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College of Business and Economics

MBA Finance

THE IMPACT OF CREDIT AND OPERATIONAL RISKS ON FINANCIAL PERFORMANCE OF COMMERCIAL BANKS IN RWANDA: A PARTIAL LEAST SQUARE STRUCTURAL EQUATION MODEL APPROACH

EVIDENCE FROM FIVE SELECTED COMMERCIAL BANKS IN RWANDA

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A Research Project submitted to the school of business and Economics, MBA Finance, in Partial fulfillment of the requirements for the Degree of MBA in Finance of University of Rwanda

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DECLARATION

I' Danielle Ndashimiye, hereby declare that document presented, this dissertation entitled: *"An Analysis of Credit and Operational risks on Financial Performance of Commercial Banks in Rwanda: A Partial Least Square Structural Equation Model Approach"*, is entirely my own work and has not been submitted in whole or in part to any other high learning or academic institution for any degree or examination in any indicated and acknowledged by complete references.

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Date: …./08/2021

CERTIFICATION

This is to certify that this work entitled "*An Analysis of Credit and Operational risks on Financial Performance of Commercial Banks in Rwanda*: *A Partial Least Square Structural Equation Model Approach*" was done by Danielle Ndashimiye with Reg n° 219016156 a student in the Finance, MBA, Batch 11, University of Rwanda/ College of Business and Economics (UR-CBE) in partial fulfillment of the requirements for the award of the masters' degree in business under my guidance and supervision.

Supervisor: Dr. Samuel Mutarindwa.

Signature: ……..

Date: …./08/2021

DEDICATION

I dedicate this thesis to:

My son and daughter;

My parents;

My siblings.

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I am humbled and very thankful to the Almighty God for protecting and guiding me, to have been my guider and my helper, grating the gift of life and courage throughout my work.

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ABSTRACT

The aim of this study was to assess the effect of credit risk and operational risk on financial performance of selected Rwandan commercial banks that are registered at Rwanda Stock Exchange. The specific objectives were to assess the levels of credit risk, operational risks, and bank's financial performance, and to examine the effects of both credit and operational risks on the financial performance of commercial banks operating in Rwanda. To achieve these objectives, this study used a partial least squares structural equation model (PLE-SEM) estimation technique with data sourced from banks' financial statements and annual reports for the period of 2013 to 2018.

Results in this study show that higher credit risks as proxied by non-performing loans (NPL) ratio significantly reduces banks' return on assets (ROA) and moderately increases banks return on equity (ROE). In addition, higher operational risks significantly reduce banks' return on assets but increases banks' return on equity. In other findings, banks' age significantly increases banks' financial performance (both ROA & ROE).

This study provides both academic and policy implications. It adds to the rare literature on the measures of credit and operational risks as required by Basel II & III financial requirements on Pillar II (Capital requirements). In addition, it uses a novel and rarely used estimation technique in measuring banks' financial performance (PLE-SEM). This study also contributes to policy by recommending central bank to implement proficient credit risk and operational risk management measures in place to protect the financial performance of the commercial banks. This will not only protect the assets of the banks and safeguard investors' interests but also harden to the business entities, individuals' benefit and the entire economy at large. Regulators should also set policies that will reinforce the banking industry mainly policies that bothers around risk management.

Keywords: Operational risk; Credit risk; PLS SEM; Financial Performance; Commercial Banks

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LIST OF ABREVIATIONS, SYMBOLS, ACRONYMS AND SIGNS

MINECOFIN : Ministry of Economy, Commerce and Finance

COGEBANQUE : Compagnie Générale de Banque

BPR : Banque Populaire du Rwanda

RSE: Rwanda Stock exchange

BK: Bank of Kigali

UR/ CBE: University of Rwanda/ College of Business and Economics

PLS: : Partial Least Square

SEM :Structural Equation Modeling

RCM: Rwanda Capital Market

OTC: Over The Counter

DR: Doctor

ROA: Return On Asset

ROE: Return On Equity

NIM: Net Interest Margin

MINICOM : Ministry of Commerce

US: United States

CD: Certificate of Deposit

FDH: Free disposal Hull

SFA: Stochastic Frontier Approach

MP: Market Power

BNR: Banque Nationale du Rwanda

NPL: Non- Performing Loans

ES: Efficiency Structure

CAR :

LTD :

CAMEL: Capital Adequacy, Assets quality, Management efficiency, Earnings ability and Liquidity

GDP: Gross Domestic Product

%: Percentage

SD: standard Deviation

Chapter 1. INTRODUCTION

1.1 Background of the study

Risks are inherent for any institution in the world but, the financial institutions are likely to be exposed given their nature of activities (Dionne, 2013). (Bessis, 2002) Considered as a model and process that allows the implementation of banks' risk- based policies and practices the main risk management depict financial institution include market risk, interest rate risk, liquidity risk, credit risk, and operation risk. Balthazar (2006) stated that banks have economic vital function which give them access to funds through collective savers money, issuing debt securities or borrowing on the inter- bank markets. Those funds collected are invested in short-term and long-term risk assets and consist mainly of credits to other various economic actors. However, risk management are based on policies and practices that have a common goal: enhancing the risk return profile of the bank portfolio (Bessis, 2002).

To enhance the productivity and growth of banks, the financial intermediaries are the main source of funding if they are efficiently mobilized with allocated funds (Mona, 2017). Therefore, given the importance of banks, it is important to maintain a strong capital base which serves as a cushion against diverse risks that occur within banks and absorb losses. Effective bank regulations and powerful supervision are able to create better and profitable banking sector in order to withstand negative shocks and maintain financial system stability (Mona, 2017).

In addition, risk management study started with the Basel I after the Second World War around 1950. At this stage, it was mainly related to market risk (Dionne, 2013). In 1950, market risk was perceived as a very costly and incomplete for protection against pure risk. However, in the 1970's the market risk arose the use of derivatives as risk management instruments, which expanded rapidly in the 1980's, when the intensified their financial risk management, in the 1990's began international risk regulation, when the internal risk management and capital calculation formulation were developed by financial institutions to hedge against unanticipated risks and reduce regulatory capital. (Dionne, 2013). Morton and Mun (2008) stated that in 2003 Basel II rise and went beyond Basel I minimum capital requirements, allowing lenders to use the internal models to ascertain regulatory capital while seeking to ensure that banks amend and improve risk management culture from the bottom up. In the 2009's arose the Basel III which

aimed to strengthen the global bank capital, enhance liquidity position and develop a strong framework for resilient banking systems which aimed to strengthen banking capital, liquidity and risk assessment by developing two liquidity ratios and one leverage ratio (Mona, 2017). Bank for International Settlements (2014) stated that the Basel III illustrated for banks to build up excessive leverage while apparently maintaining strong risk-based capital ratios.

In Rwanda, the Rwanda financial sector was created through the National Bank of Rwanda in April 1964. Till the 1994's Rwandan financial sector' development was seen to be weak as for only there were three operating commercial banks and two specialized banks with a total of less than twenty branches in the country and one microfinance (UBPR) with around one hundred and forty-six branches. But the genocide negatively affected the development of the banking sector and almost both physical and human capital of all banks was destroyed during the genocide, the post genocide period, the number of banks has increased, where in 2002 there were six commercial banks with twenty-eight branches, two specialized banks and one union of financial institutions (UBPR) with one hundred forty-eight branches (NBR, 2004). In 2007, commercial banks operated 38 branches, making only 7 % of all branches of financial institutions. By the end of 2008, 8 commercial banks, 2 specialized banks and 1 Microfinance bank were operating. At the end of 2012, the Rwanda's banking sector was composed of nine commercial licensed banks, three micro-finance banks, one development bank, and one cooperative bank (Ecobank, 2013).

During this time, the Rwandan financial services industry experienced important development, as economic strength and growth increased employment rates and the purchasing power of the Rwandan population, and this led to more penetration of financial products and services. Although the number of adults benefiting from banking services was still relatively low (58%) in 2008, this figure rose up to 72% four years later (Ecobank report, 2013). According to BNR (2010), it is expected that banking penetration will continue to increase as a result of a relatively stable macroeconomic environment and continued economic growth.

In the past, different researches have been made using other models to analyze the bank's profit through the contribution of credit risk and operational risk. But most of those studies did not combine operational risk and credit risk together.

Girling (2013) point out that many banks are still under pressure with the practical accomplishment of operational risk frameworks, to senior management and to board members

that operational risks are being effectively managed and mitigated by chief officers where they are finding themselves facing the daunting task of providing assurances. For the operational risk field traditional market and credit risk approaches offer only partial effectiveness. Ekinci et al., (2019) posited in their study using the panel data 26 commercial banks in Turkey for the period of 2005 to 2017 and panel regression model for analysis, that there was relationship between credit risk management (with non- performing loan) and profitability (with ROA and ROE) of Turkish deposit banks. Kerongo et al., (2016) assessed on 34 banks using regression analysis, the findings showed that the three independent variables which were: operational efficiency, credit risk, and insolvency risk influenced the financial performance. Togtokh (2012), argues in his study on credit risk measurement :case study of Mongolian small and medium sized firms, with 42 firm's financial statements that included bankrupted and non-bankrupted firms for the period of 2007-2008 using financial ratios which were analyzed through Altman's Z -score model, found that 71 percent on prediction accuracy of Altman Z-score to be significantly high while with the logistic regression method , two ratios from an estimated total of 15 ratios which are : retained earnings to total ratio and cash to total asset ratio were significant predictor for a firm's bankruptcy in Mongolian SMEs. Alalade et al., (2014) examined credit risk management and financial performance of selected commercial banks in Nigeria. They analyzed the antecedents as loan and advance loss provision, non- performing loan, total loan and advances, and total asset on accounting ROE and ROA. From the listed 10 selected commercial banks on Nigeria Stock Exchange (NSE) between 2006 and 2010, they found that an important effect on financial performance of commercial banks from the credit risk management and therefore propose that maintaining minimum level of non- performing loans regarding with the stipulation for loans and advances which will improve financial performance during its positive effect on return equity.

Gadzo *et al.,* (2019) assessed the role of credit risk and operational risk on financial performance of universal banks in Ghana using a partial least squared structural equation model (PLS SEM) approach, where they selected 24 universal banks in Ghana. Their findings revealed that the credit risk influenced negatively the financial performance while similarly a negative influence of operational risk influenced the financial performance of the universal banks in Ghana. It was also found that bank specific variables which were measured by: bank leverage, cost to income ratio, asset quality, and liquidity; has considerably influenced both risks as well as the financial

performance of the universal banks positively. Nguli (2016) studied the effect of credit risk on financial performance of commercial banks in Kenya, with 40 banks from 2011 to 2015, using the regression model and descriptive statistics, it was found that CAR had a positive relationship with ROE, liquidity measured by LTD has a negative relationship with R non-performing loans had a negative relationship with ROE as indicated by the co-efficient while size as measured by natural logarithm of total assets has a positive relationship with ROE. Min *et al., (*2002) applied the SEM to examine the link between financial management, capital management and risk management, by using as a research sample property/liability insurance, the results indicated that net effects of risk management decisions on allocation in bond and investment and the adoption of debt and equity and the implementation of derivatives in managing risks.

So far many researches that mentioned above have been made to analyze the financial performance used various models, however, none of these studies used latent variables to represent credit and operational risk in a structural equation model (SEM) nor joint both credit and operation risk to access the degree of their effect on the financial performance of financial institutions. This study will hence seek to discover the effect of both operational risk and credit risk on bank's performance using the Partial Least Squared Structural Equation Modeling (PLS-SEM) that involves path analysis statistical techniques. SEM, for is a better functionality compared to other multivariate techniques including multiple regression, path analysis and factor analysis. (Saghaei *et al.,* 2009), SEM permits complicated variable relationships to be expressed through hierarchical and non-hierarchical, and recursive or non-recursive structural equations to present a more complete picture of the entire model. This makes it one the powerful methods of multivariate data analysis which test the relationships proposed in parsimonious model which has been proved that SEM functionality is better than other multivariate techniques.

1.2 Problem statement

It should be noted that from Basel I and Basel II different models have been created to measure the bank profitability using regression model and structural equation model (SME) among others (Gemar *et al.,* 2019). However, credit risk and operational risk were scarcely used together in the same model for the non-largest commercial banks. In Gemar *et al.,* (2019) study, it has been used only the largest commercial banks in the world excluding African banks, with the variables that were originated from Risk management and financial management that included: capital

adequacy, operations, asset quality, size, profitability, and country profile for the period of 2011 to 2015.

Despite that Gadzo *et al.*, (2019) assessed the role of credit risk and operational risk on financial performance of 24 universal banks in Ghana using a partial least squared structural equation model (PLS SEM) approach, and find that credit risk and operational risk influenced financial performance negatively. However, after added to the model the variables like asset quality, bank leverage, cost to income ratio and liquidity; the model showed that credit risk and operational risk influenced positively financial performance.

In spite of that in Rwanda, BNR (2019) report has indicated that the bank financial performance, continued to increase from Frw 4.6 billion in FY 2017-2018 to Frw 13.6 billion in FY 2018-2019 and this high performance was principally endorsed to good performance from investment portfolio, and cost control measures implemented by the bank, yet, few remain unknown on the effect of credit and operational risks on financial performance.

Furthermore, in Rwanda, BNR (2019) has reported that financial performance is healthy even though the credit risk for staff was likely to be in stage 3 that is 90 days and more outstanding and the NPLs as percentage total loans increased in trade and mining. The NPLs dropped from 6.9% in June 2018 to 5.6% in June 2019 and they are no substantial studies that have addressed the effect of credit and operational risks on financial profitability within commercial banks like Bank of Kigali and I&M Bank. which are using structural equation model (SEM). In fact, this study intent to fill the gap.

Given that there are not only few researches that they have been made in Rwanda on credit and operational risks on financial profitability, but there is lack of studies that are using structural equation model that predict the profitability of non-largest commercial banks. Furthermore, in Gemar *et al*., (2019) study it was not predicted the profitability for commercial banks for low income countries. Lack of written in the review of literature on the direct and indirect effects of credit risk and operational on bank's financial performance using the SEM like approach in Rwanda request a research to fill the gap. In this view this study intends to fill the gap by assessing the relationship between credit risk and operational risk and financial performance of the selected commercial banks in Rwanda using SEM. The choice of SEM is dictated to test the

direct and indirect effects of credit and operational risks on their pre-assumed causal relationship on the financial performance.

. 1.3. Aims and objectives

The proposed research project aim will be to assess how the credit risk and operational risk drive the financial performance of the non-largest commercial banks:

The specific objectives are:

1. To assess the levels of operational risks in commercial banks in Rwanda.

2. To assess the levels of credit risks in commercial banks in Rwanda.

3. To analysis the levels of bank performance

4. To examine the effect of operational and credit risks on the financial performance of commercial banks in Rwanda using the PSL-SEM

1.4 Hypotheses testing

The null hypotheses that will be tested are:

H_{01} There is no relationship between credit risk and the financial performance of commercial banks in Rwanda.

Ha_1: There is relationship between credit risk and the financial performance of commercial banks in Rwanda.

H_{O2}: There is no relationship between operation risk and the financial performance of commercial banks in Rwanda.

H_{03}: Credit risk and operation risk do not drive the financial performance of commercial banks in Rwanda.

H_{a3}: Credit risk and operation risk drive the financial performance of commercial banks in Rwanda.

1.5 Significance of the study

To researcher

This study will academically help the researcher to have Master's degree in Finance option at University of Rwanda as well as to contribute in Rwandan education; this study will also help the researcher to fill the gap in credit and operational risks and financial performance in commercial banks, it will also help the researcher to acquire more knowledge and skills in credit and operational risks as well as their impact on financial performance of commercial banks in Rwanda.

This research will help the researcher to gain more knowledge of how to conduct the scientific research and take managerial decision based on the accurate collected data information.

To commercial banks in Rwanda

The findings of this study will help commercial banks in Rwanda to enhance the vigilance on credit risk and enhance the monitoring on the operational risk management; to maintain the stability of financial performance as well as to improve where there is weakness in credit and operational risks and financial performance.

To University of Rwanda

The findings of this study will help the University of Rwanda to improve the studies on credit and operational risks on commercial banks, it will help the academic researchers to reference the findings as literature review and empirical in researches as well as to find a gap to fill with credit and operational risks and financial performance of commercial banks in Rwanda.

1.6 Scope of the study

Geographical scope

This study is done on five commercial banks registered on the Rwandan stock exchange located in Kigali.

Time scope

This study will take into consideration the time of 5 years from 2013 to 2018, the researcher will make any analysis of the selected commercial banks' financial reports in those 5 years, this time

is significant because it will help to analyze the current credit and operational risks status of all selected commercial banks in past five years in order to investigate the effect of those two risks on financial performance of the selected commercial banks in that time.

Content scope

This study will focus on the analysis on credit risk and operational on financial performance the selected commercial banks; it will analyze the credit and operational as independent variable while financial performance will be analyzed as dependent variable in this study.

1.7 Organization of the study

This study is organized in five Chapters. Chapter one is an introduction and comprises the background of the study, statement of the problem, objectives of the study, research questions, significance of the study, limitation of the study and scope of the study. Chapter two will be reviewed of related literature and consists of theoretical literature, empirical literature review, critical literature and research gap identification, theoretical framework, conceptual framework and summary while chapter three will be the research methodology , chapter four will be the research findings and discussions and chapter five will be the summary conclusion and recommendations.

CHAPTER TWO: LITERATURE REVIEW

Credit and operational risks define the continued existence and viable of activities in the banking sector most notably their profitability. This study examines the role of credit and operational risks on the financial performance of commercial banks in Rwanda.

2.1 Definitions of key terms and concepts

2.1.1. Credit risk

Credit risks are the probability of the loss (due to the non-recovery of) originating from the credit extended as a consequence of non fulfillment of contractual obligations occurring from indisposition or incapability of the counterparty or for any other reason. (Ciby, 2013). Arindam (2016) opinioned that credit risk are the budding that a bank borrower or a group of borrowers will be unsuccessful to meet its contractual obligations and the future loss linked with that. Bessis (2002) reflect on credit risk as the first off all risks in terms of importance and as the risk of turn down in the credit standing of an obligor of the issuer of bond or stock, and as the risk that customers default, meaning that they fail to comply with their obligations to service debt.

2.1.2. Operational risk

Operational risks are defined as those risks of malfunction system, internal procedures, reporting systems, and internal risk-monitoring regulations intended to take timely corrective actions, or the compliance with internal risk policy rules (Bessis, 2002). Alalade *et al.*, (2015) credit risk is the option that the actual return on an investment or loan extended will diverge from that, which was expected (Conford, 2000). Coyle (2000) defines credit risk as losses from the refusal or inability of credit customers to pay what is owed in full and on the due period. Girling, (2013) defines the operational risk as the loss consequential from inadequate or failed processes, people and systems or from non internal events.

2.1.3. Financial performance

Financial performance is the stage of performance of a business over a specific period of time, uttered in expressions of overall profits and losses throughout that time (Stoner, 2003)

Financial performance is a slanted measure of how well a firm can employ assets from its primary mode of business and engender revenues. This expression is also used as a general

measure of a firm's overall financial health over a given period of time, and can be used to measure alike firms across the same industry or to compare industries or sectors in aggregation.

Kohlar (2010) stated that "Financial performance refers to the act of performing financial activity. In broader sense, financial performance refers to the level to which financial objectives being or has been accomplished. It is the process of quantifying the results of a firm's policies and operations in monetary terms. It is used to measure firm's overall financial health over a given period of time and can also be used to compare similar firms across the same industry or to compare industries or sectors in aggregation.

2.1.4. NPL ratio

According to Serwa (2013), he defines the non-performing ratio as a standard which is extensively used statistic to compute the financial performance of banking institutions. Furthermore (Meeker and Gray, 1987; Mendoza and Terrones, 2008) state that the non-performing loan ratio is repeatedly used to asses and to evaluate the quality of loan portfolios, analyze lending policies and the efficiency of banking sectors. (Aman and Miyazaki, 2009; Hasan and Wall, 2004; Cihák and Schaeck, 2010) emphasized that the non-performing loan is used to determine bank's equity also as a future prediction for bank' s breakdown and to schedule early advice models for financial volatility.

2.1.5 Return on Asset (ROA) and Return on Equity (ROE)

According to MINECOFIN (2013-2018), the profitability indicators show that profitability in Rwandan banking system evidenced a substantial increase over the years; both return on equity (ROE) and return on assets (ROA) were 2.2% and 10.5% and 2.2% and 10.4% in 2011 and 2012 respectively. The upgrading in profitability can be clarified by the BNR incessant monitoring of the banking sector profitability pursued by the improvement in asset quality management that guide to capital adequacy ratio was at 23.9 compared to 25% in 2012 and 2011 correspondingly above the regulatory minimum capital of 15% and above 10% for G20 and Basel committee new benchmark.

2.2. Theoretical framework

2.2.1 Introduction

Risk is defined as the improbability that has adverse penalty on earning or prosperity, or the uncertainty associated with negative outcomes only (Bessis, 2015). (Adekunle, 2011) stated that the banking business by its nature is a high-risk surroundings which is perilous in the sense that it is the only industry where the proportion of borrowed funds is far advanced than the owner's equity (Adekunle, 2011).

Risk management study started with the Basel I after the Second World War around 1950. At this stage, it was mainly related to market risk (Dionne, 2013). In 1950, market risk was perceived as a very costly and incomplete for guard against pure risk. However, in the 1970's the market risk arose the use of derivatives as risk management instruments, which expanded speedily in the 1980's, when the strengthened their financial risk management, in the 1990's began international risk regulation, once the internal risk management and capital calculation formulation were developed by financial institutions to hedge against unexpected risks and reduce regulatory capital (Dionne, 2013). Furthermore, in 1988, the preliminary Basel I accord that consisted of provision of capital to soak up losses arising from credit risk. The losses occurred from credit risk was assessed in relation on the degree of credit risk in the banking sector. Nevertheless, such relation got criticized, through which the main criticisms include the limited differentiation of credit risk, also to not take into consideration market risk and was also very traditional posture on credit risk for it considered the potential of risk diversification and mesh of positions, which was a matching among maturities of long and short positions. In 1995, the meshing of risk positions for credit risk was allowed with those associated with derivatives (Dionne, 2013; Morton and Mun, 2008).

2.2.2. Credit Risk Theory

Risk management activity is defined as the recognition, measurement, monitoring, and control of risk which arise from the possibility of non-payment of loans higher to a mixture of clients (kithinji,2010), (Bessis, 2015) defines the credit risk of losses owed by the borrowers' non-payment or deterioration of credit standing, which is the risk that loaners fail to fulfill their debt obligations, the default cause a total or partial amount lent to the counterparty. The loans that are extended to the bank's client may result in risk of non-payment in circumstances while the bank

assumed that the loaners will faithfully pay back the amount due. In such circumstances it results in the payment inability of borrowers. (Brown and Moles, 2014) stated that credit risk is the probable that a contractual party that will fail to meet its obligations in agreement with the agreed terms which have an impact of credit effects on an industry's transactions through it various refer as default risk, performance risk or counterparty risk. (kuncoro, 2011:462) opinioned that credit risk commonly exists in all bank activities whose performance depends on the performance of counterparty, issuer or borrower which could be caused by the provision of intense fund to be presented non-performing loan (NPL), as the inability to apply the part or the whole obligation to the bank as promised. (BCBS, 2006) suggested for banks to apply the Know your customer principle as a strategy aimed at minimizing or eliminating credit risk.

Credit risk has a significant negative effect on financial performance. Beside credit risk, operational risk could affect financial performance. Operational risk is due to inadequacy or non-functioning internal process, human error, system failure, and/ or external events that can affect the bank's operation. This takes us to the view of sources of operational risk which include: human resources, internal process, system and infrastructure and external events. Operational risk in the present study will be proxied by the bank leverage, which is defined according to Basel III as the capital measure (the numerator) divided by the exposure measure (the denominator), the ratio is expressed as a percentage. This is the consistent with Stefan Ingyes (2014), opinion which states that a measure of set up regulatory regimes with a minimum requirement for liquidity, bank capital, leverage, funding and large exposures as well as behavioral standards on governance should be provided by almost all governments. Internal control and audit, fitness and propriety, risk management, in order to ensure that the high leverage inherent in bank business models are being carefully and prudently managed.

2.2.3. Operational risk theory

Girling (2013) point out that many banks are still struggling with the useful implementation of operational risk frameworks, which cause the daunting task of providing assurances to senior management and to board members that operational risks are being effectively managed and mitigated by the today chief officers. Credit risk and traditional market approaches offer only partial effectiveness in the operational risk ground.

Operational risk management appeared as a discipline as result of drivers from three main sources: regulators, senior management and third parties. For instance, with Basel II, there other narrow drivers for operational risk management including solvency II, which require Base I –like requirements on insurance firms, and a host of local policy such as the Markets in Financial Instruments Directive (MiFID) legislation in Europe and Sarbanes-Oxley Act.

Basel II regulations define the operational risk as the risk of defeat that is consequential from inadequate of unsuccessful processes, people and systems or from external events. However, this definition includes legal risk, but it excluded strategic and reputational risk. Basel II proposes that the operational risk and measurement should meet the following criteria: (1) identifying operational risks, (2) assessing the size of operational risks, (3) monitoring and controlling operational risks, (4) mitigating operational risks and (5) calculating capital to protect you from operational risk losses.

There is no relationship between operational risk and the financial performance of commercial banks in Rwanda.

2.3. Some background on Basel 1, 2, 3

According to Basel II, there were other narrow drivers for operational risk management including solvency II, which obliged Base I –like requirements on insurance firms, and a multitude of local regulations such as the Markets in Financial Instruments Directive (MiFID) legislation in Europe and Sarbanes-Oxley Act. Noticed that the Operational Risk Management (ORM) has arisen as a discipline as result of drivers from three main sources: regulators, senior management and third parties. Girling(2013)

In addition, in 2003 Basel II rise and went beyond Basel I minimum capital requirements, permitting lenders to apply the internal models to determine regulatory capital while in search of ensuring that banks amend and improve risk management culture from the bottom up. A powerful risk management culture was associated to banks' capital requirements with prevailing modern risk management practices and with ensuring that the focus on risk is eminent to supervisory levels and market discipline through improved risk and capital related disclosures. (Morton and Mun, 2008). Through which it was mentioned three pillars which are: the first pillar, where the calculation of minimum capital requirements includes credit, market and

operational risk. The second pillar established supervisory evaluation explicitly as a central piece in the new capital allocation structure, where it needs to take an remarkable role not only of reviewing the bank's position and strategy, but also by ensuring that capital is in agreement with a bank's overall risk profile and where the bank is in conformity with regulatory capital minimum. Pillar three were examined in the perspective of increased link between banks' internal control and accounting and the contents of banking regulation, where the matter of improving market discipline through effective disclosure (the assessable of banks 'capital structures, risk exposures, risk management processes and capital adequacy by market participants). (Morton and Mun, 2008).

Basel II Accord attempted to convert relative measures of credit risks into complete measure and among the various risk metrics for setting limits for credit risks included:, loss given default and maturity, exposure, probability of default. The Accord has not yet fully acknowledged correlations among these 4 drivers. However, majority of banks use mainly default probability at various levels of complexity as the risk driver and ignore the three others drivers. In this view, someone should be interested to find out why the three others drivers have not been often used.

In addition, Carolyne (2004) exemplified that Basel II required financial institutions to integrate an explicit appraise of operational risk into their regulatory capital requirements which are applied to Bank Financial Institutions (BFIs) and are also required to be applied by additional types of financial institution such as insurance companies. Where the BFIs can prefer from these three major approaches: (1) The Standardized Approach (TSA) where the capital charge is still based on the gross income but the firm's activities are divided all along the business lines, each with their own percentage (Beta) charge., (2) The Advanced Measurement Approach (AMA) which allows the firms to establish their operational risk capital charge according to the internal model given that the coalition with certain requirements. (3) the Basic Indicator Approach (BIA)where the capital requirement is to be based in a fixed percentage (alpha) of 1 % of gross income.

However, the definition given by Girling, (2002) includes legal risk, except it excluded strategic and reputational risk. Basel II proposes that the operational risk and measurement should meet the following criteria: (1) recognizing operational risks, (2) evaluating the size of operational

risks, (3) supervising and controlling operational risks, (4) extenuating operational risks and (5) calculating capital to protect you from operational risk losses.

In 2009 Basel III was established, later on in 2010 it was implemented with the new capital standard with the following features: (1) greatly boost the quality of banks' capital, (2) significantly augment the essential level of their capital, (3) decrease systemic risk and (4) allow enough time for a smooth transition to the new command (Caruana, 2010). (Cosimino, 2011) opined the new regulation was developed known as Basel III with aim of promoting the elasticity of the banking system and develop its ability to absorb shocks arising from financial and economic stress which are compulsory for banks to hold a larger amount of assets and enlarge the exposure of bank assets.

2.4 Empirical review

In this section presents different previous studies related to the topic under study.

According to the study of Gizaw *et al.,* (2013), The impact of credit risk on the profitability performance of commercial banks in Ethiopia, where secondary data were used from 8 selected commercial banks, for the period of 12 years (2003- 2015), Descriptive statistics and Panel data regression model, the profitability of commercial banks in Ethiopia was significantly affected by NPL, capital adequacy and loan provision, the study suggested that there was a need to enhance credit risk management in order to maintain the prevailing profitability of commercial banks in Ethiopia.

Oluwafemi *et al.,* (2014), Risk Management and Financial Performance of Banks in Nigeria, the study used secondary data based on 4 year progressive annual reports and financial statements of 10 banks , panel data estimation technique was adopted, the doubt loans, and capital asset ratio found to affect positively and significantly The financial performance of banks, where it suggested that the higher the managed funds by banks the higher the performance. The study concluded that there was a significant relationship between banks performance nad risk management. The study suggested that the banks need to practice prudent risks management in order to protect the interest of investors.

Fengge *et al.,* (2013), CVaR measurement and operational risk management in commercial banks according to the peak value method of extreme value theory: China, were the Conditional value-at-risk (CVaR) models based on the peak value method of extreme value theory were used to measure operational risk and loss data for commercial banks are used in an empirical analysis. The test are carried out using a CVaR model to calculate VaR and CVaR at 95% and 99% confidence level to assess expected and unexpected lossesfor operationl risk.the finding revealed that inspection for CVaR the fitting effect was best for the revised groups which resulted in chosing to use VaR and CVaR values.

Baasi (2018), Effects of Non-Performing Loans on the Profitability of Commercial Banks. A Study of four major banks on the Ghana Stock Exchange, a Panel regression analysis model was employed to establish the relationship between credit risk and profitability in order to account for heterogeneity among the four selected banks, for a data span of 2006 to 2015. E-views was used, where the analysis was conducted based on fixed effects model and correlated Random fixed effects- Hausman test. The study proxied ROE as profitability dependent variable and NPLR with capital adequacy ratio (CAR) as key explanatory variables. The study revealed that NPLR affected negatively profitability of banks while CAR showed a significant positive relationship with profitability. The study also revealed that bank size was in a positive relationship with profitability, where the R2 explained 89% of the variations on profitability performance on profitability performance of banks. The suggestion was that managers of banks are to comply strictly with the rules that regulate the operations of banks in Ghana especially on the issue of capital adequacy ratio, it also advise that bank should be cautious on the rate they expand since bank can equally affect the fortunes of banks also that central bank must also be up and doing to ensure that banks keep- to all ratios set down by the central bank, the banking regulations and the various bards.

Ekenci *et al.,* (2019), The Effect of Credit Risk, were 26 commercial banks were operating in turkey between 2005- 2017, the study used secondary data collected from the statistical report of the Banks Association Turkey. The study used three panels' considered respectively state-owned banks, privately- owned banks and foreign banks in order to compare banks according to their ownership structure. Return on Asset (ROA) and Return on Equity (ROE) were considered as proxies for financial performance indicators while Non-Performing Loans (NPLs) was

considered as credit risk indicators. The results revealed that banks should focus more on credit risk management, in particular on the control and monitor on Financial Performance of Deposit Banks in Turkey, ROA, ROE and NPLs. The results suggested that banks should focus more on credit management, especially on the monitoring and control of non- performing loans. It suggested also that managers should focus more on modern credit risk management techniques.

Togtokh (2012), Credit risk measurement: the case study of Mongolian small and medium sized firms,the study aimed to re- examine Altman's Z-score model, and build comparable method by logistic regression, a credit scoring model technique. The data used was provided from Mongolian commercial bank where the analyzed forty two firms' financial statements which included bankrupted and non- bankrupted firms, for the period of 2007 to 2008. The result revealed that the prediction of Alman Z- score model was significantly high, 71 % while with logistic regression method where two ratios were considered: cash to total asset and retained earnings to total asset ratio, were significantly the predictor for firm's bankruptcy in Mongolian SMEs. The study concluded that the model derived from logistic regression was considerably lower than the Altman Z- score model.

Almajali *et al*., (2012), Factors Affecting the Financial Performance of Jordanian Insurance Companies Listed at Amman Stock Exchange, where they considered 25 insurance companies for the period of 2002 to 2007, with data analyzed using T-test and Multiple- regression. The findings showed that there was a statistical and positive effect on the financial performance caused by: Leverage, liquidity, Management competence index and Size. They recommended that a high consideration of increasing the company asset were to lead to a good financial performance and there was a significant need to have highly qualified employees in the top managerial staff.

Alalade *et al.*, (2015), Credit risk management and financial performance of selected commercial banks in Nigeria, the study used panel data from 10 commercial banks listed on Nigeria Stock Exchange (NSE), for the period of 2006 to 2010. where they analyzed the impacts of some antecedents such as total loan and advances, non- performing loan and total asset on accounting, Return on equity (ROE) and Return on Assets (ROA), loan and advance loss provision. ROA, ROE and NPLs. The results revealed that financial performance was significantly affected by credit risk management. They recommended that maintaining minimum level of non- performing

loans in comparison with provision for loans and advances will enhance financial performance through its positive effect on return on equity.

Gadzo *et al.,* (2019), Credit risk and operational risk on financial performance of universal banks in Ghana: A partial least squared structural equation model (PLS SEM) approach, the PLS-SEM model, the data were collected from the 24 universal banks in Ghana, the results showed that Credit risk influences financial performance negatively similarly with the operational risks found to influence financial performance negatively. Bank specific variables (liquidity, asset quality, bank leverage and cost to income ratio) have significantly influenced positively credit and operational risks as well as the financial performance of the universal banks.

It was also found that operational risk influences the financial performance of the universal banks in Ghana negatively. Furthermore, the study indicated that bank specific variables measured by (asset quality, bank leverage, cost to income ratio and liquidity) significantly influence credit risk, operational risk as well as the financial performance of the universal banks positively. We recommend that banks be encouraged to cut-down their lending rates in other to decrease credit risk and subsequently boost profitability. Regarding operational risk, banks should reduce leverage and have their portfolio more concentrated on liquid investment income so as to boost profitability.

Muriithi (2016) stated that the effect of liquidity risk, market risk, operational risk and credit risk on financial performance of commercial banks in Kenya. Secondary data were used from forty-three (43) licensed commercial banks in Kenya with their audited annual reports for the period of 2005 to 2014, and were collected using regression equations using an unbalanced panel data. The predictors measured in the study include: credit risk, operational risk, market risk and liquidity risk. Credit risk was measured by asset quality, loan & advance and capital to risk weighted asset, loan loss provision; operational risk was measured by cost income ratio; market risk was measured by interest rate risk, financial leverage, foreign currency exposure and liquidity risk was measure by net stable funding, liquidity coverage ratio and. The financial performance as the dependent was measured by ROE. The study concludes that a negative significant impact on the financial performance resulting from operational risk, credit risk liquidity risk and market risk on Kenyan commercial banks and operational risk was highlighted to have the greatest impact.

Ng'aari (2016) also stated that the effect of risk management practices on profitability of listed commercial banks in Kenya for the periods 2002-2015. Secondary data were collected on operational risk management (asset utilization ratio as measure) and profitability (return on asset as measure) from the audited financial statement of the banks and liquidity risk management (equity capital to total capital as measure), credit risk management (total debt to total assets ratio as measure). The independent variables were liquidity risk management, credit risk management and operational risk management while the he dependent variable was profitability was. A panel regression analysis method was used to analyze the data and the result revealed that credit risk management, liquidity risk management and operational risk management are all positively and significantly correlated with bank profitability.

Bagram and Ali (2018) studied on commercial banks in Pakistan, the found that the bank performance was impacted positively by the effective risk management. The study used data collected from the published annual statement of five large banks and five small banks over the period 2005 to 2015. The independent variables were capital adequacy ratio, credit risk, interest rate risk, liquidity risk and operational risk. The dependent variable was financial performance of banks measured by ROE. The analysis used the regression model. The results revealed that the risk management variables including Market risk (interest rate risk), liquidity risk, credit risk and operational risk have significant and negative effects on performance for large commercial banks, however, for small banks the impact of operational risk on performance was found to be significantly positive.

Nyarko-Baasi (2018), investigated on the effect of non-performing loans on profitability of four of the major banks listed on the Ghana Stock Exchange (GSE) as this could contribute to a healthy financial system and also enhance profitability in banks. Panel regression analysis was used to ascertain the correlation between credit risk and profitability in order to account for heterogeneity among selected banks; Standard Chartered Bank (SCG), ECO Bank Ghana (EBG), Cal Bank (CBG) and Ghana Commercial Bank (GCB) for a data span of 2006 to 2015. By the use of Eveiws, the analysis was conducted based on fixed effects model and Correlated Random fixed effects - Hausman test. The study proxied return on equity (ROE) for profitability - dependent variable. Non-performing loan ratio (NPLR) and capital adequacy ratio (CAR) were the two key explanatory variables. The study revealed that NPLR negatively affect profitability

of banks but rate of CAR showed a significant positive relationship with profitability. Bank Size equally showed a positive relationship with profitability. The R^2 explained 89 % of the variations on profitability performance of the banks. Managers of banks are to comply strictly with the rules that regulate the operations of banks in Ghana especially on the issue of capital adequacy ratio. Banks should also be cautious on the rate they expand since bank size can equally affect the fortunes of banks. The central bank must also be up and doing to ensure that banks keep- to all ratios set down by the Central Bank, the banking regulations and the various bards.

Fadum and oye (2020), in their study where they analyze the impact of operational risk management practices on the financial performance of commercial banks in Nigeria. Where they used secondary data extracted from audited financial statements for the selected commercial banks in Nigeria for a period of 10 years (208-2017) and with Linear Multiple Regression model. The results revealed that there were a positive relationship between operational risk management and the financial performance of banks. The findings revealed that sound operational risk management practices affect positively the financial performance of banks. They recommended that bank's management should deploy adequate resources towards understanding operational risk to ensure sound operational management and improved financial performance of banks.

Al-Shakrchy(2017) in his study which investigated on the impact of credit- risk exposure management on bank profitability of the major commercial banks in Sweden with emphasis on the financial crisis of 2008 where they tested empirically whether risk managing in ways to significantly reduce the profitability that defaulted loans and how the Swedish bank might keep out credit crisis with their credit activities with the aim of finding out the issues arising from the bank lending activities which have had serious impact on the banking industry and financial instability. Furthermore, the paper explores whether credit exposure manage procedures are changed during financial crisis. In their findings from empirical analysis in the pre-crisis period indicated that NPL and reserve ratio for impaired loan affected the bank performance and profitability negatively; the loans to deposit ratio shows a positive relationship with ROE as a proxy of banks' profitability. Furthermore it was found that the NPL and LTD had a negative effect on banking profitability while reserve ratio for impaired loan coefficient exerted a positive effect on ROE during and in the post-crisis period. They concluded that impact of the bank-

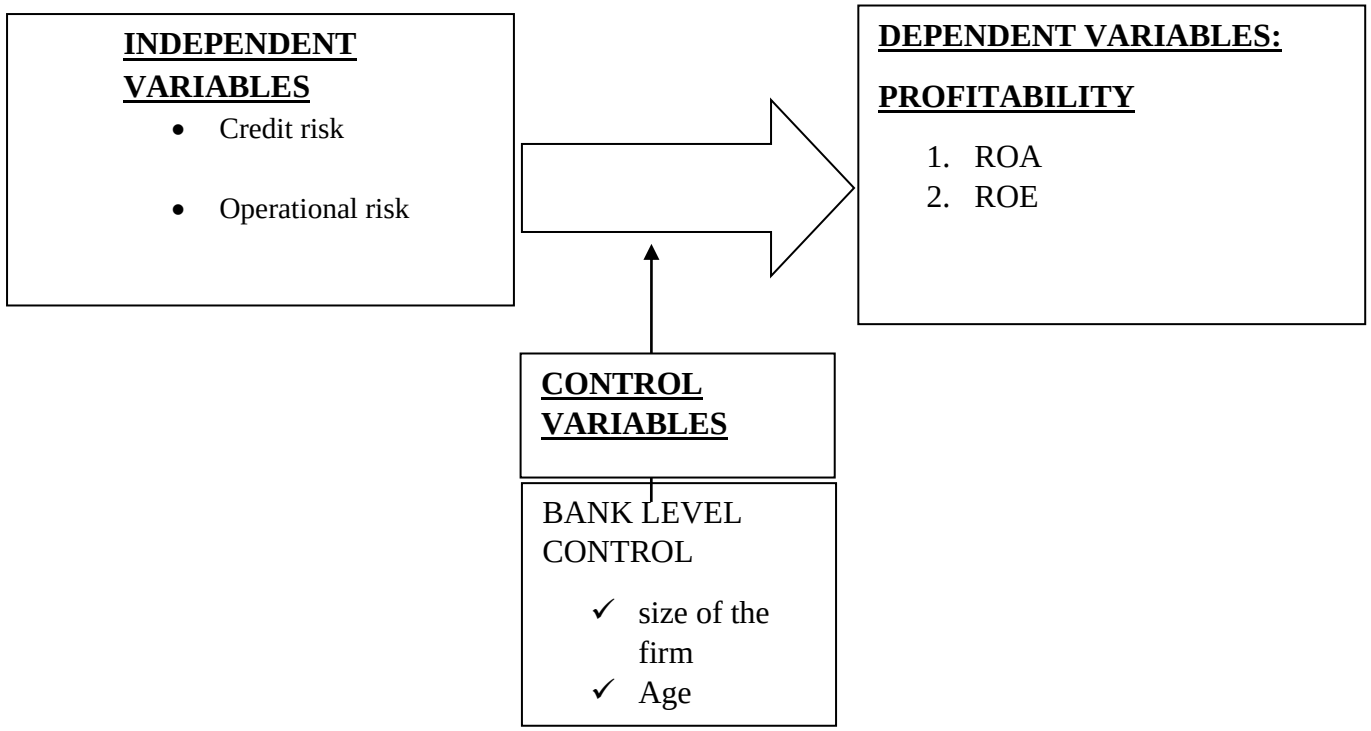
specific variables on banks‟ profitability is not always uniform and differentiate between the pre and post -financial crisis periods due to changes in economic and financial conditions.

Although all the mentioned above studies did the research on credit risk apart or operational risk apart, or both combined together none of the mentioned studies above have been made on both credit risk and operational risk combined on their effect to the financial performance to commercial banks in Rwanda using the partial least square a structural equation modeling.

2.5 Literature gap

According to the studies mentioned in the empirical review it shows that many studies have been made on each variable apart not as two combined and the ones that have been made combining the two variables was not made on the commercial banks in Rwanda, which means that there are no substantial studies that have addressed the effect of credit and operational risks on financial profitability within commercial banks like Bank of Kigali and I&M Bank. Which are using structural equation model (SEM). In addition, the literature is silent on the measures of credit and operational risks as required by Basel II & III pillar II. This study covers these literature gaps by using the PLE-SEM in assessing the relationship between credit, operational risks and financial performance of banks.

2.6 Figure of Conceptual Framework



CHAPTER III: RESEARCH METHODOLOGY

3.1. Research design

This study used quantitative design since it seeks to ascertain the effect of both operational risk and credit risk on banks' performance. In quantitative design, it will be used the Partial Least Squared Structural Equation Modeling (PLS-SEM). Fan (2016) opinioned that the reason to use the structural equation modeling it is that it is powerful and multivariate model which is used in scientific analysis to test and evaluate multivariate causal relationship as it differs from other modeling approaches for which test the direct and indirect effects on pre-assumed causal relationship. Nitzl (2016) opined that SEM is the flexible testing model that allows to apply several predictors and criterion variables, construct latent (unobservable) variables, model errors in measurement for observed variables and test mediation and moderation relationship in a single model. Longitudinal research which is defined as data gathered during the observation of subjects on a number of variables over time (Van der Kamp and Bijlieved,1998).

3.2. Population and Sampling

According to the National Bank of Rwanda's monetary and financial stability statement of 28th August 2020[1], there are sixteen banking institutions operating in Rwanda of which eleven (11) are commercial banks, 3 are microfinance institutions, one is a cooperative bank, and one is a Development bank. This study considers the population of commercial banks operating in Rwanda. Based on the availability of data, only five banks were chosen as the sample size and are observed over the period 2013 to 2018. The sampled banks include Bank of Kigali (BK), I&M Bank, COGEBANK, Access Bank, Banque Populaire du Rwanda (BPR). State the reason why you only considered five banks.

3.3. Data collection

Data was collected from secondary data of five commercial selected banks (Access Bank, BK, BPR, COGEBANQUE, I&M Bank), for the period 2013 to 2018. Data were collected from financial statements and annual reports of all the five selected commercial banks that are

[1] National Bank of Rwanda's monetary and financial stability statement of 28th August 2020[1], available on www.bnr.rw, accessed in October 2020

registered on the Rwanda Stock-Exchange as they are ones with trustable data. With financial statement reports, the following variables will be used: return on asset ratio (ROA), Return on Equity (ROE), NPL, leverage ratio, , size of the firm, age and others. In addition, ROA and ROE are the indicators of measuring managerial efficiency.

3.4. Measurement of variables

Table 3.1: Formula

Latent variables	Variables to be observed	Formula
Operational risk	Leverage ratio	• Dividing the capital by the average total consolidated assets. • Where the capital is calculated by adding its stockholders' equity and retained earnings and subtracting goodwill
Credit risk	Non- performing Loans	• The ratio of the amount of nonperforming loans in the bank's loan portfolio to the total amount of outstanding loans the bank holds.
Financial performance	• Return On Asset • Return On Equity	• The ROA is the division of the net income by the Average total assets. • ROE is the division of the net income by shareholder's equity
Bank controls	• Size of the firm • Age	• The natural logarithm of total assets • The actual year minus the foundation year.

Source: Authors construct (2019) based of reviewed literature

3.5. Data analysis

The research uses the SEM as technique to estimate the parameters and we have used maximum likelihood, with specification, diagnostic and goodness-of-fit analysis where we have（1) Hausman specification test,(2) Overall goodness of fit, (3) Equation- level goodness of fit, (4) Matrix of residuals, (5) Assess stability of non-recursive systems, (6) Information

criteria -AIC and BIC; we were supposed to use all these tests but with time limitation we only used "Overall goodness of fit".

Apart from PLS and SEM, this research will analyze the profitability performance through the return on asset ratio (ROA), the higher the ROA the better the bank profit. With the Return on Equity (ROE) and the two independent variables will be credit risk and operational risk.

Where:

$ROA = \alpha_0 + \alpha_1 NPL + \alpha_2 Leverage\ ratio + \alpha_3 Banksize + \alpha_4 Age + \varepsilon$ (Equation 1)

$ROE = \beta_0 + \beta_1 NPL + \beta_2 Leverage\ ratio + \beta_3 Banksize + \beta_4 Age + \epsilon$ (Equation 2)

In addition, we used the scale of the Pearson correlation coefficient which determines the strength of the correlation. According to Cohen (1988), states that even though there are no hard-and- fast rules for transfer strength of association to particular values through some general procedure he provided:

Table 3.2: Interpretation of Correlation

Coefficient Value	Strength of Association
$0.1 < \| r \| < .3$	Small correlation
$0.3 < \| r \| < .5$	Medium/moderate correlation
$\| r \| > .5$	Large/strong correlation

Source: Cohen, J. (1988).

Where | r | means the absolute value or r (e.g., | r | >0.5 means r > 0.5 and r < -0.5). Where the coefficient of determination is the proportion of variance in one variable that is explained by the other variable and is calculate as the square of the correlation coefficient (r^2).

CHAPTER 4: ANALYSIS OF RESULTS

4.1 Introduction

This chapter analyzes and discusses results obtained from the PLE-SEM estimations for the period 2013-2018. It is composed of three sections. Section 4.2 provides information on the commercial banks sampled. Section 4.3. Provides a descriptive summary statistic of the variables used in this study. Section 4.4 discusses the regression results from model estimations.

4.2 Summary description of the banks used in the sample.

This section provides information on the banks used namely BK, I&M, COGEBANQUE, Access Bank and BPR, where by:

Table 4.1 Overview of the selected banks

Bank's name	Incorporation date	Products and services	The total asset	Branches/ employees
BK	22nd December 1966	Loans, checking, savings, investments, mortgages Internet Banking, Insurance services	As of 31 December 2019, the bank's total assets were valued at US$1, 1059 million, with a loan book of $735.8 million, customer deposits of $697.4 million and shareholders' equity of US$239.6 million.	79 networked branches, nearly 100 automated teller machines, more than 1,427 banking agents, six mobile banking vans and employed over 1,200 staff (December 2018)
I&M Bank	1963	Loans, Checking, Savings, Investments, Debit Cards	US$344.6 million (RWF:317.9 billion) (December 2019)	14 blanches with 370 employees (December 2019)
Access Bank	January 2009	Standby Letter of Credit. Standby letters of credit/Guarantees are instruments used by the bank on behalf of its customers; Trade Services. Trading across borders is a complex activity; Bills for Collection; Credit Information; Letters of Credit; Trade Finance; Distributor Credit Plans	$26.84 million in sales (USD).	8 branches and 159 total employees across all of its locations and generates).
COGEBANQUE	17th July 1999	account. CURRENT ACCOUNTs. SAVINGS	$21.69 million in sales (USD).	28 branches, 36 ATM location with 331

		ACCOUNTS. digital banking. Mobile Banking. Internet Banking. card solutions. ATM. transfers. agency banking. loans. Gisubizo Loan Express. HOME LOANS. CAR LOAN. EQUIPMENT LOAN. overdrafts. prestige accounts.		employees as of December 2019
BPR	1975	current and savings accounts, debit and credit cards, mortgages and loans. The bank offers consumer banking tools like mobile banking, as well as agricultural business expertise to corporate customers in the food and agri-business value chain	RWF:273.201 Billion (US$320 Million) (2017)	As of March 2019, Bank Populaire du Rwanda maintained a network of nearly 200 full-service branches, and over 100 ATMs in all Regions of Rwanda with 930 employees as for 2020

Source: https://en.wikipedia.org/wiki/I%26M_Bank_Rwanda, consulted on 13 February 2021

4.3 Descriptive statistics

This section summarizes the statistics for the variables used in this study. In addition, it discusses summary statistics for variables with respect to each bank. Finally, the section reports correlations among variables using a correlation matrix.

With reference to the descriptive statistics, Table 4.2 below summarizes the means and standard deviations for the variables used in this study:

Table 4. 2: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	30	35.9	15.15	14	55
Bank size	30	8.287	0.323	7.69	8.94
Leverage ratio	30	6.53	1.846	3.51	11.38
NPL ratio	30	5.91	3.076	2.5	13.5
ROA	30	0.027	0.015	0	0.05
ROE	30	0.194	0.106	0	0.5

Source: Computed by Researcher from the secondary data from 2013 to 2018

Results in Table 4.1 sum up the mean, standard deviation, minimum and maximum values for all variables under study. On average, banks have been in operation for 36 years. Banks total assets are on average 82 million Rwfs- The leverage is on average 6.5 and non-performing loans are as high as 6%. The average return on assets is 3% and the average return on assets is 19% for all banks.

Table 4. 3. Summary statistics of variables by bank name

Bank	Leverage ratio	Age	Bank size	ROA	ROE	NPL ratio
Access Bank	6.495	20.5	7.842	0.017	0.105	4.883
BPR	7.838	40.5	8.318	0.015	0.140	11.22
Bank of Kigali	4.56	49.5	8.778	0.042	0.218	5.567
COGEBANQUE	7.705	16.5	8.212	0.022	0.210	4.067
I&M Bank	6.052	52.5	8.287	0.042	0.297	3.817
Total	6.53	35.9	8.287	0.0273	0.194	5.91

Source: Computed by Researcher from the secondary data from 2013 to 2018

Table 4.3 reveals that on average, the leverage ratio for all banks was 6.53%, the highest and lowest leverage ratio were respectively 7.838% for BPR and 4.56% for BK. However, based on the theory on leverage ratio it should be noted that the leverage ratios are used to verify the relative level of debt loan that a business has acquired. Furthermore, these ratios compare the

total debt obligation to either the assets or equity of business, a high ratio indicates that a business may have incurred a higher level of debt than it can be sensibly expected to service with ongoing cash flows. This is a major concern, since elevated leverage is associated with heightened risk of bankruptcy. In this context, the results in Table 4.3 revealed that BK had have the lowest level of debt while BPR and Cogebank had have a highest level of debt that can be probably associated with heightened risk of bankruptcy.

A NPLs is a loan in which the borrower is defaulting and hasn't made any planned payments of principal or interest for a period of time, in baking commercial loans are considered non-performing if the borrower is 90 days past due and the International Monetary Fund (IMF) considers loans are less than 90 days due as nonperforming if there's high uncertainty adjacent future payments.

The average of NPLs for the five commercial banks in Table 4.3 is 5.91% which is above 4.91% in 2019. The highest and lowest values of the NPLs were respectively 11.22% for BPR and 3.817% for I &M Bank. The results in Table 4.2 indicated that BPR presents high level of NPLs compared to the rest of the commercial Banks.

With ROA, the results in Table 4.3 revealed that two banks BK and I&M Bank had have the highest ROA of 4.2% while BPR and Access Bank had had the lowest ROA respectively 1.5% and 1.7%. With ROE, the results in Table 4.1 revealed that two banks I&M Bank had have the highest ROE of 2.97% while BPR and Access Bank had had the lowest ROA respectively 14% and 10.5%.

Given the trend of ROA and ROE in the country as stipulated by National Bank, the profitability pointers show that profitability in Rwandan banking system evidenced a significant increase over the years as shown in figure 4.3 both return on equity (ROE) and return on assets (ROA) were 2.2% and 10.5% and 2.2% and 10.4% in 2011 and 2012 respectively. The enhancement in profitability can be explained by the BNR incessant supervision of the banking sector profitability followed by the expansion in asset quality management that lead to capital adequacy ratio was at 23.9 compared to 25% in 2012 and 2011 correspondingly above the regulatory minimum capital of 15% and above 10% for G20 and Basel committee new benchmark.

With bank age, the results in Table 4.2 revealed that two banks BK and I&M Bank are the oldest with respectively with 49.5 and 52.5 years while Cogebank and Access Bank are youngest respectively 16.5 and 20.5 years.

With size, the results in Table 4.3 revealed that two banks BK and BPR had have the highest size respectively of 8.778 and 8.318 while Cogebank and Access Bank had had the smallest size respectively 8.212and 7.842.

4.2 Bivariate Analysis

In this section it has been question of examining the relationship variables 2 by 2. Table 4.4 below illustrates the different correlation coefficient computed from the Spearman's Rho correlation between variables 2 by 2. Spearman correlation was used since the normality of each variable was not been tested**.** Given that the results in Table 4.4 are not both significant the researcher interpreted only the results which are statistically significant means those which have one star(*) or two stars (**). The interpretation of the results on correlation was referred to Table 3 in chapter 3 section 3.5.

Table 4. 3: Correlation Matrix

	NPL	Leverage ratio	Bank size	Age	ROA	ROE
NPL	1					
Leverage ratio	0.3115	1				
Bank size	0.0915	-0.4131	1			
Age	0.1529	-0.3960*	0.6771**	1		
ROE	-0.3800*	0.0469	0.236	0.3443	1	
ROA	-0.4507*	-0.421*	0.5008**	0.6017**	0.813*	1

*=Correlation is significant at the 0.01 level (2-tailed), **= Correlation is significant at the 0.05 level (2-tailed).

Source: Computed by Researcher from secondary data from 2013 to 2018.

Pair wise correlations among independent variables may be high (in absolute value). Rule of thumb: If the correlation > 0.8 then severe multicollinearity may be present. Correlation is used to test the multicollinearity of two or more independent variables before to use them in the regression model. The rule of thumb states that if the correlation is great than 0.8 then there is a presence of severe multicollinearity and the researcher may opt for the following options: (1) transform the multi-collinear variables, (2) increase the sample size, (3) do nothing, (4). Drop the redundant variable. However, given the researcher background, the first option was chosen and we had used in the model both inflation and interest rate even though they had in absolute value r=0.829>0.8.

Table 4.4 shows that there is a negative and moderate correlation between leverage ratio and ROA at level of 5% significance (r=-0.439, p<0.05), is a negative and moderate correlation between liquidity ratio and NPL at level of 5% significance (r= -0.378, p<0.05), a positive and moderate correlation between bank size and ROA at level of 5% significance (r=0.460, p<0.05), a negative and moderate correlation between bank size and leverage ratio at level of 1% significance (r=-0.478,p<0.01).

4.4 Multivariate Analysis

This section reports regression results from the PLE-SEM estimations. Below, model description, estimations and results are discussed.

4.4.1 Model description

Structural equation modeling (SEM) is a dominant, multivariate technique increasingly in scientific analysis to test and evaluate multivariate causal relationship, which is a logical of causal modeling via path analysis (Fan, 2016). Hox et al., (1998) defines it as a very general statistical modeling technique which is frequently applied in the behavioral sciences. And is a mixture of factor analysis and regression or path analysis. Which gives a theoretical construct of the latent factors, which are presented by regression or path coefficients between the factors and it implies a structure for the covariances between the experiential variables.

This study assesses the following model:

$$ROA = \alpha_0 + \alpha_1 NPL + \alpha_2 Leverage\ ratio + \alpha_3 Banksize + \alpha_4 Age + \varepsilon \quad \text{(A)}$$

Where ROA=return on assets , α_0=intercept, α_i =slopes (i=1 to 4), ε =term error

$$ROE = \beta_0 + \beta_1 NPL + \beta_2 Leverage\ ratio + \beta_3 Banksize + \beta_4 Age + \varepsilon \quad \text{(B)}$$

Where ROE=return on Equity , β_0=intercept, β_i =slopes (i=1 to 4), ε =term error

4.4.2 Model description

With the SEM, the model A and model B were broken down as:

Model 1 : NPLs= α_0+ α_1*banksize + α_2*bankage + e_1

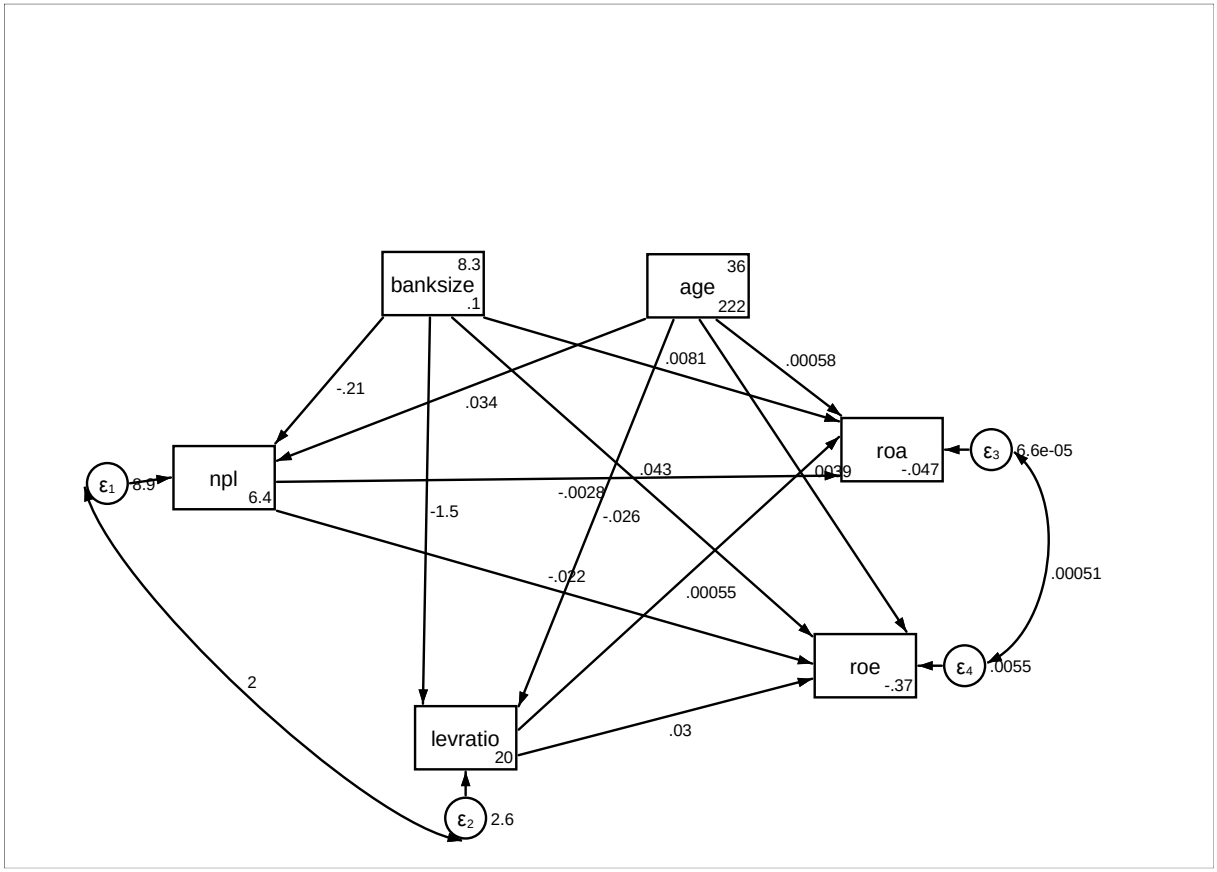
Model 2: Leverage ratio= β_0+ β_1*banksize + β_2*bankage +e_2

Model 3:ROE=$Ƙ_0$ + $Ƙ_1$*NPLs+ $Ƙ_2$*Leverage ratio + $Ƙ_3$*banksize + $Ƙ_4$*bankage +e_3

Model 4:ROA=d_0 + d_1*NPLs+ d_2*Leverage ratio + d_3*banksize + d_4*bankage +e_4

4.4.3 Estimation results.

Figure 4.1: The coefficients path



Were by the:

- **ε** stands for the error variance
- the path between the $\varepsilon_1 \longrightarrow \varepsilon_2$ represents the covariance between the NPL and Leverage ratio
- The paths between the variables represent the unstandalized path (coefficient)
- the path between the $\varepsilon_3 \longrightarrow \varepsilon_4$ represents the covariance between the Return on assets (ROA) and return on equity (ROE)

The following table, Table 4.5 below presents the results on standardized estimate coefficients, standard deviation, Z-scores, p-values presence or lack of effect and decision that was been taken on H_0.

Table 4.5. reports regression results from the PLE-SEM estimations as follows:

DV	IV	Coefficient	Standard deviation	Z	P-value	Presence of effect	Decision on Ho
NPL	Bank size	-0.211	2.33	-0.09	0.928	No effect	Fails to Reject Ho
	Age	0.034	0.05	0.68	0.49	No effect	Fails to Reject Ho
	Cons	6.432	18.172	0.35	0.723	N/A	
Leverage ratio	Bank size	-1.528	1.27	-1.2	0.229	No effect	Fails to Reject Ho
	Age	-0.026	0.03	-0.97	0.334	No effect	Fails to Reject Ho
	Cons	20.133	9.898	2.03	0.042	N/A	
ROE	NPL	-0.022	0.005	-4.42	0.000	There is effect	Reject Ho
	Leverage ratio	0.03	0.009	3.27	0.001	There is effect	Reject Ho
	Bank size	0.043	0.06	0.72	0.471	No effect	Fails to Reject Ho
	Age	0.004	0.001	3.05	0.002	There is effect	Reject Ho
	Cons	-0.368	0.484	-0.76	0.447	N/A	
ROA	NPL	-0.003	0.0005	-5.05	0.000	There is effect	Reject of Ho
	Leverage ratio	0.0006	0.001	0.55	0.581	No effect	Fails to Reject Ho
	Bank size	0.008	0.007	1.24	0.216	No effect	Fails to Reject Ho
	Age	0.0006	0.0001	4.1	0.000	There is effect	Reject Ho
	Cons	-0.047	0.053	-0.9	0.37	N/A	
Var(e.npl)		8.929	2.306				
Var(e.roa)		0.0000658	0.000017				
Var(e.roe)		0.005527	0.0014271				
Var(e.levratio)		2.649411	0.684514				
Cov(e.npl,e.levrat)		2.024127	0.9618514	2.1	0.035		
Cov(e.roa,e.roe)		0.0005115	0.000144	3.54	0.000		

Source: ***Computed by researcher from secondary 2013-2018.***

4.4.4 Effect of credit and operational risks on ROE

Table 4.5 presents the results on the effects of the different variables considered in this study. The different effects were being examined through model 1, model 2, model 3 and model 4:

(1) Effect of age and bank size on npl

To examine the effect of age and bank size on npl, the model 1 was expressed into the following equation:

Model 1: NPLs= α_0+ α_1*banksize + α_2*bankage + e_1

From the results in Table 4.5, the model 1 is:

npl =6.432 – 0.211 bank size +0.034 age

Therefore, we concluded that path from bank size to npl was negative but not statistically significant (b=-0.211, SE=2.33, p=0.928, β= -0.022). [β=standardized path coefficient] there is no effect of bank size on npl since p-value was p=0.928>0.05. It was concluded that the path from age to npl was positive, but not statistically significant (b=0.034, SE= 0.05, p=0.49, β= 0.168), there is no effect of age on npl given that p=0.49>0.05.

(2) Effect of Bank size and age on leverage ratio

Here the leverage ratio was expressed as a function of bank size and age under the following equation:

Model 2: Leverage ratio= β_0+ β_1*banksize + β_2*bankage +e_2

Leverage ratio =20.13-1.528 banksize -0.026 Bankage

Therefore, we concluded that the path from bank size to leverage ratio was negative but not statistically significant (b= -1.528, SE= 1.27, p= 0.229, β= -0.268). There is no effect of bank size on leverage ratio since p- value was p= 0.229> 0.05. It was also concluded that the path from age to leverage ratio was negative, but not statistically significant (b= -0.026, SE= 0.03, p= 0.334, β= -0.215) there is no effect of age on leverage ratio given that p= 0.334> 0.05).

(3) Effect of NPL, Leverage ratio, Bank size, and age on Return on Equity (ROE)

Here the ROE was expressed as a function of NPL, Leverage ratio, bank size and age under the following equation:

Model 3: ROE=$Ƙ_0$ + $Ƙ_1$*NPLs+ $Ƙ_2$*Leverage ratio + $Ƙ_3$*banksize + $Ƙ_4$*bankage +e_3

ROE= -0.368 -0.022 NPL+0.03 Leverage ratio+0.043 Bank size +0.004 Bank Age

Therefore, we concluded that the path from NPL to ROE was negative but statistically significant, which means that the NPL was found as negative predictor to ROE (b= -0.022, SE= 0.005, p= 0.000, β= -0.640). There is effect of NPL on ROE given that p= 0.000< 0.05). It was found that the path from Leverage ratio to ROE was positive and statistically significant, which means that Leverage ratio was found to be a positive predictor to ROE (b=0.03, SE= 0.009, p= 0.001, β = 0.522), there is effect of leverage ratio on ROE given that p= 0.001<0.05). it was found that the path from Bank size to ROE was positive but statistically no significant, which means that Bank size was found to have no positive effect to ROE (b=0.042, SE= 0.06, p= 0.471, β= 0.131). There is no effect of Bank Size to ROE given that p= 0.471 > 0.05. It was also found that that the path from Age to ROE was positive and

statistically significant, which means that Age was found to have a positive effect to ROE (b=0.004, SE= 0.001, p= 0.002, β= 0.56). There is an effect of age to ROE given that p= 0.002 < 0.05.

(4) Effect of NPL, Leverage ratio, Bank size, and age on Return on Asset (ROA)

Here the ROA was expressed as a function of NPL, Leverage ratio, bank size and age under the following equation:

Model 4: $ROA = Ƙ_0 + Ƙ_1 * NPLs + Ƙ_2 * Leverage\ ratio + Ƙ_3 * banksize + Ƙ_4 * bankage + e_3$

Model 4 was expressed into the following null hypothesis H_{02} that states that 'Credit risk management and operational risk do not affect ROA of commercial banks in Rwanda'

ROA= -0.047 -0.003 NPL+0.0006 Leverage ratio+0.008 Bank size +0.0006 Bank Age

Therefore, we concluded that path from NPL to ROA was negative but statistically significant, which means that the NPL was found as negative predictor to ROA (b= -0.003, SE= 0.0005, p= 0.000, β= -0.58). There is effect of NPL on ROA given that p= 0.000< 0.05). It was found that the path from Leverage ratio to ROA was positive but statistically no significant, which means that Leverage ratio was found not to be a positive predictor to ROA (b=0.0006, SE= 0.001, p= 0.581, β = 0.67), there is no effect of leverage ratio on ROA given that p= 0.581>0.05). It was found that the path from Bank size to ROA was positive but statistically no significant, which means that Bank size was found to have no positive effect to ROA (b=0.008, SE= 0.007, p= 0.216, β= 0.178). There is no effect of Bank Size to ROA given that p= 0.216 > 0.05. It was also found that that the path from Age to ROA was positive and statistically significant, which means that Age was found to have a positive effect to ROA (b=0.0006, SE= 0.0001, p= 0.000, β= 0.597). There is an effect of age to ROA given that p= 0.000 < 0.05.

Results in Table 4.5 revealed that NPL as a predictor associated to variables such as leverage ratio, bank size and bank age affect negatively ROA (b= -0.003; SD=0.005; p<0.001). This result implies to conclude that H_{02} that states that the NPLs associated to variables such as leverage ratio, bank size and bank age affect financial performance. Therefore, H_{02} was rejected. This result corroborates with the findings in the researchers carried out by Gadzo *et al.,(*2019) and Fadun & Oye (2020). In addition, the results in Table 4.4 showed also that Leverage ratio was not significantly positive predictor of ROA (b=0.006; SD= 0.0006; p> 0.55), which indicate that H_{02} was not rejected if the independent variable were NPLs and

age; this result do contradict the results in Gadzo *et al.,(*2019) and Fadun & Oye (2020) studies.

In this section, both credit and operational risks are modeled against returns on equity. Bank controls are also included in the estimation of the result. Results in Table 4.5 revealed that a higher credit risk as proxied by NPL ratio significantly reduces banks' return on assets. This implies that banks with higher loan defaults are the least performers. The coefficients are negative and statistically significant. In addition, results in Table 4.5 showed that operational risks moderately and positively affect banks' return on assets. This implies that operational risks do not adversely affect banks performance (ROE).

Table 4.5 also reports results on the effects of bank controls. Specifically, banks' size as proxies by total assets moderately and positively affects banks' return on equity. In addition, banks' age significantly and positively affects banks ROE. This implies that older banks are better performers than young banks. Our results show that hypotheses H_{01} and H_{02} are rejected and H_{a1} and H_{a2} were accepted. Covariance between npl and leverage is 2.024 with p-value $p=0.035 <0.05$ and covariance between npl and leverage is 0.0005 with p-value $p=0.000<0.01$.

In sum, the results in Table 4.5 provide enough evidence to conclude that credit risk management and operational risk measured respectively by NPLs and leverage ratio, associated to control variables such as bank size and bank age were not both affecting the financial performance measured by ROA. It was find that only NPLs does affect negatively ROA while leverage ratio does not affect ROA. The result on NPLs and ROA corroborates with the findings in the researchers carried out by Gadzo *et al.,(*2019) and Fadun & Oye (2020). However, with the result on Leverage and ROA it was find that the result does contradict the findings in Gadzo *et al.,(*2019) study. Furthermore, it was found that the associated variables to the independent variable such as bank size did not have any effect on the bank profitability, while bank age variable had had a positive effect on ROA ($b= 0.0005$, $p<0.01$). The researcher did not discuss the results on the effect of bank size on ROA, since there were not statistically significant.

CHAPTER FIVE: MAJOR FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 introduction

This chapter discusses the results from the study which aim was to assess the effect of credit risk management and operational risk on financial performance of selected commercial banks in Rwanda. In order to achieve the above objective, credit risk and operational risk were measured respectively by NPLs and leverage ratio while financial performance was measured by ROE and ROA. Furthermore, credit risk and operational risk were associated to control variables such as age and bank size.

This study used secondary data and with regard to sample, it was chosen all certified financial statements of 5 commercial banks that were registered within the Rwanda Stock Exchange or any commercial bank that had have complete data from the period of 2010 to 2019 was selected. The study opted for quantitative design since it was seeking to determine the effect of both operational risk and credit risk on banks' performance. Hence, the statistical method named 'Partial Least Squared Structural Equation Modeling (PLS-SEM)' was used to assess the effect of both operational risk and credit risk on banks' performance.

5.2 Discussion of findings

Findings are discussed according to study objectives as follow:

5.2.1 To assess the levels of operational risks in commercial banks:

Findings for these objectives are shown in Table 4.1. Operational risk is measured by leverage ratio. On average banks' leverage ratio is at 6.5. However, there are variations among banks with respect to leverage ratios. For instance, the highest and lowest leverage ratio was respectively 7.838% for BPR and 4.56% for BK. However, based on the theory on leverage ratio it should be noted that the leverage ratios are applied to verify the relative level of debt load that a business has acquire Furthermore, these ratios evaluate the total debt obligation to either the assets or equity of business, a high ratio shows that a business may have incurred a higher level of debt than it can be logically expected to service with continuing cash flows. This is a main concern since high leverage is combined with heightened risk of bankruptcy. In this context, the results in Table 4.2 revealed that BK had have the lowest level of debt while BPR and COGEBANK had a highest level of debt that can be probably associated with heightened risk of bankruptcy.

5.2.2 To assess the levels of credit risks in commercial banks:

This study uses NPL ratio as the measure of credit risk. A NPL is a loan in which the borrower is defaulting and hasn't made any planned payments of principal or interest for a given period of time, in baking sector loans given by commercial banks are considered as non-performing if the borrower is 90 days past due and the International Monetary Fund (IMF) considers loans are less than 90 days due as nonperforming if there's high uncertainty nearby future payments.

The average of NPLs for the five commercial banks in Table 4.3 is 5.91% which is above 4.91% in 2019. The highest and lowest values of the NPLs were respectively 11.22% for BPR and 3.817% for I &M Bank. The results in Table 4.3 indicated that BPR presents high level of NPLs compared to the rest of the commercial Banks.

5.2.3. To assess the levels of bank performance in commercial banks

Bank's performance is measured by Return on Asset and Return on Equity (ROA and ROE). Results in Table 4.1 revealed that two banks BK and I&M Bank had have the highest ROA of 4.2% while BPR and Access Bank had had the lowest ROA respectively 1.5% and 1.7%. With ROE, the results in Table 4.1 revealed that two banks I&M Bank had have the highest ROE of 2.97% while BPR and Access Bank had had the lowest ROA respectively 14% and 10.5%.

Given the trend of ROA and ROE in the country as stipulated by National Bank, the profitability indicators illustrate that profitability in Rwandan banking system recorded a significant raise over the years as shown in figure 4.2 both return on equity (ROE) and return on assets (ROA) were 2.2% and 10.5% and 2.2% and 10.4% in 2011 and 2012 respectively. The enhancement in profitability can be explained by the BNR continuous monitoring of the banking sector profitability followed by the progress in asset quality management that direct to capital adequacy ratio was at 23.9 compared to 25% in 2012 and 2011 respectively above the regulatory minimum capital of 15% and above 10% for G20 and Basel committee new benchmark.

5.2.4 To establish the relationship between operational, credit risks and financial performance.

Results show that a higher credit risk as proxied by NPL ratio significantly reduces bank's return on assets. This implies that banks with higher loan defaults are the least performers. In

addition, results show the operational risks moderately and positively affect banks' return on assets. This implies that operational risks do not adversely affect banks' financial performance (ROE). Results show that credit risks as proxied by NPL significantly reduces a bank's return on assets. This implies that banks with higher credit risks (loan defaults) are worst performers in terms of income. Results also reveal that higher operational risks as proxied by leverage ratio are worst performers. Overall, both credit and operation risks significantly reduce bank's return on asset. The results in this study provide enough evidence to conclude that credit risk and operation risk measured by NPLs and leverage ratio, associated to control variable such as bank size and bank age were not affecting the financial performance measured by ROA. The results on NPLs and ROA corroborates with the findings in research carried out by Gadzo *Et al.*,(2019) and Fadun &Oye(2020).

However, with the results on Leverage and ROA it was found that the results don't contradict the findings in Gadzo *Et al.*,(2019) study. The results in this study revealed that credit risk (NPLs) and operational risk (leverage ratio) do affect negatively and positively financial performance measured by Roe when we are using the control variables such as bank size and bank age . The findings are not in unanimity with the several empirical works which have concluded that bank performance is positively related to credit risk such as Nduku (2013), Abba *et al.,(*2014), Chimkono *et al.,* (2016) and Al-Shakrchy (2017).the results of credit risk management (NPLs)and leverage ration ROE corraboraote with the findings of research of Bagram and Ali (2018), Gadzo *et al* .,(2019) and Fadun & Oye (2020).

5.3 Conclusion

The purpose of this study was to assess the effect of credit risk and operational risk on financial performance of selected Rwandan commercial banks that are registered at Rwanda Stock Exchange. The specific objectives were to assess the levels of credit risk, operational risks, and bank's financial performance, and to examine the effects of both credit and operational risks on the financial performance of commercial banks operating in Rwanda. To achieve these objectives, this study used a partial least squares structural equation model (PLE-SEM) estimation technique with data sourced from banks' financial statements and annual reports for the period of 2013 to 2018.

Results in this study show that higher credit risks as proxied by non-performing loans (NPL) ratio significantly reduces banks' return on assets (ROA) and moderately increases banks return on equity (ROE). In addition, higher operational risks significantly reduce banks'

return on assets but increases banks' return on equity. In other findings, banks' age significantly increases banks' financial performance (both ROA & ROE).

This study provides both academic and policy implications. It adds to the rare literature on the measures of credit and operational risks as required by Basel II & III financial requirements on Pillar II (Capital requirements). In addition, it uses a novel and rarely used estimation technique in measuring banks' financial performance (PLE-SEM). This study also contributes to policy by recommending central bank to implement proficient credit risk and operational risk management measures in place to protect the financial performance of the commercial banks. This will not only protect the assets of the banks and safeguard investors' interests but also harden to the benefit of individuals, business entities and the entire economy at large. Regulators should also set policies that will strengthen the banking industry particularly policies that bothers around risk management.

This study concludes that credit risk influences profitability measured by ROA and ROE negatively and these results are in line with several studies such as Gadzo *et al.,(*2019) and Fadun & Oye (2020) studies. Consequently, the findings are not in unanimity with the several empirical works which have concluded that bank performance is positively related to credit risk such as Nduku (2013), Abbas *et al*., (2014), Chimkono *et al*., (2016) and Al-shakrchy (2017) studies nevertheless in line with the lemon theory, information asymmetry could lead to more NPLs which negatively affect the financial profitability of the commercial banks.

In addition, the findings from this study also revealed that operational risk of banks measured by leverage ratio have significant positive effect on the profitability like ROE but not on ROA. These results are in line with Gadzo *et al.,(*2019). The results suggest that as banks should increase their operational risk exposure and the amount of profit levels drops. Moreover, it was found that the associated variables to the independent variables such as bank size and bank age did not have any effect on the bank profitability, while bank age variable had had a positive effect on the bank profitability**.**

5.4 Recommendations

Based on the findings of this study, it is vital that central bank implement proficient credit risk and operational risk management measures in place to protect the financial performance of the commercial banks. This will not only protect the assets of the banks and safeguard investors' interests but also harden to the benefit of individuals, business entities and the entire economy

at large. Regulators should also set policies that will strengthen the banking industry particularly policies that bothers around risk management.

On the negative relationship between financial profitability and credit risk management, it is proposed that commercial banks be encouraged to cut down their lending rates cautiously so that more clients can access loans which in turn decrease credit risk and subsequently boost profitability further as the industry is already doing well in terms of profitability. The banks could also divert funds available for fee-generating activities into loan-generating activities. Nonetheless, borrowers should pay the full interest plus principal on time to ensure profitability as anticipated, is attained.

With regard to operational risk, where a positive relationship was found between operational risk and financial profitability, it is recommended that commercial banks maintain their leverage and improve their portfolio by focusing on investment income so as to boost their financial profitability.

5.5 Future Studies

To the future researcher, we propose the investigation of effect of credit and operational risk on financial performance by adding control variables such as ownership of the bank and Z-scores for this study is based on a limited scope, therefore, a large sample size may be advisable for future researchers.

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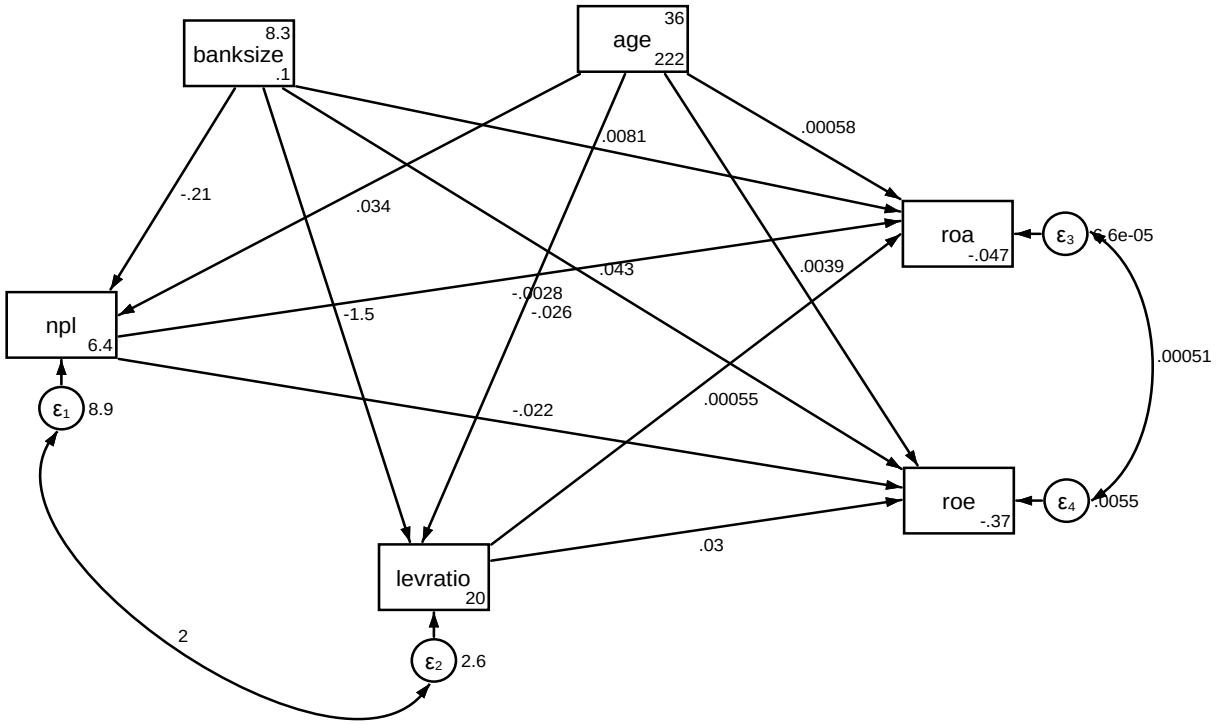
```
. sem (banksize -> npl, ) (banksize -> levratio, ) (banksize -> roa, ) (banksiz
> e -> roe, ) (age -> npl, ) (age -> levratio, ) (age -> roa, ) (age -> roe, )
> (npl -> roa, ) (npl -> roe, ) (levratio -> roa, ) (levratio -> roe, ), cov( e
> .npl*e.levratio e.roa*e.roe) nocapslatent

Endogenous variables

Observed:  npl levratio roa roe

Exogenous variables

Observed:  banksize age

Fitting target model:

Iteration 0:   log likelihood = -96.029078
Iteration 1:   log likelihood = -96.029078

Structural equation model                       Number of obs     =         30
Estimation method  = ml
Log likelihood     = -96.029078
```

	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
Structural						
npl						
banksize	-.2106108	2.33197	-0.09	0.928	-4.781188	4.359967
age	.0340747	.049763	0.68	0.494	-.0634589	.1316083
_cons	6.43212	18.172	0.35	0.723	-29.18435	42.04859
levratio						
banksize	-1.528143	1.270242	-1.20	0.229	-4.017771	.9614851
age	-.0261619	.0271063	-0.97	0.334	-.0792892	.0269654
_cons	20.13344	9.898426	2.03	0.042	.7328846	39.534
roa						
npl	-.0027546	.0005452	-5.05	0.000	-.0038232	-.001686
levratio	.0005525	.0010009	0.55	0.581	-.0014092	.0025143
banksize	.00805	.0065041	1.24	0.216	-.0046977	.0207977
age	.0005758	.0001403	4.10	0.000	.0003008	.0008509
_cons	-.0473799	.0528619	-0.90	0.370	-.1509874	.0562276
roe						
npl	-.0220749	.0049954	-4.42	0.000	-.0318656	-.0122842
levratio	.030006	.0091707	3.27	0.001	.0120317	.0479803
banksize	.0429877	.059592	0.72	0.471	-.0738105	.1597858
age	.0039206	.0012858	3.05	0.002	.0014005	.0064408
_cons	-.3684799	.4843355	-0.76	0.447	-1.31776	.5808003
var(e.npl)	8.929403	2.305562			5.383233	14.81159
var(e.levr~o)	2.649411	.6840749			1.597239	4.394693
var(e.roa)	.0000658	.000017			.0000397	.0001092
var(e.roe)	.005527	.0014271			.003332	.0091678
cov(e.npl, e.levratio)	2.024127	.9618514	2.10	0.035	.1389327	3.909321
cov(e.roa, e.roe)	.0005115	.0001444	3.54	0.000	.0002285	.0007945

```
LR test of model vs. saturated: chi2(0)   =      0.00, Prob > chi2 =      .
```


banksize
8.3
.1
age
36
222
npl
6.4
roa
-.047
roe
-.37
levratio
20
ε1
8.9
ε2
2.6
ε3
6.6e-05
ε4
.0055
-.21
.034
.0081
.00058
.043
-.0028
-.026
-1.5
.0039
.00051
-.022
.00055
.03
2

thesis_after_test_1.docx

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