause of bank failure is due to a higher volume of problem loans and is a significant predictor of insolvency.

Louzis et al (2012) noted that, bank insolvency is a significant problem in many countries caused by asset deterioration. Salas & Saurina (2002) shares the same sentiments that, the insolvency of financial systems and individual banks are consequence of the accumulation of problem loans over time. A company is insolvent when the total value of its assets are less than the total value of its liabilities (Jon, 2005). According to Caprio & Klingebiel, (1997), bank insolvency may result from financial losses, misallocation of resources and slower economic growth. Loans make bulk of the commercial banks' total assets and their deterioration may result in insolvency. Therefore, De Bock & Demyanets, (2012) asserts that, asset deterioration forces banks to recapitalise and deprives them of new credit extension.

ISO Guide 73 (2009) defines risk as effects of uncertainties on objectives. According to Bank of Kenya, (2013), credit risk is the current or prospective risk to earnings and capital arising from a borrower's failure to meet the terms and conditions of a loan contract with the bank. Failure to meet contractual obligations by clients will result in non-performing loans, which then dents the bank's asset quality and future income. Furthermore, Kithinji (2010) adds that, credit risk may be a result of limited institutional capacity, inappropriate credit policies, volatile interest rates, inadequate capital and liquidity, poor loan underwriting and management inefficiency.

According to Basel Committee on Banking Supervision, Non-Performing Loans (NPLs) are defined as loans that are more than 90 days past due, thus making them eligible for write-offs. NPLs reduce income, increase resources for collection and monitoring of bad debts, hence levitation of operating expenses (Adeolu, 2014). Therefore, this study will recognize NPL as loans that have been in arrears for 90 days (Senatla & Basutli, 2016).

Literature groups determinants of credit risk into two categories namely unsystematic and systematic factors (Castro, 2013; Louzis et al., 2012). Unsystematic factors are bank specific factors, which are within the control and influence of banks' management (Haron, (2004). Bank specific factors can be either financial factors or non-financial factors. Financial factors include bank size, capital ratios, liquidity, asset quality, deposits, operational efficiency while non-financial variables include number of branches, employees, ownership, ATM's. Gottesman & Leibrock, (2017) defines systematic risk as risk that is inherent to the entire market and undiversifiable. These factors includes macroeconomic conditions, changes in economic policies and political changes. Gabeshi, (2017) noted that both macroeconomic and bank specific factors have an effect on loan quality and they vary according loan category.

According to Tsumake & de Jager, (2016), the 2007/2008 global financial crisis led to collapse of some banks and impacted economies. Zsolt (2011) noted that, defaulting household were the first domino to fall, followed by mortgage lenders, holders of mortgage-backed securities and their guarantors and insurers. Therefore, these encouraged researchers to further investigate factors that can lead to banking or finacial crises (Castro,2013). And as a result, macroeconomic factors were higlighted as a significant trigger. Kaminsky and Reinhart (1999) cited that financial liberalization often precedes banking crises. This entails removal of government intervention in financial markets such as restrictions on credit allocation decisions, interest rates ceilings, compulsory reserve requirement or foreign financial intermediaries (Masci, 2008). Demirguc-Kunt & Detragianche, (1999) suggested that even in the presence of macroeconomic stabilisation, financial liberalisation should be approached with caution in countries where institutions that ensure legal behaviour, contract enforcement, and effective prudential and supervision are not fully developed. Castro (2013) cited that, banking crisis may also occur when banks are overwhelmed with liquidity or insolvency issues that results from increased non-performing loans.

Loans are the main assets and vital source of revenue for banks and NPLs tend to erode the profit margins for commercial banks. As cited by Sontakke & Tiwari (2013) and Cai & Zhang (2017), credit risk management is essential in identifying warning signs of a bank's vulnerability. Godlewski (2004) noted that defaults generate costs such as financial losses (clients, shareholders, deposits insurance fund), loss of competitiveness, and a potential destabilisation of the financial systems.

This study intends to investigate the internal and external determinants of credit risk of commercial banks in Botswana to ensure quality assets, profitability and economic growth. Loans are the major assets for banks and income contributor for Botswana commercial banks. Therefore, it is vital to ensure asset quality. Commercial banks used for this study are Barclays Bank of Botswana, First National Bank of Botswana and Standard Chartered Bank of Botswana due to availability of annual reports on the Botswana Stock Exchange (BSE) and their long operation in Botswana. Non-publicly listed banks do not publicly publish their annual reports regularly. The period covered is 2005 to 2017 to appreciate the response of variables during different economic conditions. Response variable used is non-performing loans ratio (non-performing loan to total loan) as a proxy for credit risk and, capital adequacy ratio, return on asset, management efficiency, loan to deposit ratio, inflation rate, GDP growth rate and unemployment rate as predictor variables.

1.1 PROBLEM STATEMENT

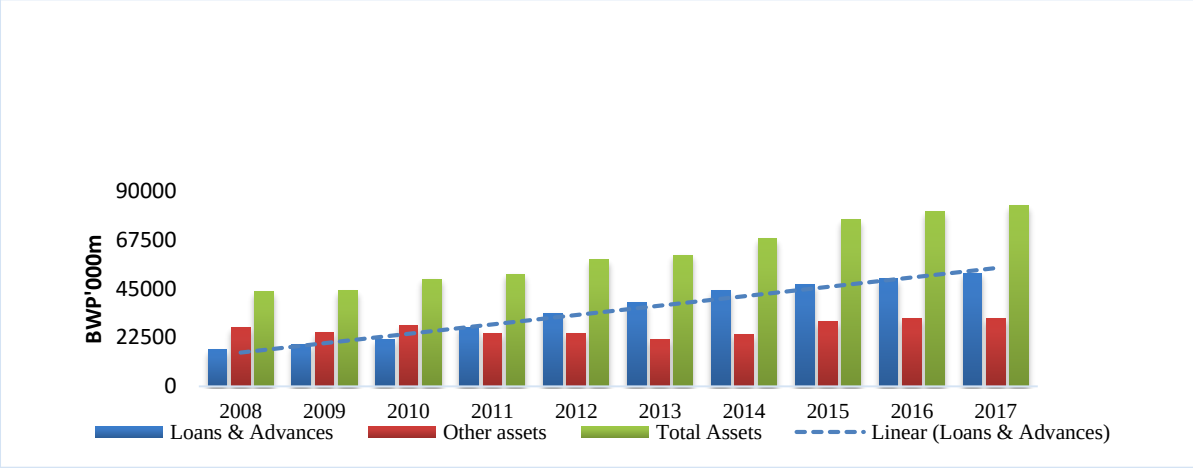
Financial intermediation is a core activity and the largest contributor to banks income in Botswana. Revenue streams in banking are interest and non-interest income. Interest income is revenue from interest received from loans and non-interest income is from commission and management fees. Figure 1 shows that total assets increased from P43 823.4 million from 2008 to P83 468.2 million in 2017, an increase of 90%. During the same period, loans and advances grew from P16 778.9 million to P52 147 million. The magnitude of loans to total assets continue to increase year on year. In 2017, loans attributed 62% of the banks total assets, thus signifying the importance of having quality loans as they are highly affected by risk of default. Other assets include cash balances at the Bank of Botswana, balances due from other domestic banks, Bank of Botswana certificates, treasury bills and fixed assets.

In 2017, debt extension by commercial banks showed that, households were accorded 61%, private enterprises 34% and public sector 5%. The largest proportion of the household debt is unsecured at 64% of the total household debt. Senatla & Basutli, (2016) noted that the highest share of non-performing loans is attributed to household loans and also suggested that banks must offer loans with understanding of economic trends and forecasts. This study tends to focus on interest income as it is the largest income contributor to banks income and affected by credit risk.

Jefferis & Tacheba, (2010) noted that, Botswana financial system was indirectly impacted by the 2007/09 global financial crisis. Botswana's commercial banks are subsidieries of the international banking groups. So, during the global financial crisis, these international banking groups tightened their lending criteria and reduced their credit appetite in some sectors. Some of the sectors affected included the mining industry, which is a key contributors to the Botswana's economy (Jefferis & Tacheba, 2010). According to the Bank of Botswana (2017), growth in non-performing loans (NPL) followed closure of some mines such as BCL, Tati Nickel and sightholders. Thus causing a spiral of default from companies and employees that were dependent on these mines.

Figure 1 below illustrates total commercail banks assets in Botswana since 2008 to 2017. It shows the asset type and contribution to total commercial bank assets. In 2008 to 2010, other assets contributed more towards total assets than loan and advances. Post 2010, loans and advances started to contribute more towards total assets. The increase intensified the risk of default and calls for stringent measures to monitor and control it.

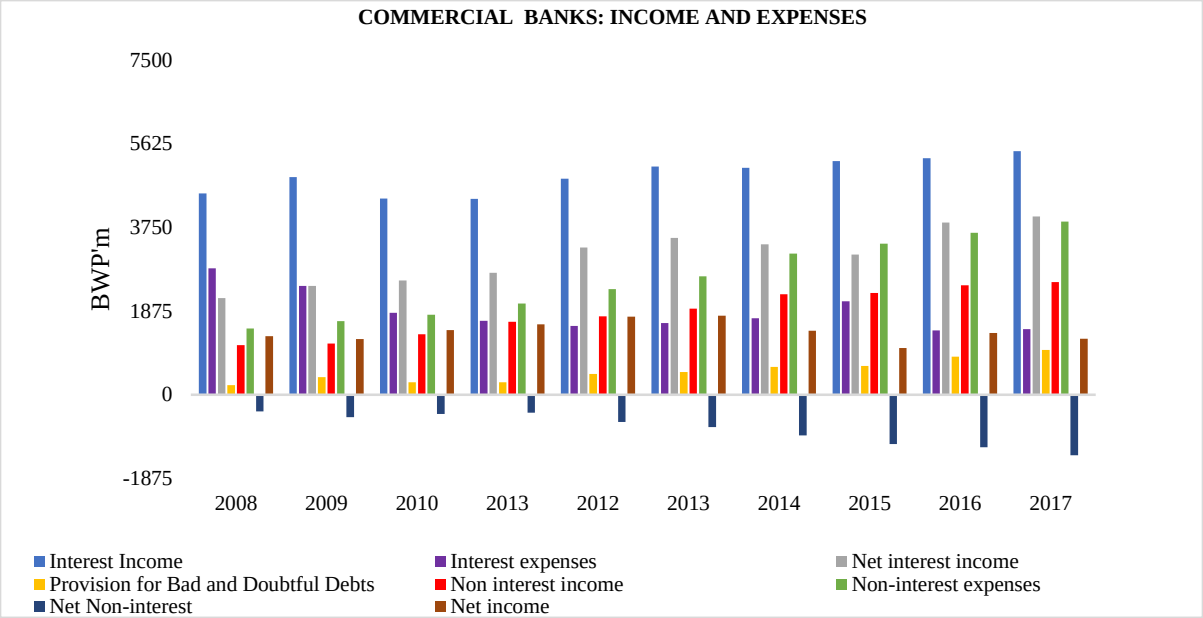
Figure 1: Commercial banks assets 2008 - 2017



Source: Bank of Botswana: Botswana Financial Statistics October 2018 and author's calculations

Figure 2 shows types of income and expenses in the Botswana banking sector. In 2017, commercial banks made a total revenue of P7 981.6 million compared to P6 098.5 million in 2008, reflecting a 31% growth. During the same period, interest income contributed 82% to total revenue in 2008 and 68% in 2017. This highlights the importance of lending and asset quality for commercial banks in Botswana due to concentration risk on interest income. Categories of bank expenses are interest income expense, non-interest income expense and provisions for bad and doubtful debts. During 2017, non-interest expense was the largest contributor to total banking expenses by 61%, interest income expense 23% and provision for bad and doubtful loans was 16%.

Figure 2: Commercial banks' incomes and expenses 2008 – 2017.



Source: Bank of Botswana: Botswana financial statistics October 2018 and author's calculations

Figure 3 shows income and expenses in 2017 for Botswana commercial banks. It shows the importance of interest income in banking profitability. As depicted below, interest income makes the largest contribution on banking revenue. If we take away this line of income, and remain with non-interest revenue and its related expense (non-interest expense), the banking sector would make losses. Non-interest revenue cannot cover expenses related to it. Therefore, the quality of loans and advancements are vital to commercial banks for profitability. If the level of non-performing loans increase, interest income declines, provision of bad and doubtful loans increase and reduce operating profits. Hence affecting commercial banks profitability.

Figure 3: Income & Expense 2017

	P' million	**P' million**
Interest Income	P5 457.9	
Non-interest revenue	P2 523.7	P2 523.7
Total Income	**P7 981.60**	
Interest expense	P1 467.1	
Non-interest expense	P3 877.9	P3 877.9
Provision of bad and doubtful loans	P1 002.9	
Operating Profits	**P1 633.7**	**- 1 354.2**

Source: Bank of Botswana: Botswana Financial Statistics January 2019 and Author's Calculations

Cebenoyan & Strahan, (2004); Neal, (1996), noted that, determinants of credit risk can either be due to macroeconomic factors or bank-specific factors. In addition, Mpofu & Nikolaodou, (2018) highlighted the need for single country case studies on determinants of credit risk in the banking sector using both systematic and unsystematic factors due to different economic environments, monetary policies and financial development. Patra & Padhi, (2016) wrote that credit risk could be detrimental to the sustainability of banks and the economy if not managed. Furthermore, Ahmad & Ariff, (2007) noted that, credit risk in emerging economies is higher than in developed countries and it is caused by several bank-specific factors.

Therefore, it is important to understand factors driving asset quality, explore their significance, and help policy makers to weave policies geared for a healthy financial system in Botswana.

1.2 OBJECTIVE OF THE STUDY

The primary objective of the study is to investigate the determinants of credit risk of commercial banks in Botswana. Below are specific objectives,

- Bank specific factors: To establish the impact of capital adequacy ratio, return on asset, management efficiency and loan to deposit ratio on credit risk.
- Macroeconomic factors: To establish the impact of inflation rate, GDP growth rate and unemployment Rate on credit risk.

1.3 RESEARCH HYPOTHESIS

The aim is to test the following alternative hypotheses based on the above objective,

Hypothesis 1: Bank specific factors have no impact on credit risk.
Hypothesis 2: Macroeconomics factor have no impact on credit risk.

1.4 SIGNIFICANCE OF THE STUDY

Banks are significant to the development of the economy through employment creation, collection of surplus deposits from economic agents to deficient agents and smoothing trade (Kalpana & Vasantaha Rao, 2017). However, the key role of financial intermediation exposes banks to credit risk. The purpose of the study is to carry research in the Botswana's context and investigate the determinants of credit risk. This would be beneficial as below,

- Bank of Botswana to develop and enhance regulatory standards regarding the lending policies of commercial banks.
- Commercial banks to enhance their loan book performance and quality. Furthermore, to understand key contributors of credit risk and reduce its impact.
- Research: The study is not the first of its kind in the context of Botswana. Tsumake & de Jager, (2016) made a study titled "What are the determinants of non-performing loans in Botswana"? The focus of the study was based on the macroecoecomic factors and industry specific factors as determinants of non-performing loans.

- Tsumake and de Jager (2016) used non-performing loan as a response variable and independent variables as industry level variable (credit growth, industry size and profitability) and macroeconomics variables (real gross domestic product growth, inflation, interest rates and unemployment). The outcome of the study has shown that the predictor variables have significant impact on non performing loans. Furthemore, the results are supported by Ghosh (2015) and Garr (2013).

The current study is an addition to Tsumake and de Jager (2016) by considering banks specific factors, which other studies have found to be influential regarding credit risk. The bank specific variables (capital adequecy ratio, return on assets, management efficiency, loan to deposits) are within the control of management and macroeconomic factors (GDP growth rate, inflation and unemployment) are inherent to whole market. Furthermore, this study seek to explore the significance of bank specific factors toward credit risk and how it affectd it. Management plays a critical role on the extension of credit to customer. Therefore, giving loans to credit worthy customer is vital as it will reduce the risk of default.

This study will use listed commecial banks for ease of data and experience in the Botswana banking sector. Furthermore, the study will use a panel data approach for taking account for individual heterogeneity which allows control for variables that cannot be observed or measured and reduces biasness. It also gives more informative data and less collinearity among variables.

1.5 OUTLINE OF THE STUDY

The proceeding part of the study is as follows, chapter two is the overview of the Botswana banking sector, chapter three is the literature review of related studies and chapter four captures the methodology adopted. Chapter 5 explain is the estimation and analysis of results and chapter six is the conclusion and policy recommendations.

CHAPTER 2

AN OVERVIEW OF BANKING SECTOR IN BOTSWANA

2.1 INTRODUCTION

This chapter presents an overview of the banking sector in Botswana. The section is sub-divided into three areas being, evolution of the banking sector in Botswana, loan categorization in Botswana and importance of financial intermediation.

2.2 EVOLUTION OF THE BANKING SECTOR IN BOTSWANA

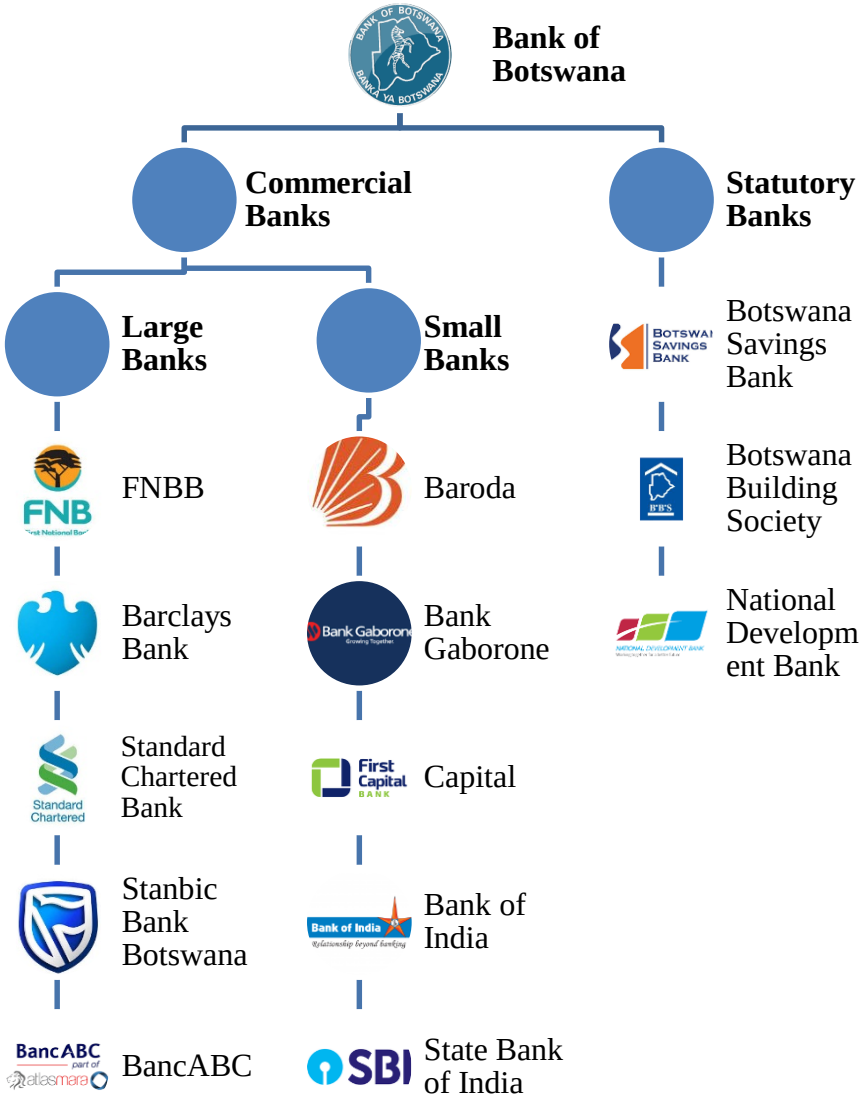
Botswana banking sector has changed over the period since 1990. The sector was relatively small and dominated by Barclays Bank of Botswana and Standard Chartered Bank of Botswana. By 1970s, both banks incorporated in Botswana (Jefferis & Tacheba, 2010). Botswana does not have a state-owned commercial bank. However, the government has been an extensive provider of finance in the economy through Botswana Building Society, National Development Bank, Financial Service Company, Botswana Savings Bank, Botswana Development Corporation and Public Debt Service Fund (PDSF).

During the 1980, though the banking sector was sound and profitable, the degree of competition and intermediation was lower. However, some of the issues regarding the challenges of the Botswana banking sector at the time were summarized on the Government of Botswana/World Bank report entitled "Financial sector policies for diversified growth", published in 1989. The report motivated an extensive set of financial sector reforms. These entails encouraging establishment of new banks, reduction of government's role as a direct lender to parastatals, development of capital market and introduction of the market-based interventions for monetary policy purposes and the absorption of excess liquidity through Bank of Botswana Certificates.

Due to the above policy framework, we have seen an influx of new commercial banks in the market as per appendix 1. The market currently has 10 commercial banks in operation. According to Bank of Botswana, (2017), these commercial banks are, Barclays, Standard Chartered, FNBB, Stanbic Bank, BancABC, Bank of Baroda, Bank Gaborone, Capital Bank, Bank of India and State Bank of India. The branch and ATM network presence for commercial

banks grew 4% and 4.1% respectively from 2016 to 2017. Furthermore, banking structure is shown as below in figure 4.

Figure 4. Bank in Botswana



Source: Bank of Botswana Supervisory Report 2017, author computation

Using the Herfindah-Hirschman Index (HHI), a widely applied measure of concentration to assess the degree of competition in Botswana banking industry, in 2017, the index was at 0.1800. Given the theoretical threshold of 0.1800 for moderate concentration, there continues to be scope for enhanced competitiveness (Bank of Botswana, 2017).

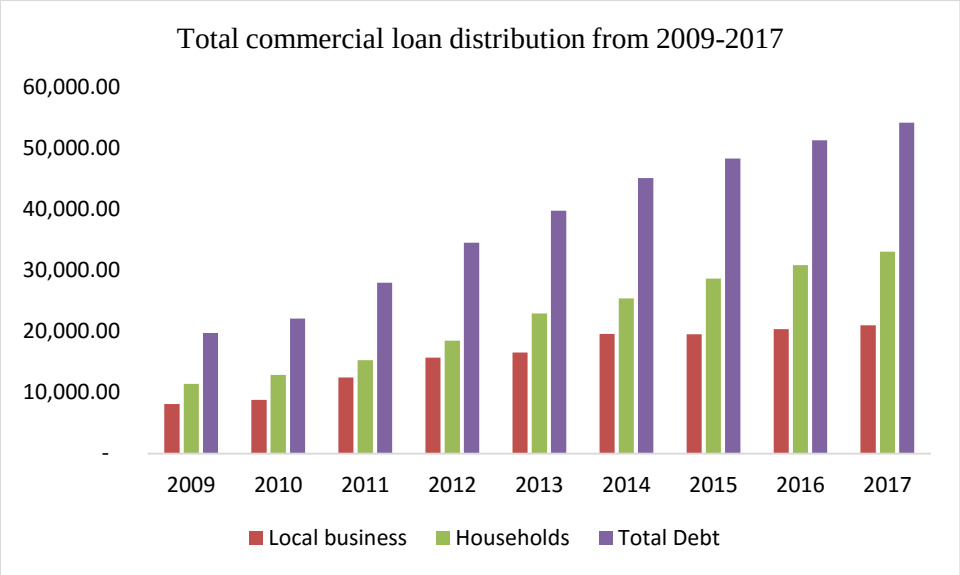
2.3 LOAN CATEGORIZATION IN BOTSWANA

According to (Bank of Botswana, 2018) survey, the term debt is defined as loans taken by household, differentiated into housing loan, motor vehicle loan, credit card loan and personal unsecured loans that are normally associated with household debt. Commercial banks loan distribution is skewed toward households. In 2017, 60% of the total loan and advancement went to household. The findings indicate that about 59% of the loans to the household sector financed unsecured personal lending, while around 34% was for residential property. The rest was for motor vehicles and credit cards at 5% and 2% respectively. The amount translates to a ratio of 20.9 percent for household debt to gross domestic product (GDP). Compared to other countries, this ratio remains low. For example, in 2007, Malaysia reported a ratio of 65 percent while South Africa's ratio was 33.1 percent (Bank of Botswana, 2018).

From the same survey "commercial bank and other deposit taking institutions household indebtedness survey report", men take up more loans from banks than female counterparts, both in numbers and outstanding value. The proportion of borrowing by youth is low, suggesting that the youth have limited access to bank lending and/or signaling the high unemployment level. The study concluded that, because the majority of the borrowers have formal employment, the potential threat to financial stability that could stem from the sector has lessened significantly.

According to Bank of Botswana Financial Statistics for July 2019, looking at 2017, about 35% of loans went to business sector towards different sectors. The sectors that were more indebted were trade (7.80%), real estate (6.80%), manufacturing (6.33%), business services (4.48%) and agriculture (2.27%).

Figure 5; Total Commercial Bank Loan Distribution from 2009 - 2017



Source: Bank of Botswana Financial Statistics and authors computation

2.4 THE IMPORTANCE OF FINANCIAL INTERMEDIATION

Tapen, (2001) the importance of banks and other financial intermediaries is derived from the effects it has on the economy during a banking crisis. According to (Allen & Santomero, 1998), financial intermediation plays a pivotal role in promoting economic growth activities in the economy through different means. In support, (Allen & Santomero, 1998), Aziakpono (2005) assert that, Firstly, financial intermediation acts as a conduct for channeling funds from surplus economic units to deficit economic units by mobilizing resources and ensuring an efficient transformation of funds into the real productive sector of an economy. Secondly, it also leads to the transformation of the maturity of savers and investor portfolio, thus providing sufficient liquidity to the system as the need arises. Thirdly, it plays the role of risk reduction from the system through diversification and techniques of risk sharing pooling. Additionally, financial intermediation reduces the information asymmetry of borrowers.

CHAPTER 3

LITERATURE REVIEW

3.1 INTRODUCTION

This chapter provides the review of the theoretical and empirical literature on the determinants of credit risk of commercial banks.. It gives insight on different analytical and empirical evidence from various authors. The literature is in two sections. The first section reviews the theoritical literature on this subject matter. The second section focuses on emperical literature

3.2 THEORETICAL LITERATURE REVIEW

Capital Asset Pricing Models (CAPM)

This is one of the overarching theories of risk and developed by (Sharpe, 1963). The simplified model is as below,

$$E(R_j) = R_f + \beta_j\{E(R_m) - R_f\} \quad \ldots (3.2.1)$$

Where,
$E(R_j)$ Expected return on the asset j, R_f risk-free rate of return, $E(R_m)$ the expected return for the risky market portfolio, β_j the individual asset's systematic risk relative to the risky market's portfolio. $E(R_m) - R_f$, the expected risk-premium of risky market portfolio

Commercial banks may maintain a combination of loans with varying risk profiles. A bank will price its loan according to the level of risk it perceives on a customer. A perceived higher risk loan will result in a higher price. Loan diversification eliminates individual risk. Therefore, the risk a bank is concerned with in a loan-pricing decision is the market risk and the price of risk.

$$Price\ of\ risk = \beta_j\{E(R_m) - R_f\} \quad \ldots (3.2.2)$$

Following Ahmad & Ariff, (2007), as a highly leveraged firm, a bank must incorporate in its loan pricing other related costs such as bankruptcy cost. The bankruptcy arises due to the bank

taking in excessive risk-taking. The risk increases if the debt to equity ratio for the bank increases. Therefore, incorporating the leverage effect by (Hamada, 1972) into equation 2, beta of an individual firm bank, j, with loan capital is expressed below,

$$\beta_{jL} = \beta_{ju}\left\{1 + \frac{D}{E_j}(1 - tc)\right\} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3.2.3)$$

Where, β_{jL} = beta of leveraged firm, β_{ju} = beta of unlevered bank, $\frac{D}{E_j}$ = debt-equity ratio and tc= tax rate applicable to income stream of a bank. A bank's risk increases as the leverage increases and the capital structure is likely to affect credit risk. Capital structure in this case means distribution of debt and equity that makes up the finances of a company.

Credit Risk Modeling

There are two main categories of credit risk modeling being structural and reduced form. The interest in credit risk models originated from the need to quantify the amount of economic capital necessary to support a bank's exposures (Chatterjee, 2015). Also, Basel Committee, (1999) suggested that the credit risk models help banks in quantifying, aggregating and managing credit risk across geographical and product lines. Additionaly, according to Chatterjee (2015), the role of the credit risk model is to take as input the conditions of the general economy and those of the specific firm in question, and generate as a credit spread.

Merton (1974) initiated the structural model. It uses the Black-Scholes option-pricing framework to characterize default behavior. The model calculates the probability of default for a firm based on the value of its assets and liabilities (Chatterjee, 2015). The firm will default if the market value of its assets is less than the debt it has to pay. A firm's balance sheet is made of assets, equity and liabilities. The challenge with this model is that, one cannot observe the market value of a firm's assets, but for any publicly listed bank, the market value of equity is observable, as its debt.

Reduced form models (Default-intensity model) assumes exogenous cause of default (Basel Committee, 1999). The fundamental modelling tool is the poison distribution (Chatterjee, 2015). This introduces a degree of predictability into the default event (Lando, 2004). It models default as a random event without any focus on the firm's balance sheet (Chatterjee, 2015).

The default intensity model estimates the credit spread of contingent convertibles (CoCo bonds). CoCo is a bond that will get converted into equity or suffer a write down of its face value as soon the capital of the issuing bank falls below certain trigger level (Chatterjee, 2015). The triggered level is the point at which a bank has insufficient regulatory capital.

Theories linking bank-specific and macroeconomic factors:

Akerlof (1970) and Berger and DeYoung (1997) over the years have developed a variety of theories and hypothesis to explain factors that are associated with the occurrence and accumulation of non-performing loans in commercial banks. Akerlof initially introduced the lemon problem in his seminal article of 1970. In his article, he showed how a market with unbalanced information can lead to dissapearance or to offerings with poor quality where bad products (Lemons) wipe out the good ones. In this case, if overal quality of customers is reflected on the entire group rather than individuals due to information asymmetry, good customers my flee the market because they are not appreciated for their reputation. This will leave bad client in the market and increases the risk of accumulation of non-performing loans. Therefore, the theoretical perspectives that informed this research has led to the development of hypotheses in analyzing the relationship between bank specific factors and the occurrence of non-performing loans. These hypotheses and theories are moral hazards theory, information asymmetry theory, adverse selection theory and bad management hypothesis.

Information Asymmetry Theory:

The theory contends that, asymmetric information occurs when one party in a transactional relationship is informed than the other party (Kingu, Macha, & Gwahula, 2017). According to Mishkin (1992), in the financial decision space, asymmetric information literature looks at the impact of decision based on the difference in the information available to both parties. Lenders faces uncertainties of loan repayment by the borrowers, as they cannot observe characteristics and actions, difficult to assess their creditworthiness (Ariccia, 1998). Consequently, information asymmetries causes adverse selection and moral hazard problems (Akerlof, 1970).

Lenders cannot distinguish good from bad borrowers, all borrowers are charged a normal interest that relfects their collective experience (Castro, 2013). However, if this rate is higher than good borrowers can afford, it will push some of the good borrowers out of the market, forcing banks to charge higher rates to remaining unqualified borrowers (Barron & Staten,

2008). Consequently, adverse selection leads to a situation whereby, high-quality borrowers are displaced by low-quality borrowers, which in the long run cause deterioration in the overall quality of bank loan portfolio, thus leading to accumulation of non-performing loans (Bofundi & Gobbi, 2003).

Moral Hazard Theory:

Regarding the banking sector, moral hazard is a principal-agent problem (Kingu, Macha, & Gwahula, 2017). Therefore, in banking, managers have incentives to undertake risky decisions because they stand to gain higher profits and a small portion of downside on their part. On the other hand, there is a higher downside risk to depositors and shareholders (Jensen & Meckling, 1976). Likewise, bank managers experiencing capital pressure tend to react to moral hazard incentives by underwriting high-risk loans at high interest rate with the assumption that, high interest rate will boost profits and capital base. Therefore, high-risk loans may result in higher levels of NPL and high interest rates may have adverse incentive to borrowers. (Kingu, Macha, & Gwahula (2017) argue that moral hazard is normaly linked to bank management behavior through bank balance sheet such as the bank size, loan growth,asset growth, deposit growth and capital adequecy ratio as, changes in all of these items is associated with the decisions made by bank management) once again please avoid very long sentences.

Bad management Hypothesis:

In line with adverse selection, bank managers may lack the ability to underwrite, manage credit risk and manage operating costs, this phenomenon is linked to Bad management hypothesis. According to Berger & DeYoung (1997), the increase in non-performing loans resulting from adverse selection, bank management tends to inject more resources into managing and monitoring bad loans. In the long term, this results in an increase in operating expense over the interest income. Accordingly, higher cost to income ratio is a sign of weak bank management in underwriting, monitoring and control of loan portfolio (Louzis et al, 2012).

Financial Accelerator Model:

According to Williamson (1985), theoretically, business cycle models with an explicit role for financial intermediation offer a good background for modelling NPL as they highlight the countercyclicality of credit risk and business failures. Furthermore, regarding these models, the financial Accelerator Model as discussed in (Bernanke & Gertler, 1989) and (Kiyotaki & Moore, 1997) has become the most prominent theoretical framework for discussing macro-financial linkages. As a result, it is influential in the modeling of both NPL and its interaction with macroeconomic performance. Likewise, according to Messai & Jouini (2013) the academic literature provides evidence to suggest a strong relationship between the NPL and many macroeconomic variables. Therefore, macroeconomic environment has an impact on the assessing borrowers and their ability to have loans. An economy in growth is favorable to an increase in revenues and a decrease in financial distress (Messai & Jouini, 2013).

3.3 EMPIRICAL LITERATURE

Most studies done on determinants of credit risk focus on the developed and larger emerging economies due to availability of data.

Mpofu & Nikolaodou (2018), the study examined the impact of macroeconomic factors on the ratio of non-performing loans to total gross loans in 22 Sub-Saharan African economies. The study applied a dynamic panel data approach over the period of 2000 - 2016 employing pooled - OLS, Fixed effects, two-step difference and system GMM estimation techniques. The dependent variable used is NPL whereas independent variables are GDP growth rate, unemployment rate, lending interest rate, inflation rate, domestic credit to private sector by banks as percentage of GDP, VIX which is the Chicago Board Options Exchange Market Volatility Index, real effective exchange rate, a dummy variable for the 2008/2009 financial crisis, real GDP growth rate of the United State and trade openness. The results show that, an increase on the real growth rate is statistically and economically significant in reducing NPL. Furthermore, as a proxy of global volatility, trade openness and the dummy variable for the 2008/2009 global financial crisis, all have a positive and significant impact on NPL's. The study suggests that, the deterioration of macroeconomic environment increases credit risk in the Sub-Saharan African banking system. The study suggests that policies geared to improve the macroeconomic environment be implemented as they could bring substantial benefits to the banking sector by reducing the likelihood of defaults and minimizing credit risk.

Ahmad & Ariff (2007) studied the determinants of credit risk of commercial banks in emerging economies compared with developed economies. The countries representing developed countries are Australia, France, Japan and US and India, Korea, Malaysia, Mexico and Thailand representing emerging economies. The study uses a cross sectional data of individual bank balance sheet and income statement items of commercial banks. Non-Performing loans was used as a dependent variable whereas management efficiency, loan loss-provision, loan to deposit ratio, leverage, regulatory capital, funding costs, liquidity, spread and total assets are bank specific explanatory variables. The results management quality is critical in the case of loan-dominant banks, example emerging economies. Leverage is insignificant determinant of credit risk while loan loss provision seems to be a significant determinant of credit risk.

Messai & Jouini (2013) undertook a study on the micro and macro determinants of non-performing loans for 85 banks in three countries (Italy, Greece and Spain) for a period of 2004

to 2008. The study used a panel regression method. The dependent variable is measured by NPLR (non-perfoming loan by total loans) where as the independent variables are growth rate of GDP, unemployment rate and real interest rate, return on asset, the change in loans and loan loss reserve to total loans ratio. The results show that, GDP growth and return on asset of credit institutions have a negative impact on non-performing loans.

Ghosh (2015) examines state-level banking-industry specific as well as region economic determinants of non-performing loans for all commercial banks and savings institutions across 50 US states and the District of Columbia for 1984–2013. Using both fixed effects and dynamic-GMM estimations. The results of the study found out that capitalization, liquidity risks, poor credit quality, greater cost inefficiency and banking industry size significantly increase NPLs, while bank profitability lowers NPLs. Additionally, higher state real GDP and real personal income growth rates, and changes in state housing price index reduce NPLs and while inflation, state unemployment rates, and US public debt significantly increase NPLs.

Castro, (2013) made an analysis regarding the determinants of the credit risk in the banking system. Greece, Ireland, Portugal, Spain and Italy are used in the study. Moreover, the author used quarterly data between 1997 and 2001. Data was analyzed by panel data analysis. The variables used in the study are GDP, unemployment rate, interest rates, credit growth, private sector indebtedness, public debt, household index, real effective exchange rate and term of trade. In conclusion, the study noted that, macroeconomic environments have significant influence on credit risk.

Adu & Adjare (2014) studied the determinants of credit risk of commercial banks in Ghana from 2007 - 2014 using robust least square regression analysis. To proxy credit risk, the study used loans and advances standardized by total assets and explanatory variables are management efficiency, leverage, bank size and profit. The study shows a positive significant relationship between credit risk and leverage, suggesting that, highly geared commercial banks are more likely to engage in more lending operations due to profit motives. There is a negative relationship between credit risk and profits measure interest and tax. Management efficiency has a negative significant relationship with credit risk. This denotes that management can utilize assets to generate interest income for their shareholders. In conclusion, the study recommends that commercial banks operating in Ghana should diversify their funds in to reduce credit risk.

A study done by Gabeshi, (2017) on the impact of macroeconomic and bank specific factors on Albanian Non-performing loans. The study period was from 2005 – 2014 with dependent variable NPL and independence variable return-on-equity, GDP, inflation rate, fluctuating-exchange-rate, bank-size, credit-growth-rate and loan-to-deposit. The estimation techique is the muiltiple regresion. Results showed a positive statistically significant link between fluctuating-exchange-rate and loan-to-deposit. Also, the researcher found an indirect link between NPL and credit-growth-rate and ROE.

Mukhtarov, Yüksel, & Mammadov (2018) did a study on the factors that increase credit risk of 10 biggest Azerbaijani banks from 2010 – 2015 and analysed using panel logit method. A proxy for credit risk is non-performing loans. Independent variables have categoried by bank specific factors and macroeconomic factors. Bank specific factors are total assets, capital adequecy ratio, return on equity, total loans and total expense whereas macroeconomic factors include inflation, GDP growth, unemployment, exchange rate, deposit interest rate. The results showed that, there is a negative relationship between capital adequecy and credit risk. There is a positive relationship between unemployment and credit risk, if unemployment rate is high, it increases the probability of default.

Farhan et al, (2012) studied the economic determinants of non-perfoming loans, a perception of Pakistani bankers since 2006 for top 10 banks. Variables used in the paper are non-perfoming loan (dependent variable) and interest rates, energy crisis, unemployment, inflation growth in gross domestic product and exchange rates. The study used multiple regression analysis to measure the impact of independent variable on non-performing loans. The results showed that interest rate, energy crisis, unemployment, inflation and exchange rate have a significant and positive relationship with non-performing loan. GDP growth has a significant negative relationship with NPL. The study note that, bad performance of energy sector along with poor economic setting are the main factors causing non-performing loan in Pakistan. Unemployment also has a positive significant relationship with non-performing loans.

Abid, Ouertani, & Zouari-Ghorbel (2014) study on the macroeconomic and bank specific determinants of household's non-performing loans in 16 Tunisian banks from 2003 - 2014. A dynamic panel data approach was used, and the estimation technique is GMM systems. The dependent variable used is non-performing loans. Since the determinants are bank specific and macroeconomic, bank specific explanatory variables are, return-on-equity, solvency ratio,

inefficiency and bank size. The macroeconomic factors are real GDP growth rate, inflation and real lending rate. The results from the study suggest that, all the macroeconomic factors have effect on NPL's. Results share the same sentiments with Mpofu (2018) who studied the impact of macroeconomic factors on the ratio of non performing loan in Sub-Saharan Africa. Regarding the bank specific factors, ROE and inefficiency which are decided by the operating income, as part of the study hypothesis, these were linked to quality of management. These factors are considered as a key factor for future bad loan. The study continues to imply/suggest that to avoid future financial instability, regulators should take into account the system of credit risk management and the banks procedure.

Tsumake & de Jager (2016) did a study on, what is the determinants of non-performing loans in Botswana. The dependent variable is non-performing loans and explanatory variable include inflation rate, real interest rate, real gross domestic product, unemployment rate, credit growth, profitability, capitalisation, industry size, and diversification. The authors used multiple regression analysis to analyse the data from 2005 to 2014. The study concluded that, inflation, interest rates, real GDP, unemployment, profitability, industry size and credit growth have a statistically significant effect on the level of NPL. However, the study revealed that there is an insignificant effect of capitalisation and diversification on NPL in Botswana. There is a negative relationship between inflation and NPL. On the industry level variable, there is a positive relationship between NPL and the industry size and credit growth.

Garr, D. K. (2013) did a study on the determinants of credit risk in the banking industry of Ghana, covering 33 commercial banks over 21 years, that is from, 1990 to 2010. The study used bank-specific factor (ownership and management efficiency), industry-specific (financial sector development and competition) and macroeconomic factors (macroeconomic instability and macro-policy environment). The study used panel data regression technique. The results of the study show that there is no significant relationship between ownership and credit risk. There is a negative relationship between management efficiency and credit risk.

Kingu, Macha, & Gwahula (2017) made a study on the bank specific determnants of non-performing loans with an empirical evidence from commercial banks in Tanzania. The study used a panel data with 16 commercial banks for a period from 2007 to 2015. The dependent variable used is NPL ratio while the independent variables are bank size, capital adequacy, loan growth, deposit growth, cost to income ratio, net income margin and loan to asset ratio. Findings of the study showed that, growth in total assets,higher loan to asset ratio are assiciated

with decrease in NPL. On the other hand, higher cost to income ratio is associated with the increase in NPL.

CHAPTER 4

METHODOLOGY

4.0 INTRODUCTION

The section presents the methodology adopted by this study. This subsection discusses the model specification, techniques of data analysis and estimation, data type and source and description of data variables and expected signs.

4.1 MODEL SPECIFICATION

Based on the theoretical relationship among variables, panel regression models were developed as per the objective of the study. The study employed a modified version of the econometric model of Kingu, Macha, & Gwahula (2017) and Messai & Jouini (2013). The model examines both bank-specific and macroeconomic determinants of credit risk. Therefore specific model is given as,

$$NPLR_{it} = \alpha + \beta_1 CAR_{it} + \beta_2 ROA_{it} + \beta_3 ME_{it} + \beta_4 LTD_{it} + \beta_5 INF_t + \beta_6 GDPGR_t + \beta_7 UNEMR_t + \varepsilon_i \quad (4.1.1)$$

Where i indexes bank and t denotes the year, $NPLR\ is\ non-performing\ loan\ ratio$ proxy for credit risk, CA is the capital adequecy ratio, ME is the management efficiency, LTD is the loan to deposit, INF is the inflation rate, $GDPGR$ is the gross domestic product growth rate, $UNEMR$ is the unemployment rate and ε is the error term.

The study did not incorporate the industry specific factors as they have been included in the study done by (Tsumake & de Jager, 2016). The results were evident that they were significant in impacting non-performing loans. Therefore this study builds on that of (Tsumake & de Jager, 2016) by including the banks-specific factor affecting credit risk.

4.2 TECHNIQUES OF DATA ANALYSIS AND ESTIMATION

To comply with the objective of this research, the study is based on the quantitative research which adopts an econometric model to identify and measure determining factors that have an effect on credit risk. Since the study uses three listed commercial banks in Botswana which are First National Bank of Botswana, Barclays Bank of Botswana and Standard Chartered Bank with several explanatory variables measured over time, the study adopts the fixed effects model. According to Baltagi, (2001), panel data refers to pooling of observation of cross sections over several time periods.

Hsiao, (2014) and (Klevmarken, 1989) denotes the benefits of using panel data as below,

- Panel data controls individual heterogeneity and cannot be controlled by time series and cross-sectional studies. It allows control for variables that cannot be observed and reduces biasness.
- It gives more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficient. Time series are overwhelmed with multi-collinearity, which gives biased results.
- Panel data are better able to study the dynamics adjustment. (Baltagi, 2005) cross sectional distributions hide a multitude of changes.

Baltagi, (2005) cited the short comings of using panel data such as data collection problems, short time-series dimension, distortions of measurement errors and that the model denies the individuality or heterogeneity (Greene, 2012). Data is sourced from the commercial bank's annual reports from 2005 to 2017. All banks under study are listed on the stock exchange and they are required to publish their financial statements publicly by stock exchange (Botswana Stock Exchange Limited, 2003).

Panel data models examine group effects, time effects or both in order to deal with heterogeneity or individual effects. There are three types of models regarding panel data being pooled regression, fixed effects and random effects.

Pooled regression:

Pooled regression is carried out on the time-series cross-sectional data, that is, data that has observations for several different units or cross-sections over time. Pooled regression model is used when groups pooled are relatively similar and homogeneous. In this case, banks are similar in that, they are both listed commercial banks in Botswana and have vast experience.

Fixed Effect Model: It examines individual differences in intercepts, assuming the same slopes and constant variance across individual (Torres-Reyna, 2007).

Random Effect Model: It is used when the variation across estimates are assumed to be random and uncorrelated with the independent with the independent variables (Green, 2012). The model assumes the variation between entities has influence on the depended variables and, that the firm's error terms are uncorrelated with the predictors, which allows time-invariant variables.

The difference between the models is the dummy variable. In fixed effect models, dummy variables are part of the intercept and the error component as a component of the random effect model. Therefore, the Hausman test is used to choose an appropriate model.

The Hausman test's null hypothesis: Individual effects are uncorrelated with other regressors in the model.

If the p-value is less than $\alpha = 0.05$, the fixed effects model is better than the random effects. In the fixed effects model, individual effects are a part of the intercept and the correlation between the intercept and regressors does not violate Gauss-Markov assumption, hence fixed effects model is still BLUE.

However, according to Gujarati (2004), if T (number of time series data) is large and N (the number of cross-sectional units) is small, there is likely to be a little difference in the values of parameters estimates by Fixed effects model/FEM and random effects model/REM. Therefore, the choice is based on computational convenience. On this score, FEM may be preferable as the number of time series is (i.e. 13 years) is greater than the number of cross-sectional units (i.e. commercial banks). Therefore, the use of the Hausman test is inconsistent.

Therefore, the study continues to use the Wald test to find which model is appropriate between pooled regression and fixed effects. The hypothesis is as below,

Null hypothesis: *Pooled regression is an appropriate model*
Alternative hypothesis: *Fixed effects model is an appropriate model.*

We then reject the null hypothesis if the p-value is less than 5%.

4.3 DATA TYPE AND SOURCE

The study will use secondary data from the three commercial banks in Botswana to examine the determinants of credit risk for the period of 2005 to 2017. Data will be derived from the banks Annual Financial Statements, Botswana Financial Statistics, Bank of Botswana Reports, Statistics Botswana. The banks used are Fisrt National Bank of Botswana, Barclays Bank of Botswana and Standard Chartered Bank of Botswana. The rationale for using these banks is because of their long operation in Botswana, has experienced different economic turbulances and availability of information, as they are listed on the Botswana Stock Exchange.

The limitation of the study is that, unlisted banks do not publish their financial statements consistantly, only when they register a bond with the stock exchange (Botswana Stock Exchange Limited, 2003). Therefore inconsistancy regarding their Annual Financial Statements.

4.4 DESCRIPTION OF VARIABLES AND EXPECTED SIGNS

According to Basel Committee of Banking regulation Supervision (2001) credit risk is defined as the possibility of losing the outstanding loan due to the credit events (defaulting risk). Most authors used different credit risk measures as an indicator of credit risk. Financial ratio's such as NPL total loans, loan loss reserve to total loans and loan loss provision to total loans were used as a proxy for credit risk is several credit risk determinant related literature. Generrally, the ratio of non-performing loans to total loan was considered by (Mpofu & Nikolaodou, 2018; Ahmad & Ariff, 2007; Farhan et al, 2012; Mukhtarov, Yuksel, & Mammadov, 2018 and Tsumake & de Jager, 2016). The amount of non-performing laons represents the quality of bank assets (Tseganesh, 2012). Therefore this study will use the ratio of non-performing loans to total loans. According to (Bank of Botswana, 2015) credit risk is the risk that would arise if an entity that the bank conducts business with is unable to meet its financial obligations or in the event of adverse credit event or default. Furthermore, Senatla & Basutli (2016) noted that, NPL's are loans that have been in arreas for 90 days or more and for which provisions are raised. These are recorded as impairment of advances on the income statement of commercial banks. Therefore, credit risk will be defined as the allocation of NPL (impairment of advances) to total loans and advancements.

$$NPLR = \frac{NPL(Impairment\ of\ advances)}{Total\ loans\ and\ advances} * 100$$

Bank specific variables used in this study are capital adequacy ratio, return on assets, management efficiency and loan to deposit ratio.

Capital adequacy ratio (CAR):

Wood & Skinner (2018), capital adequacy ratio measures a banks solvency and ability to absorb risk. It is also known that, capital risk weighted asset ratio is used to protect the depositors and promote stability and efficiency of the financial system. Theoretical, the impact of CAR on non-performing loans is uncertain (Wood & Skinner, 2018). Demirguc-Kunt & Huizinga, (1999) noted that, bank with high levels of CAR may pursue opportunities more aggressively, which increase risk taking leading to riskier credit portfolios. Conversely, Wood & Skinner (2018), via moral harzard argument, banks with low capital may be inclined to engage in risky lending and increased non-performing loans. According to the study, this behaviour is more likely to happen deposit insurance schemes are in place. Therefore CAR is expected to have a negative impact on non-performing loans. So, as for this study, we expect to have negative sign for CAR and credit risk.

$$Capital\ adequacy\ ratio\ (CAR) = \frac{Equity}{Total\ assets}$$

Return on Assets (ROA):

Wood & Skinner (2018) indicates the ability of bank management to generate profits by utilising the available assets of the banks. As a measure of bank profitability, ROA is defined by banks's after tax profits over total assets Flamini et al (2009). The choice for ROA as a proxy for bank profitability instead of return on equity (ROE) is in line with Flamini et al (2009), that is, ROE disregards financial leverage and the risk associated with it. Though ROA may be biased due to off balance sheet activities, such activities are negligible in Sub-Saharan African bank (Flamini, et al 2009). Godlewski (2004) and Kasana & Naveed (2016), banks performance negatively impacts the level of NPL. Therefore, this study expects ROA to have a negative impact on credit risk.

$$Return\ on\ Assets\ (ROA) = \frac{Net\ profits}{Total\ assets}$$

Management Efficiency:

Managerial efficiency is measured by the ratio of operating expenses to operating income. Berger & DeYoung, (1997), found that poor performance, poor credit evaluation and monitoring skills and wrong collateral evaluation can lead to future growth in NPL.Ganic, (2012) concluded that, efficient banks have sound and effective credit strategy, policy and procedure with strong credit culture that enable to undertake credit risk management functions properly and reduce operating expenses. A negative sign is expected between management efficiency and credit risk.

$$Management\ Efficiency\ (ME) = \frac{Operating\ Expense}{operating\ Income}$$

Loan To Deposits (LTD):

This is the ratio of total credit to loans. It examines the bank liquidity by measuring the funds banks has utilized into loans from the deposits. It demonstrates the relationship between deposits and loan. Dessie, (2016) found a negative relationship between loan to deposit and credit risk. A negative sign is expected.

$$Loan\ to\ Deposit\ Ratio\ LDR) = \frac{Total\ Credits}{deposits}$$

Macroeconomic factors used in this study are inflation, GDPGR, interest rates and unemployment rate.

Inflation Rate:

Inflation is the general increase of prices. This affect the purchasing power of currency, as inflation increases, cost of borrowing gets expensive and deteriorate the quality of loan portfolio. Inflation favours borrower than lenders and saver as it reduces the purchasing power of currency. Klein, (2013); Mpofu, T. R., & Nikolaodou, E. (2018) and Farhan, et al., (2012) found that there is a positive relationship between NPL's and inflation. On the contrary, Tsumake & de Jager (2016) found a negative relationship between inflation and NPL. Theoretically, inflation should reduce the real value of debt. Interest rates may pass through to nominal interest rates, reducing the capacity to repay the debt. High inflation rates are normally associated with a high loan interest rates. Therefore, a positive relationship is expected.

Gross Domestic Product Growth rate:

It measures how fast the economy is growing. GDP is the total market value of all final goods and services produced within a country in one year. Empirical studies have shown a negative relationship between growth in GDP and non-performing loans (Louzis, et al,, (2012; Farhan, et al., (2012)). Therefore, an increase in the growth of GDP enhances the loan capacity of the borrowers which then contributes to lower bad loans. A negative relationship is expected.

Unemployment Rate:

Theoretically, an increase in the unemployment in the country negatively affects the income on individuals and increases their debt burden. If a person loses a source of income, repayment of the loan becomes difficult, thus leading to non-performing loans. Empirical studies note a positive relationship between unemployment in the economy and non-performing loans (Nkusu, 2011). Therefore, a positive relationship is expected.

CHAPTER 5

ESTIMATION AND ANALYSIS RESULTS

5.0 INTRODUCTION

This chapter presents the analysis of the results. The sections are organised as follows; section 5.1 deals with descriptive statistics to determine the structure of the data, 5.2 deals with the panel root test, 5.3 deals with correlation, 5.4 deals with normality, 5.5-model specification and lastly 5.6 which deals with the interpretation of regression results.

5.1 DESCRIPTIVE STATISTICS

The descriptive statistics examined bank specific and macroeconomic determinants of credit risk. Bank specific variables are derived from audited financial statements of commercial banks and macroeconomics factors are obtained from Bank of Botswana, Statistics Botswana and World Bank Data.

Table 5.1 provides a summary of descriptive statistics of dependent and independent variables for the three-listed commercial Banks in Botswana from the year 2005 to 2017 with 39 observation. The table shows the mean, minimum, maximum, standard deviation and number of observations. The dependent variable of the study is non-performing loan ratio whereas bank specific variables are management efficiency (ME), capital adequacy ratio (CAR), return on assets (ROA) and loan to deposit (LTD). Macroeconomics factors are unemployment rate (UNEMR), inflation rate (INFLR) and GDP growth rate (GDPGR).

Non-performing loans measured by non-performing loans/impairments to total loans and advancements, has an average mean of 1.38%, a minimum of 0.01% and a maximum of 3.44%. The results give an indication that, the total loans disbursed from the three listed commercial banks has an average of 1.38% relating to non-performing loans over sample period. The lowest non-performing ratio was 0.01% and the highest being 3.4%. The standard deviation for non-performing loans 0.85%, thus implying that there is a small variation among the three banks in terms of their loan recovering capacity varies from the mean by 0.53%.

Among bank specific independent variables, management efficiency as measured by operating expense to operating profit has an average mean of 1.47, a minimum 0 and maximum of 10.28. If the ratio increases, it gives an indication that the management is inefficient in reducing its cost for profit maximization. Maximum value of management efficiency of 102.8% was from Standard Chartered Bank of Botswana in 2015. This depicts that management was inefficient in controlling operation cost. In the same year, the bank had made a profit after tax of P 47 391 million from P 319 184 million in 2014. Significant expense that contributed to reduction of income is interest expense and impaired financial assets (impaired loans).

Looking at LTD, the minimum and maximum values ranges from 0.309 to 1.044 with an average mean of 67.8%. A maximum value being greater than one (1.044189) implies that one of the three commercial banks borrowed money to fund their loan book rather than relying from its customer's deposit. The particular bank in this case is Barclays Bank of Botswana in 2017. A minimum value of 0.309 suggest that, the banks used money from its customers rather than borrowing.

Return on assets measures how much banks are efficiently earning from the loans given to clients. Profitability measures indicates that, listed commercial banks in Botswana have an average mean of 3.10% for the period under study. From the sample, the minimum and maximum for return on assets are 0.36% and 5.72% respectively. This indicates that, most profitable banks earned 5.72% from loans disbursed.

The remaining independent variables are macroeconomic indicators that affecting credit risk. The mean value of GDP growth rate was 4.6, indicating the average growth rate of the economy over the study period. The maximum GDP growth rates recorded was 11.3 in 2013 and the minimum was -7.7 in 2009. The GDPGR for the study period has not been steady over time. From the study period, in 2015 the GDP growth contracted by -1.7, where we saw the Government making a strategic decision to introduce the Economic Stimulus Package to boost the economic growth through. This was achieved through increased government spending in identified sectors, diversify the economy and accelerate employment creation.

Table 5.1: Descriptive statistics:

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	No. of Obs.
NPLR	0.013759	0.011579	0.034350	0.000135	0.008545	39
ME	1.466586	1.061816	10.28381	0.000000	1.748407	39
LTD	0.677999	0.684226	1.044189	0.309160	0.205840	39
ROA	0.031033	0.031476	0.057213	0.003609	0.010672	39
UNEMR	17.68831	17.86000	19.83200	15.93000	0.973436	39
CAR	-2.554832	-2.438935	-1.989444	-5.264046	0.579939	39
INFLR	6.991667	7.500000	12.60000	2.800000	3.009863	39
GDPGR	4.600000	4.600000	11.30000	-7.7	4.766329	39

Source: Author Computation

Regarding inflation, the average is 6.99, minimum of 2.8 in 2016 and maximum of 12.6 in 2008. Inflation rate is dispersed over the period under study towards its mean with a standard deviation value of 3.00. Accordingly, Bank of Botswana has been closely monitoring monetary development to arrest the speed of inflation and inflation expectation. Therefore, the medium-term objective range of 3 – 6 percent. Lastly, unemployment has an average value of 17.69% and a minimum and maximum of 15.93% and 19.83% respectively.

DIAGNOSTIC TESTS

5.2 PANEL UNIT ROOT TEST

Before using panel data, it is important to check for the stationarity of the variables. Non-stationary variables tends to be spurious, thus rendering inconsistent estimates. The variables in the model were tested for unit root using Fisher's Augmented Dickey-fuller (ADF) and Fisher's Phillips-Perron (PP) methods and the results are presented in Table 5.2.

Table 5.2: Panel Unit Root Test

Variables		ADF Statistics	P-Value	PP Statistics	P-Value
CAR	0	3.8289	0.6998	3.7758	0.7070
	1	8.6363	0.1951	21.3901	0.0016*
	2	7.7936	0.2536	22.6194	0.0009*
ME	0	7.6554	0.2645	5.1634	0.5230
	1	15.4727	0.0169**	16.8315	0.0099*
	2	21.4173	0.0015*	38.1293	0.0000*
ROA	0	3.8416	0.6981	7.3361	0.2909
	1	9.7684	0.1348	20.6706	0.0021*
	2	12.1492	0.0587	41.6070	0.0000*
LTD	0	3.4119	0.7556	7.0457	0.3166
	1	11.9070	0.0641	45.2486	0.0000*
	2	16.7129	0.0104**	63.4574	0.0000*
INFLR*	0	0.8099	0.9918	1.9231	0.9266
	1	17.7025	0.0070*	66.1603	0.0000*
	2	30.4141	0.0000*	63.0918	0.0000*
UNEMR	0	11.4800	0.0746	14.5733	0.0238
	1	12.0100	0.0617	28.9074	0.0001*
	2	9.1871	0.1633	19.9684	0.0028*
GGDPR	0	4.0087	0.6755	9.2922	0.1578
	1	40.4827	0.0000*	55.3653	0.0000*
	2	56.0333	0.0000*	57.9361	0.0000*

Notes: Significance at 1%, ** Significance at 5%. While: 0 indicate at levels, 1 at first difference and 2 at second difference:*

5.3 MULTI-COLLINEARITY

Multi-collinearity test was employed to investigate whether there is any existence of statistically significant linear relationship among explanatory variables in the model. The presence of multi-collinearity results in large variances leading to insignificant estimators. According to Gujarati and Porter (2003) Pearson's pairwise correlations may also be used to detect multi-collinearity between regressors. A correlation coefficient exceeding 0.8 in absolute value is a sign of severe multi-collinearity among variables. The presence of multi-collinearity results in large variances leading to insignificance estimators. Table 5.3 below indicates that multi-collinearity is not a problem as all the correlation coefficients of the regressors are less than 0.8.

Table 5.3: Pearson Correlation Coefficient

Correlation	NPLR	ME	LTD	CAR	ROA	INFLR	UNEMR	GDPGR
NPLR	1.000000							

ME	-0.044166	1.000000						
LTD	0.097877	0.205586	1.000000					
CAR	-0.139554	0.090304	0.395689	1.000000				
ROA	-0.176087	-0.645987	-0.035520	0.324322	1.000000			
INFLR	-0.342732	-0.367752	-0.657030	-0.229644	0.501526	1.000000		
UNEMR	-0.224575	0.041394	0.410213	0.323091	0.191748	-0.327243	1.000000	
GDPGR	-0.253721	-0.201143	-0.169661	0.041023	0.206589	0.232474	0.259110	1.000000

Source; Author Computation

5.4 NORMALITY

Normality test was applied to determine whether the data is well modelled by a normal distribution or not, and to compute how likely an underlying random variable is to be normally distributed. If the residuals are normally distributed, the histogram should be bell-shaped and the Jarqre-Bera statistic would not be significant. Therefore, this means that the p-value should be greater than 0.05% to support the null hypothesis of presence of normal distribution.

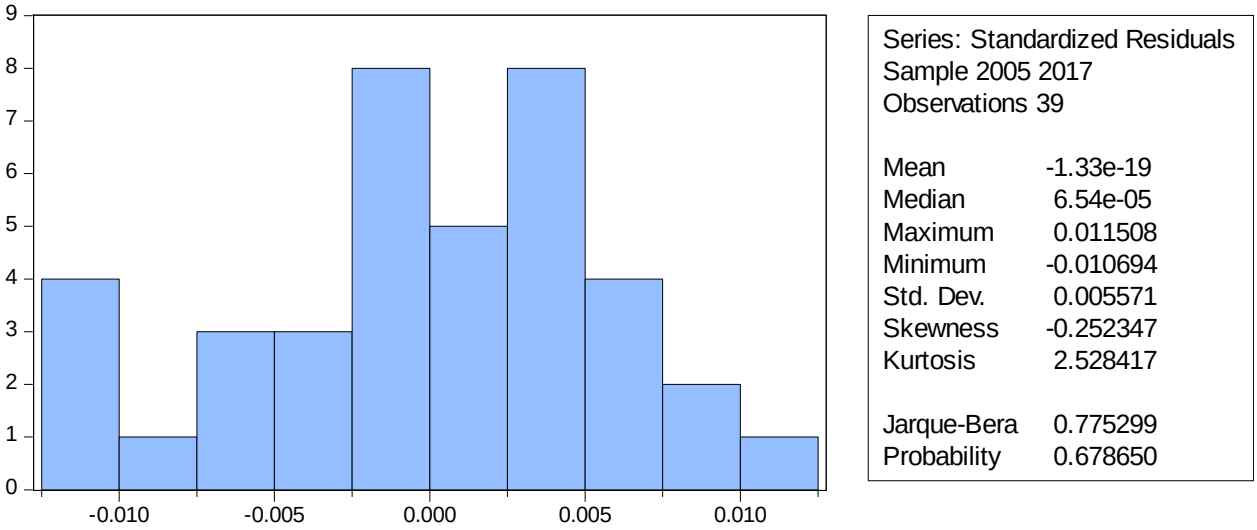
Jarque-Bera test the residuals for normality and testing whether the coefficient of skewness and kurtosis are close to zero and three respectively.

Hypothesis:

Null hypothesis: residuals follow a normal distribution

Alternative hypothesis: residuals do not follow a normal distribution

Figure 5.4: Normality



Source: Author Computation

As shown on the histogram above figure 5.4, the Jarque-Bera statistics is insignificant, therefore we fail to reject the null hypothesis and conclude that the residuals follows a normal distribution.

5.5 MODEL SPECIFICATION

The Pooled OLS Regression and Fixed Effects Models of Credit Risk.

Pooled OLS model uses data that is composed of both time series and cross-section data; it has some strength and weakness. Gujirati. N, (2004) noted that pooled OLS models might improve the relative precision of the estimated parameters since it includes all observation in a regression. One of the basic advantage of the OLS model is that it increases the accuracy of the estimation due to its possibility of increasing sample size. On the other side, it assumes homogeneity amongst the banks, which is an unrealistic assumption (Asteriou & Hall, 2007). So, F-statistics is used to check whether pooled OLS and fixed effect model estimation is appropriate (Gujirati. N, 2004). We therefore use the Wald test to determine the appropriate model to use between the pooled OLS regression and the fixed effects model.

Hypothesis:

Null hypothesis: Pooled regression is an appropriate model
Alternative hypothesis: Fixed effects model is an appropriate model.

Therefore, as shown on the Table 5.5.1, the Wald test for this study has a p-value of 0.0124 for the regression. This indicates that the p-value is significant at 5%; therefore, we reject the null hypothesis and conclude that fixed effects model is appropriate.

Table 5.5.1: Wald Test

Test Statistic	Value	Df	Probability
t-statistic	-2.665203	29	0.0124
F-statistic	7.103308	(1, 29)	0.0124
Chi-square	7.103308	1	0.0077
Null Hypothesis: C(10)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)	Value	Std. Err.	
C(10)	-0.007482	0.002807	
Restrictions are linear in coefficients.			

Source: Author computation

Fixed Effect Model Results:

As already noted above, the Wald test specified that the fixed effects model is an appropriate model to estimate the results in this study. The model is appropriate as the focus is on homogeneity of groups and the choice of the bank was not random. The fixed effect model will produce unbiased estimates of β. Therefore, the operational panel regression model used to find the determinants of credit risk of commercial banks in Botswana is as below,

Table 5.5.2: Fixed Effects Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001784	0.021139	-0.084412	0.9335
ME	-0.001420	0.000546	-2.603536	0.0159
CAR(-1)	-0.016969	0.004269	-3.974650	0.0006
ROA(-2)	0.453599	0.136571	3.321337	0.0030
LTD	0.018295	0.006657	2.748237	0.0115
UNEMR(-2)	-0.002136	0.000818	-2.613092	0.0155
INFLR(-1)	-0.002122	0.000464	-4.569816	0.0001
GGDPR	8.29E-05	0.000190	0.436735	0.6664

Effects Specification
Cross-section fixed (dummy variables)

R-squared	0.790917	Mean dependent var	0.013660
Adjusted R-squared	0.709102	S.D. dependent var	0.008355
S.E. of regression	0.004506	Akaike info criterion	-7.721696
Sum squared resid	0.000467	Schwarz criterion	-7.268209
Log likelihood	137.4080	Hannan-Quinn criter.	-7.569111
F-statistic	9.667125	Durbin-Watson stat	1.854636
Prob(F-statistic)	0.000006		

Source; Author computation

Operational Model:

$$NPLR_{it}(-1) = -0.001784 - 0.016969CAR_{it}(-1) + 0.453599ROA_{it}(-2) - 0.001420ME_{it} + 0.0182951LTD_{it} - 0.002122INF_t(-1) + 0.0000829GDPGR_t - 0.002136UNEMR_t\ (-2) \quad (5.5.1)$$

5.6 INTERPRETATION OF REGRESSION RESULTS

This section discusses in detail the analysis of the results for each explanatory variable and their importance in determining credit risk in Botswana commercial banks. Furthermore, the discussion analyzes the statistical findings of the study in relation to the previous empirical evidence. Hence, the following discussions present the interpretation on the fixed effects model regression results and relationship between explanatory variables and credit risk.

The estimation results reported in table 5.5.2 depicted that, the R-squared values of 0.79 is an indication that the model is a good fit. This means that 79% of variations in non-performing loan ratio of Botswana commercial Banks was explained by independent variables included in the model. However, the remaining 21% changes in credit risk ratio of Botswana commercial banks is caused by other factors that are not included in the model.

Furthermore, the F-statistic is 9.667125 and the probability is 0.000006. This indicates that the overall model is highly significant at 1% and that all the independent variables are jointly significant in causing variation in credit risk.

As in table 5.5.2, the coefficient estimates of capital adequacy ratio, management efficiency, unemployment rate and inflation rate are negatively related to non-performing loans whereas GDP growth rate, return on asset and loan to deposit are positively related to non-performing loans. From the regression, non-performing loans ratio does not respond immediately to changes in some variables: it takes a year to respond to changes in capital adequacy ratio and inflation rate, and half a year to respond to ROA and unemployment rate. Management efficiency, capital adequacy ratio, return on asset, loan to deposit, unemployment rate and inflation rate have shown to be statistically significant whereas GDP growth rate is statistically insignificant towards non-performing loans.

Management efficiency is statistically significant at 2 percent level of significance. For every unit increase in management efficiency, it would reduce non-performing loans by 0.001420. The results are in line with the researches findings and that of Berger, A. N., & DeYoung, R. (1997). Therefore, poor performance, poor credit evaluation and monitoring skills and wrong collateral valuation could lead to future growth in NPL's. Taking lagged values of capital adequacy ratio, the variable became statistically significant at 1 percent, the sign is in line with the researcher's expectation and it adheres to the study done by Mukhtarov, Yüksel, & Mammadov (2018) and (Dessie, 2016)

Return on asset measured as lagged values of bank profitability is positive and statistically significant at 1%. Results shows that, as return on asset increases, non-performing loans tends to increase and is not in line with the study's expectation. Therefore, there is no sufficient evidence to support the positive relationship between non-performing loan ratio and return on assets.

Regarding unemployment and inflation, both have a negative relationship and are statistically significant at 2% and 1% respectively. The results suggest that, if inflation rate and unemployment increase, credit risk will decrease by 0.002122 and 0.002136 respectively. This is in contradiction with what the researcher expected. Generally, regarding inflation, although widely used in similar studies, the results are not clear whether it affects credit risk positively or negatively. The author's results are in line with that of (Nkusu, 2011), whom in his study on

banking sector of emerging markets found that higher inflation can enhance the loan payment capacity of borrower by reducing the real value of outstanding debt and this will result on the negative relationship between inflation and non-performing loan.

Finally, yet importantly, a pooled regression model is computed as per appendix 2 as an alternative model. The results show that only inflation rate and unemployment are statistically significant. The signs for statistically significant variable still did not match what the study expected. However, management efficiency shown a negative relationship similar to the researcher's expected sign. According to appendix 2, the R-squared is 34.6%. The results suggest that 34.6% of non-performing loan ratio of Botswana commercial banks was explained by the independent variables included in the model. Therefore, the remaining 65.4% changes in credit risk ratio of Botswana commercial banks is caused by other factors that are not included in the model. Furthermore, the selected model is a good fit for the study.

Additionally, a third alternative model is considered. The study did not consider lagged values of the dependent and the independent variables. The results of the regression is shown on appendix 3. The model shows that only capital adequacy ratio, return on asset, unemployment rate and inflation are statistically significant to credit risk. However, as per the chosen model, only GDP grow rate is statistically insignificant to credit risk. The R-squared for the chosen model is better at 79%.

CHAPTER 6

CONCLUSION AND POLICY RECOMMENDATION

6.0 INTRODUCTION

This chapter summarizes the study's main findings, draws the conclusion and then offers policy recommendations. Section 6.1 gives a summary and conclusion of the study. Policy recommendations are on the last section 6.2.

6.1 SUMMARY AND CONCLUSION

The main objective of the study was to examine the determinants of credit risk of commercial banks in Botswana. In doing so, the study covered the three listed commercial banks in Botswana from 2005 to 2017. To achieve the intended objective, the study used fixed effects panel regression model for the seven variables, which were bank specific and macroeconomic variables. For bank specific variables, the author used audited financial statements collected from Botswana Stock Exchange. As for macroeconomic variables, they were collected from Bank of Botswana, Statistics Botswana and World Bank Indicator Data.

The independent variable include capital adequacy ratio (CAR (-1)), management inefficiency (ME), return on asset (ROA (-2)), loan to deposit (LTD), inflation ratio (INFLR (-1)), unemployment rate (UNEMR (-2)) and GDP growth rate (GDPGR), whereas the dependent variable is non-performing loans ratio (NPLR (-1)). Data was analyzed using descriptive statistics, correlation, normality and finally the fixed effects regression results. The results showed that management efficiency, capital adequacy ratio, return on assets, loan to deposit, inflation and unemployment rate are statistically significant to affect credit risk, whereas GDP growth rate is insignificant in affecting credit risk in the Botswana commercial banks.

In addition, the study has found that capital adequacy ratio, management efficiency, unemployment ratio and inflation rate showed a negative coefficients, whereas loan to deposit, return on assets and GDP growth rate have a positive coefficients.

Conclusion

Regarding the capital adequacy ratio on credit risk in Botswana commercial banks, findings indicate that capital adequacy ratio has a negative and statistically significant relationship in explaining the credit risk of commercial banks in Botswana. This implies that banks with strong capital adequacy have a tendency to absorb possible loan losses and thus reduce the level of credit risk due to efficient utilization of its capital. Therefore, capital adequacy is one of the main determinant factors of credit risk in commercial banks in Botswana.

Return on assets has a positive and statistically significant relationship in explaining credit risk. The sign differs from the initial assumption. This means, there is no sufficient evidence to support the positive relationship between non-performing loan ratio and return on assets. On the other hand, inflation rate and unemployment rate are negative and statistically significant in explaining credit risk on the Botswana commercial banks. The author expected positive sign for unemployment which is in line with results of Tsumake & de Jager, (2016) and Castro, (2013). However, the sign from the result is negative and shows that, there is no sufficient evidence to support the positive relationship.

Lastly, management efficiency is negative and statistically significant to credit risk. The results are in line with that the researcher. However, regarding GDP growth rate, though the variable is statistically insignificant, the sign is also inconsistent with that of the study.

6.2 POLICY RECOMENDATIONS

Based on the findings of the regression analysis and conclusion, the following policy recommendations were raised,

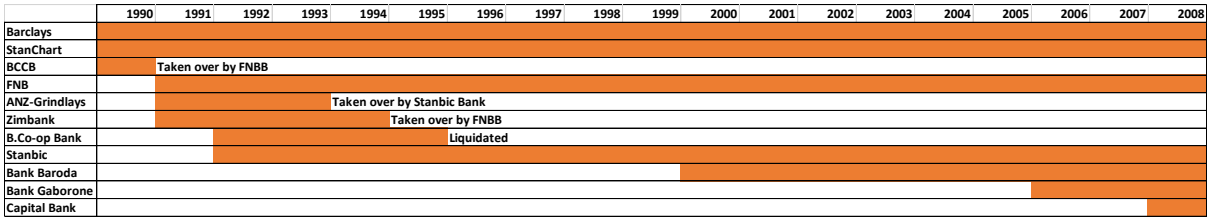
Commercial banks should consider the impact of bank specific and macroeconomic factors when giving out loans. More precaution measures need to be taken into account during times of high inflation and unemployment. Commercial banks should maintain high credit standards to reduce credit risk to sustain profits. Furthermore, this will help banks to detect early warning of potential risk in the future.

Household sector is highly indebted and it is worrisome to the banking sector given high levels of unemployment in the country. Monitoring unemployment and inflation by the government and the central bank is vital in reducing credit risk. There is substantial evidence that management efficiency has a significant impact on credit risk, it is therefore advisable that, to improve the bank's assets, bank management and credit analyst should give more attention to origination and loan portfolio performance. This will assist to curb loan loss, default rates and improve profitability.

Commercial banks should also strive to improve their capital level through mobilizing funds by issuing more shares to the new and existing shareholders. Highly capitalized banks are good in absorbing more losses. These losses may be a result of non-performing loans. Banks are therefore encouraged to increase their non-interest income contribution to total revenue. Recommendation towards the central bank is to continue monitoring inflation to maintain price stability and medium-term growth of the economy.

APPENDICES

Appendix 1: Commercial Banks timeline



Source: Econsult

Appendix 2: Pooled Regression Model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.079889	0.030075	2.656288	0.0124
CAR	-0.003697	0.002891	-1.278734	0.2105
ME	-0.000203	0.001112	-0.182326	0.8565
ROA	0.309275	0.254847	1.213573	0.2341
LTD	-0.007559	0.009375	-0.806244	0.4262
UNEMR	-0.003530	0.001672	-2.111731	0.0429
INFLR	-0.002403	0.000833	-2.884511	0.0071
GGDPR	-0.000110	0.000296	-0.373128	0.7116

R-squared	0.346979	Mean dependent var	0.013759
Adjusted R-squared	0.199522	S.D. dependent var	0.008545
S.E. of regression	0.007645	Akaike info criterion	-6.728732
Sum squared resid	0.001812	Schwarz criterion	-6.387489
Log likelihood	139.2103	Hannan-Quinn criter.	-6.606297
F-statistic	2.353092	Durbin-Watson stat	0.945288
Prob(F-statistic)	0.047499		

Author's computation

Appendix 3: Fixed Effects Model Results variables

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.076904	0.027107	2.837000	0.0082
ME	0.000459	0.000953	0.482111	0.6333
CAR	-0.005850	0.002683	-2.180014	0.0375
ROA	0.484432	0.226019	2.143325	0.0406
LTD	-0.009951	0.008201	-1.213377	0.2348
UNEMR	-0.003789	0.001437	-2.636951	0.0133
INFLR	-0.002816	0.000741	-3.800865	0.0007
GGDPR	-7.49E-05	0.000247	-0.303381	0.7638

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.574922	Mean dependent var	0.013759
Adjusted R-squared	0.443001	S.D. dependent var	0.008545
S.E. of regression	0.006378	Akaike info criterion	-7.055505
Sum squared resid	0.001180	Schwarz criterion	-6.628951
Log likelihood	147.5824	Hannan-Quinn criter.	-6.902461
F-statistic	4.358085	Durbin-Watson stat	1.444864
Prob(F-statistic)	0.001153		

CHAPTER 7

7.0 REFERENCE

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