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FACTORS DETERMINING PROFITABILITY OF MICROFINANCE INSTITUTIONS IN RWANDA

THESIS SUBMITTED IN PARTIAL FULFILMENT FOR THE REQUIREMENTS FOR THE AWARD OF MASTER'S IN ECONOMICS

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Declarations

STUDENT'S DECLARATION

I declare that this Thesis is my work and that all sources of materials used have been fully acknowledged. It has been submitted in partial fulfilment of the requirements for the master's degree of Science (MSc) in Economics.

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SUPERVISOR'S DECLARATION

This master thesis has been submitted for review with my approval as university supervisor.

Dr Ruhara Mulindabigwi Charles

Signature : ……

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Abbreviations and Acronyms

ADF- Augmented Dickey–Fuller

ATM- Automated Teller Machine

BNR- Banque Nationale du Rwanda/ National Bank of Rwanda

BRD- Banque Rwandaise de Développement/ Rwanda Development Bank

CAR- Capital Adequacy Ratio

CGAP- Consultative Group to Assist the Poor

COOPEC- Coopérative d'Epargne et de Crédit

DF- Dickey Fuller

FOREDEM- Fund for Refinancing and Development of Microfinance

FSS- Financial Self-Sufficiency

GDP- Gross Domestic Product

MFB- Microfinance Banks

MFI- Microfinance Institution

NBFFC- Non-banking Finance Company

NGO- Non-Governmental Organisation

NISR- National Institute of Statistics Rwanda

OSS- Operational self-sufficiency

RMP- Relative Market Power

ROA- Return on Asset

ROE- Return on Equity

ROSCAs - Rotating Savings and Credit Associations

SA- Société Anonyme

SCP- Structure Conducted Performance

UBPR- Union des Banques Populaires du Rwanda

UNCDF- United Nations Capital Development Fund

Abstract

In recognition that profitability is a necessary condition for microfinance institutions to scale up to a level that allows them to provide microfinance services to a large client base independent of external subsidies over the long run, this study investigates and documents the factors that determine the profitability of MFIs in Rwanda. We have used aggregated data of MFIs in the country over a period of 7years from Q4, 2014 to Q3, 2020 collected from the Central Bank of Rwanda.

The research applied ordinary least squares to an analysis of multiple correlation and regression consisting of aggregated data for Rwandan MFIs to identify the dynamics that determine profitability of MFIs in Rwanda and the extent to which the identified factors explain the profitability. The study found that Capital Adequacy, portfolio yield, operating expense and GDP have a positive relationship with the profitability of MFIs in Rwanda while financial expense, provision expense, gross loan book to total assets and inflation have a negative correlation with the profitability of MFIs in Rwanda.

From the findings, three recommendations were formulated: To put in place a good loan management policy and appraisal system, strive to improve the level of investment in the expenses driving income and bring these to the optimal levels such as technology, training, marketing, personnel expenses just to name a few and the government to support MFIs in matter related to computerisation and continue close supervision for their development.

Key words: Factors, Determining, Profitability, MFIs

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CHAPTER ONE: INTRODUCTION

This chapter outlines the background, the statement of the problem, objectives, the significance, scope, and limitation of the study.

1.1 Background of the study

Microfinance is high on the public policy agenda, with the aim of attaining incredible achievements in advancing the living of the poor, by the way of financial services provision. Such programs are broadly supported by various organisations including the World Bank, national governments, United Nations, and many charitable non-governmental organisations (NGOs). The MFIs goal consist of assisting the poor deal with risk and benefit from opportunities generating small income, using profit-making banks methods among poor people (Ahlin & Jiang, 2008; Imai et al., 2010)

Adam and Johan (2016) argued that it should be expected that capital flows at exceptional rates to the developing economies from the western world looking for higher returns, while likely contributing to stronger economic expansion in the receiving countries. Nevertheless, in the progress until recently, this has not been the case. Most loans in the poor parts of the world are controlled by local loan sharks at very high rates of interest and very short maturity periods. This leads us to observe many developing countries struggling with low degrees of capital intensity and credit crunches, making it virtually difficult for them to establish opportunities for entrepreneurs and businesspersons.

The microfinance institutions, apart from being a critical component of the financial system, it is also regarded as a poverty reduction strategy for developing countries (Tehulu, 2013). Microfinance institutions (MFIs) allow a bigger part of the world's population to gain access to credit, thus making possible investments in the promotion of small-scale businesses (Adam & Johan, 2016). Microfinance bulletin found that the privileged and the underprivileged stay on the same globe. However, majority are poor. It is evident that 4 billion people across the world live on below two USD per day (Zergaw, 2015).

Sustainability/profitability of MFIs is key to address the above-mentioned challenge it is not something to be achieved in a blue sky; it is a vital component that MFIs should make every effort to accomplish so that they attain their meant objective. At this point the elephant in the

room is about how this sustainability can of course be reached? And that is the arguable concern among scholars (Muriu, 2011).

One side of scholars argue that the main purpose of MFIs should be poverty alleviation, by helping the poor to gain admission to financial services, that is declined to them by classic banks. Consequently, their purpose should not be to make profit. As they suggest that the poverty alleviation should be the top priority and hence be more valuable than making profit. In this point of view, to reach their meant objective MFIs need to be subsidised (Zergaw, 2015).

Others argue that though the objective of MFIs is to fight poverty, by assisting the economically active poor by way of giving them access to loans and others financial services; given that they charge higher interest rate considered as reimbursement for associated costs to the provision of the above-mentioned services, and as they should reinforce their financial situation, their objective is also to gain profit, for their sustainability to enable the improvement of their services to the poor through innovation and technology, which require more investment (Sima, 2013). Whatever the case, profitability is vital even for the social mission to be achieved. Sustainability is key in the long run, which cannot be attained by cumulating losses or building on donor's funds.

1.2 Problem statement

Microfinance institutions help in poverty alleviation by providing to the needy sustainable credit facility to start a small business. Empirical evidence establishes that below fifteen percent of the inhabitants in developing economies has access to financial services (Mulandi, 2010). MFIs are there to bridge this gap. Poverty eradication is at the forefront of the development strategy of Africa Rwanda included. Non-accessibility to credit by the needy has been found as one of the factors that contributes to poverty (Tehulu, 2013). There is no way to think about sustainability without profitability, in other words, no access to financial services consistently to the poor without MFI profitability. Mulandi, (2010) states that the factors determining the profitability of financial institutions have been broadly analysed theoretically and through empirical observation.

Experiments can be arranged in two categories, those that concentrated on a given contry referring to (Berger et al., 1987, Berger, 1995, Barajas et al., 1999 and Naceur and Goaied,

2001) and those that have focused on a panel of countries (Haslem, 1968, Short, 1979, Bourke, 1989, Molyneux and Thornton, 1992 and Demirgüç-Kunt and Huizinga, 1999). Findings concluded that the factors that determine financial institutions' profitability include characteristics of individual firms.

King'ori et al., (2017) established that capital adequacy, operational efficiency and firm size significantly and positively influences the profitability of microfinance banks in Kenya. Alternatively, Kinde, (2012) found that there was no significant association found between capital structure and profitability of MFIs in Ethiopia, which contradicts the above-mentioned findings. Dissanayake, (2009) confirm that the Sri Lankan microfinance institutions could achieve profitability if they emphasise on minimising cost per borrower, operating expenses, write offs, and gearing, that concur with Adam & Johan, (2016) who found that MFIs specific characteristics are the most important drivers of their profitability. Among others three stand out, risk management, cost management and size of the institution, they also found some convincing evidence that macroeconomic determinants affect in a significant way MFIs profitability.

Furthermore, market sources of funding are accessible only to MFIs that have demonstrated capabilities to generate profits. By minimising the likelihood of financial crisis, notable profits are vital in reassuring MFIs stakeholders, including investors, borrowers, suppliers, and regulators. On the macroeconomic level, a profit-making microfinance industry is in a better position to prevail over negative shocks and be able to bring its contribution to the overall financial system stability (Murui, 2011).

We have selected the Return on Equity (ROE) as a proxy for profit, due to the fact that it is the metric which draws the attention of investors and shareholders who are profit oriented. The Portfolio Yield (effective interest rate charged to customers) has been considered among independent variables, which was not the case for studies reviewed in our research. It is our hope that this study will benefit the Rwandan MFI industry, as we did not find a similar study conducted in Rwanda.

1.3 Research Objectives

1.3.1 General Objective

The general objective of this study is to assess the factors that drive profitability of Rwandan MFIs.

1.3.2 Specific objectives

The specific objectives are

To examine the drivers of MFIs profitability in Rwanda and

To provide some practical policy recommendations.

1.4 Significance of the Study

The findings of this research will benefit the MFI stakeholders like investors, operators, regulators, policy makers, Banks, just to name a few. It will help them acknowledge factors affecting the profitability of MFIs in Rwanda and the actions that may be brought in as a result, to enable them flourish.

1.5 Scope of the Study and delimitation

The scope is the Rwandan case, (MFIs in Rwanda) over 7 years (2014–2020, 24 quarters) using aggregated data which were provided by the National Bank of Rwanda.

1.6 Limitation

Given that MFIs in Rwanda are classified in different categories: Public Limited Companies, Umurenge saccos and other saccos (BNR, Financial Stability, 2020), we were expecting to get individual data for MFIs using panel data that were not possible as the National Bank of Rwanda informed us that they can provide only aggregated data according to the policy.

1.7 Structure of the study

The study is divided into five chapters. The chapter one outlines the introduction for the research while chapter two discusses the literature review. Chapter three presents the methodology and research design while chapter four presents and discusses the results, whereas chapter five presents the conclusions attained and recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the available literature on the factors influencing microfinance institutions profitability that serves as a treasure from earlier findings on this research. It is divided into three parts. Section one unpacks the theoretical foundations, section two review the empirical literature and the last part that summarises the literature and highlights the knowledge gap that this research is supposed to bridge.

2.2 Theoretical foundations

2.2.1 Definition of Microfinance

As per Churchill and Framkiewicz, (2006); Microfinance is generally associated with small working capital loans that are disbursed in microenterprises or small income-generating activities.

Microfinance is a small-scale of financial services mainly loans and savings delivered to the poor who farm, fish, herd, who operate micro-enterprises or small businesses where goods are produced, recycled, repaired, or sold, who offer services, who work for wages and commissions, who gain income from renting out a small amount of land, motorcycles, vehicles, draft animals, machinery tools, other individual and groups at the local level of developing countries both rural and urban area Robinson, (2001). MFIs are also defined as institutions that offers financial services to low-income clients Jorgensen, (2012). Other definitions are also given to MFIs by different institutions.

According to UNCDF, (2000), Microfinance is commonly referred to as the provision of financial services to those who are deprived of such services by classic banks. MFIs offers various financial services that target low-income clients, predominantly women. Since microfinance institutions customers have lower incomes and often have limited access to other financial services, microfinance products tend to be for smaller monetary amounts than traditional financial services. These services include loans, savings, insurance, and remittances.

Microfinance consists of the provision of financial services in small increments, typically to very poor people. Formal credit and savings institutions for the poor have also been around for decades, serving customers who were traditionally neglected by commercial banks a way

to obtain financial services. One of the earlier and longer-lived microcredit organisations providing small loans to rural poor with no collateral was the Irish Loan Fund system, initiated in the early 1700s by the author and nationalist Jonathan Swift. Swift's idea began slowly but by the 1840s had become a widespread institution of about 300 funds all over Ireland. Their principal purpose was making small loans with interest for short periods. At their peak they were making loans to 20% of all Irish households annually, (Ashenafi, 2018).

2.2.2 History of Microfinance

As mentioned in the above statement, the microcredit history is traced back to early 1700s when Jonathan Swift, an Irishman, had the idea to create a banking system that would reach the poor. The Irish Loan Fund was created then, which gave small short-term loans to the poorest people who live in the territorial confines of Ireland, and who were not being served by the formal financial institutions.

The primary goal was to create wealth in Ireland's rural areas. For this idea, to pick up it took several years, but then quickly grew and expanded globally. On the verge of the 1800s, the Irish Loan Fund had more than 300 banks for the poor and was serving over 20% of the Irish citizens. In 1800s similar banking systems were also shown up across Europe targeting the rural and urban poor residents.

To the other side of western Europe, Friedrich Wilhelm Raiffeisen of Germany realised that the poor farmers were being taken advantage of by loan sharks. He pointed out that under the then lending system, the poor would never be able to create wealth; they would be stuck in a cycle of borrowing and repaying without ever making personal economic development. By the year 1864, he founded the first rural credit union to break this trend. The system was different from previous banks because it was owned by its members, provided reasonable lending rates, and was created to be a sustainable means of community economic empowerment.

Grameen Bank History

"My experience working in the Grameen Bank has given me faith; an unshakeable faith in the creativity of human beings said Yunus. **It leads me to believe that humans are not born to suffer the misery of hunger and poverty**. They suffer now as they did in the past because we turn our heads away from this issue.

I have come to believe, deeply and firmly, that **we can create a poverty free world**, if we want to. I came to this conclusion not as a product of a pious dream, but as a concrete result of experience gained in the work of the Grameen Bank".

The roots of microfinance can be found in many places, but the best-known story is that of Muhammad Yunus, the founding of Bangladesh's Grameen Bank. We will briefly tell the story now and return to our subject in later chapters (Aghion & Morduch, The Economics of Microfinance second edition, 2010).

Here I want to reproduce the history of Grameen Bank, as it is in the Yuns' book "The Bank of the Poor" (Muhammad, 2007), which clearly provides the origination of the microfinance and its difference from traditional banking.

In the mid of the 1970s, Bangladesh was beginning the long road to build a new nation. Challenges were great: Independence from Pakistan had been won in December 1971 after a fierce war, and two years later widespread flooding brought on a famine that killed tens of thousands (Sen 1981). Government surveys found more than 80 percent of the population living in poverty in 1973–1974 (Bangladesh Bureau of Statistics 1992) (Aghion & Morduch, The Economics of Microfinance second edition, 2010).

In 1974, while Muhammad Yunus was teaching economics in Bangladesh, the country was ravaged by famine. Increasingly uncomfortable teaching abstract theories while starving people shuffled by outside his classroom, Yunus realised his economic education was **incomplete**. To complete it, he went to local villages to "learn from the poor" about what they needed rather than what a textbook said they should have. The answer was credit, so Yunus founded a bank to provide it – Grameen Bank. The name means the "bank of the village." Today, Yunus is a Nobel Peace Prize winner for the year 2006 and Grameen Bank has extended credit to more than 6.7 million active borrowers in 2012.

Bangladesh was under a severe famine. In his daily exchanges at the university, Yunus noticed something strange: lands proper for agriculture remaining uncultivated in the midst of a starving population. This appeared like a problem that could be resolved.

With his student, he started investigating the nearby villages, trying to understand why the lands were not being used. The answer was poor irrigation. Together with his students they asked what skills villagers had and how they made their living. By this stage of his

career, Yunus had decided. Personal experience and contact with people were preferred above learning from books and classrooms. To combine the academic and practical worlds, Yunus founded the Chittagong University Rural Development Project, through which students earned academic credit while assisting local poor people. They focused on irrigation technology and helping the villagers grow high-yield rice. Yunus also experimented with agricultural cooperatives, which he funded himself.

While these projects were successful, Yunus concluded that he was still having a room of improvement to help the poorest of the poor – landless people such as Sufiya Begum, a mother of three kids 21-year-old who was making bamboo stools in the nearby village of Jobra. Sufiya used to buy equivalent 22 cents of raw materials from the intermediary on credit, and then sold him finished stools to repay the loan. Her income was two cents a day. She could have borrowed money for her raw materials from local moneylenders, but they charged interest rates ranging from 10% a week to 10% a day. As Yunus talked with others in Jobra, he saw the same problem: a dependence on usurious loans. Working with a student, Yunus listed all the villagers in Jobra who were borrowing money and added up how much they needed.

These 42 people needed only $27 to buy their raw materials. Yunus decided to loan the Villagers the money himself, interest free. Knowing that this *ad hoc* solution could not work on a large scale, in 1976, he approached the local branch of Janata Bank, one of the largest government banks in Bangladesh, and pitched an idea: small loans to the very poor. It seemed like a simple solution to a complex problem. However, the bank managers rebuffed him. The poor were illiterate and could not fill out the necessary forms, he was told. In addition, they had no collateral (which was obviously true – that was the problem). After some negotiation, he offered to personally guarantee the loans, which totalled about $300. Gradually, the bank managers came around and agreed. It took another six months, but finally the loans were made to Yunus. The bank required him to act as intermediary, filling out the necessary paperwork for each loan because it did not want to deal with the poor directly. Why did he think the poor would repay these unsecured loans? “The poor know this credit is their only opportunity to break out of poverty,” he says. “If they fall afoul of this one loan, they will have lost their one and only chance to get out of the rut.”

This program later evolved into Grameen Bank, which Yunus started even though he had no training in managing a bank, particularly one for impoverished people. How did he learn? He decided to look at the way other financial institutions operated, gain from their errors and, **often, does the exact opposite of what a traditional bank would do**. For instance, he thought that bearing large debts would discourage poor borrowers, so he made them start repaying immediately. Loans lasted for one year, and borrowers had to pay back a tiny amount each day. (Later, payments were made weekly.) He discovered that repayment was probable if borrowers formed groups. If one borrower defaulted, the group's members could not get loans. He also required borrowers to accumulate savings, which could then be lent to other members of the borrowing group. (By 1998, $100 million had been saved this way.) He conducted all transactions in the open, so everyone could see how the system worked. There were no secrets. The system was self-policing, and never involved the courts or anyone outside Grameen.

A Shift in Thinking

Grameen Bank started very little and developed gradually. What was ground-breaking was the shift in thinking it represented. In the past, financial institutions always asked themselves, "Are the poor credit-worthy?" and always the answer was no. As a result, the poor were simply ignored and excluded from the financial system, as if they did not exist. Yunus reversed the question: "Are the banks people-worthy?"

When he discovered that they were not, and he realised it was time to establish a new kind of bank. None of us like the idea of apartheid. We object when we hear about such a system in any form, anywhere. We all understand that no one should suffer because he or she was born in a certain race, class, or economic condition. However, our financial institutions have established a worldwide system of apartheid without anyone being horrified by it. If you do not have collateral, you are not credit-worthy, he stated, to the banks, you are unacceptable.

Suppose global electronic communication system of the banking world collapses and every financial institution in the world suddenly stop operating. Banks everywhere would close their doors. ATM screens would go empty. Credit and debit cards would no longer function. In addition, billions of families would not be able even to put

provisions on the table. Well, this is exactly the situation that half of the world's population lives with every day—a non-stop dread story.

It is up to us to remove the institutional barriers we have created around the poor for them to get the chance to lift themselves out of poverty. We are to remove the absurd rules and laws, and we have made that treat the poor as nonentities. In addition, we are to find different ways to recognise people by their own worth, not by manmade measuring sets enforced by a unfair approach said Yunus.

The discovered issue in Bangladesh, exclusion of the poor from accessing and enjoy the financial system, is not a challenge to the developing countries of the world only. It is a global problem. In the wealthiest countries of the planet as well, many people are not considered creditworthy and are consequently disqualified to fully participate in the economic system.

Is it not shocking that low-income people who are fighting to make ends meet are the ones who must pay *the most* for basic financial services, when they can get access to those services at all?

New ways to take advantage of the underprivileged are continuously being developed. As an example, if you belong to the privileged class, you may have certainly not heard of payday loans, small, short-term loans, most of time less than USD1,500, that are given to low-income Americans without access to conventional sources of credit. They use these loans to get from one payday and the next to pay an unpredicted doctor's bill or fix a car or a broken appliance when broke.

Privileged individuals would use a credit card to cover such expenses. If the credit card bill is paid in full and on time, and no finance charge would be assessed. If it takes a few months to pay the bill, an annualised interest rate of about 25 percent might be charged. However, the working poor, who do not qualify for a conventional credit card, are forced to take payday loans instead. In addition, the fees and interest charges for these loans can come to an annual rate of 250 percent, or even higher.

It is so appealing to blame the underprivileged for the problems they face. However, when we look at the institutions we have created and how they fail to serve the poor,

we see that those institutions and the backward thinking they represent must bear much of the blame.

At Grameen Bank, they challenged the financial apartheid. They dared to give the poorest people bank credit. They included destitute women who had never in their lives even touched any money. They defied the rules. At each step along the way, everybody shouted at them, "You are wasting your money! The money you lend will never come back. Even if your system is working now, it will collapse in no time. It will explode and disappear."

However, Grameen Bank neither exploded nor disappeared. Instead, it expanded and reached much more people. Today, it gives loans to more than seven million poor people, 97 percent of whom are women, in 78,000 villages in Bangladesh. Since it opened, the bank has given out loans totalling the equivalent of $6 billion (U.S.). The repayment rate is currently 98.6 percent. Grameen Bank routinely makes a profit, just as any well-managed bank should do. Financially, it is self-reliant and has not taken donor money since 1995. Deposits and other resources of Grameen Bank today amount to 156 percent of all outstanding loans.

Grameen bank has been making profit each year with the exception of 1983, 1991, and 1992. And most significant of all, according to Grameen Bank's internal survey, 64 percent of their borrowers who have been with the bank for five years or more have crossed the poverty line. Grameen Bank was born as a tiny home-grown project run with the help of several of Yunus's students, all local girls, and boys. Three of them are still with him in Grameen Bank, after all these years, as its leading executives (Yunus, 2007).

Today there is a strong trend towards commercialisation and transformation of providers of microfinance into formal financial institutions. This stems from the motivation of profitability and sustainability of microfinance institutions.

2.2.3 Microfinance in Rwanda

According to Bateau, (2015), the Rwandan microfinance sector is comparatively young. Even though small self-help peasant organisations (such as tontines-ROSCA or ibimina) have been there for quite some time, the sector growth accelerated with the creation of the Rwanda Banques Populaires or Union des Banques Populaires du Rwanda (UBPR) in 1975 whose

network dominates the microfinance industry at the time. The history of MFIs is better described by the following timeline:

- 1965: Probable date of emergence of the first ROSCA or IBIMINA;
- 1975: Launch of the first Banque Populaire (BP), the Banque Populaire of NKAMBA, on August 4, 1975;
- 1986: Banques Populaires establish a Union called Union of the Banques Populaires (UBPR);
- 1994: all MFIS stopped their activities and lost their assets during the 1994 war and genocide;
- 1995: Launching of the financial sector reform.

After 1995, the Government initiated reforms of the financial sector aimed at establishing an efficient financial system. The principal objectives of these reforms include the strengthening of the Central Bank (BNR) legal powers of coordination and supervision of the banking structure, the introduction of new financial instruments, the liberalisation of interest rates and the opening of the banking structure to foreign banks. These reforms had a considerable impact on the development of the Rwandan financial sector.

- 1999: Announcement of the banking law n° 08/99 dated 18th June 1999 assigning the responsibility for the MFIs' supervision to BNR.
- 2002: Creation within the Rwanda Development Bank (BRD) of the Fund for Refinancing and Development of Microfinance (FOREDEM).
- 2002/2003: Adoption by BNR of two instructions regulating the activities of microfinance in general (Instruction n° 06/2002) and the instruction specific to COOPECS (Instruction n° 05/2003).
- 2004: First microfinance conference evaluating the level of achievement of the objectives of year 2005, declared international year of microcredit.
- 2005: a "microfinance best practices sensitisation tour" was organised around the country by the Secretary of State for Planning (in the Ministry of Finance) and the Governor of the National Bank of Rwanda explaining the risks of an illegal proliferation of Coopecs and other MFIs. Were invited to these meetings all MFIs, local authorities at various levels, the National police force and all the other actors of the field.

In 2008, the sector counted 125 MFIs including 111 COOPECs, 11 SA and 3 limited liability companies Bateau, (2015).

Currently, the financial sector in Rwanda comprises eleven Commercial Banks, three Microfinance Banks (MFBs), one Development Bank, one Cooperative Bank, Non-banking Finance Companies (NBFCs) (43 Microfinance Institutions, 416 Umurenge Saccos, 12 Private Insurance Companies, 2 Public Insurance Companies & Pension). Under the prevalent legislative structure, the supervisory responsibilities fall within legal ambit of National Bank of Rwanda (BNR, Financial Stability, 2020)

2.2.4 MFIs Profitability

This section discusses available profitability concepts. Even though there is no such customised profitability theory for MFIs, we will also refer from commercial banks associated theories as some of its forerunners since MFIs deliver banking services to the underprivileged.

"The Profit first" by Mike Michalowicz has challenged the long-time known formula for profit provided by the generally accepted accounting standards which is: **Profit = Sales − Expenses**. That crusty, bifocal-wearing, old-person-smelling formula according to Mike at first blush makes total sense. Sell as much as you can, then pay the bills, and what is left over is profit. Here is the problem: there are never any leftovers. He introduces a simple new Profit First formula: **Sales − Profit = Expenses** Michalowicz, (2017). Which resonates with efficiency and cost management.

Market powers

The market power theory state that industry market structure drives bank performance. Structure-conduct-performance (SCP) and Relative Market Power (RMP) are the parts of this theory. SCP approach stipulates that profit is raised by the level of concentration in the banking market by raising market power. While, the RMP approach stipulates that, market share determines the profitability that is to say large banks with differential products drive prices and rise profit as a result Tregena, (2009).

Efficiency

The efficiency theory states that high profits are made by more efficient banks. X-efficiency and Scale efficiency are the distinct approaches discussed in this theory. X-efficiency stipulates those good profits are earned as a result of more efficiency as they can lower their operating expenses, the scale efficiency stipulates that larger firms can obtain high profit as a

result of lowering their cost-unit and through economies of scale. Under X-efficiency approach, firms that lower costs tend to gain larger market share, which implies a high concentration. In the scale- efficiency approach economies of scale enable large firms to acquire higher market share which helps them to get high concentration then high profit (Athanasoglou et al., 2006).

Balanced portfolio

As per the balanced portfolio theory, the optimum asset balance is a function of rates of return on all assets held in the portfolio, risks associated with the ownership of each financial asset and the size of the portfolio, which requires the decision of the management. The best portfolio composition determined for each asset considering risk and return, by the management of the bank; resulting in profit maximisation while minimising the risk Nzongang, (2006).

Risk-return trade off

Risk-return trade off theory stipulates that as organisations grow their risk via enlarged leverage (debt over equity), firms tend to make good profit, Van Ommeren, (2011). Alternatively, signalling and insolvency hypotheses cost are opposite to the above-mentioned theories. Signalling hypothesis states that high equity ratio (equity over debt) results to good profit while bankruptcy cost hypothesis states that where bank anticipates bankruptcy costs to accumulate equity/capital will be high to cushion themselves from a possible financial crisis. Berger, (1995)

2.3 Empirical Literature

Zergaw (2015) urged that MFIs should be profitable to enable them to reduce poverty by expanding their outreach. Available literature describes the profitability of financial intermediaries as the return on assets (ROA) or the return on equity (ROE). This is presented as a function of internal and external variables. Variables that are under management control and influenced by their decision-making are called internal variables. These include firm size, capital adequacy, loan risk impairment and efficiency in operating expenses management just to name a few. External factors that are not under management control (not influenced by management decision-making) include macroeconomic and industry-specific variables.

Any given institution profitability depends on internal and external variables, as above-mentioned. Nevertheless, empirical literature with regards to factors influencing MFIs profitability is less available. Prior surveys performed in the domain were predominantly on the retail banking profitability theory. Nevertheless, considering that MFIs provide bank services also to the deprived findings from the banking industry can still serve. Zergaw, (2015).

2.3.1 Internal factors

A positive relationship between returns and capital has been confirmed by Furlong and Keeley (1989), Keeley and Furlong (1990), Berger (1994), Berger (1995), Naceur (2003) and Kwan and Eisenbeis (2005). Naceur and Goaied (2001) found that the banks which have struggled to improve labour, capital productivity and those who have been able to strengthen their equity were best performing. Bourke (1989) and Naceur (2003) agree that well capitalised banks face lower need to external funding and lower bankruptcy and funding costs; and this advantage translates into better profitability. Therefore, researchers have widely suggested that the more capital a financial institution has, the more resistant it will be to failure (Uche, 1998).

Mulandi (2010) states that the profit function of a financial institution includes the size and composition of its credit portfolio referring to (Bashir, 2000 and Fries *et al*., 2002). Tilahun Aemiro Tehulu, (2013) results indicate that MFIs' financial sustainability is positively and significantly influenced by the ratio of gross loan portfolio to total assets and size. Generally, loans generate revenue through interest and rise profits (Rhoades and Rutz, 1982); hence, a bigger credit portfolio ought to imply better profitability. Nevertheless, since substandard loans are a source of severe financial losses and have been held responsible for several institution failures, he recommends that a huge credit portfolio could also result in diminished bank profitability if it mainly consist of substandard loans. Therefore, it is right to conclude that the size of a MFI's credit portfolio impacts its profitability either positively or negatively, depending on its composition.

Mulandi (2010), Koehn & Santomero (1980) and Athanasoglou *et al*. (2005) propose that financial institutions risk taking have perverse consequences on profits and safety. Bobáková (2003) asserts that the profitability of a financial institution depends on its ability to anticipate, prevent, and monitor risks, possibly to cover losses brought about by risks arisen.

Hence, in decision making on the allocation of resources to asset deals, MFI must consider the level of risk to the assets.

Valentina et al, (2009), Adam & Johan, (2016) in their survey respectively on the Determinants of Commercial Banks and MFIs Profitability in Sub-Saharan Africa, got consistent results confirming that specific characteristics are the principal factors of profitability, among them three stand out, cost management, size of the institution and risk management. They also found convincing evidence confirming that macroeconomic determinants significantly affect both Banks & MFIs profitability.

2.3.2 External factors

Existing literature indicates that the environment in which financial institutions operate, like any other firm influences them. Consequently, the financial market shape, the economic situation of the country, the legal and political environment may influence the performance of MFIs (Mcdonald, 1999). GDP is anticipated to affect various aspects related to the supply and demand for loans and deposits which in turn influence the profitability of MFIs. A positive correlation was established between the performance of the financial institutions and these variables (Staikouras & Wood, 2003).

One more significant macroeconomic factor, that affects both costs and revenues of MFIs, is inflation. As Staikouras and Wood (2003) noticed that inflation may have direct impacts like rise in the price of labour and indirect consequences like changes in interest rates and asset prices, hence influence the profitability of MFIs. According to Deger & Anbar, (2011), the impact of inflation on MFIs performance depends on whether the inflation is anticipated or unanticipated. In the former case (anticipated inflation) the interest rates are adjusted accordingly resulting in revenues, which increase faster than costs, with a positive impact on profitability. In the latter case (unanticipated inflation) MFIs may be slow in adjusting their interest rates, which results in a faster increase of MFIs costs than revenues that consequently have a negative impact on profitability.

2.4 Overview of literature

Empirical research have investigated factors affecting MFIs profitability, Valentina et al., (2009); Dissanayake, (2009); Kinde, (2012); Tehulu, (2013) Adam & Johan, (2016); Blessing & Ranga, (2016); Yehualashet Rade (2016); and King'ori et al., (2017). The findings

revealed that MFI internal dynamics are the main determining factors of their profitability. Among them three stand out, size of the institution, cost management and risk management. Also, studies found convincing evidence that macroeconomic determinants significantly influence MFIs profitability as well.

However, most of the literature above is from other countries whose economic situation is different from that of Rwanda. Therefore, a study for the Rwandan case is welcome to provide new evidence on the considerations influencing the profitability of Rwandan MFIs by analysing a unique firm-level data set of aggregate performance which is quite different from previous studies. The study thus looks at the profitability of MFIs, as a function of capital size, size of credit portfolio, credit risk, operating cost, funding expense, portfolio yield, and GDP and Inflation.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter presents the methods that were used to attain the objectives of the study. It is structured into research design, population of the study, data collection and data analysis.

3.2 Model specification

This study sought to establish the factors affecting profitability of MFIs in Rwanda. The study used aggregated secondary data from the Central Bank of Rwanda covering a period of 24 quarters from Q4, 2014 to Q3, 2020. The data collected were analysed using descriptive and inferential statistics with the help of Eviews7. Correlation and regression analysis were used to establish correlation between the explained and the explanatory variables.

To examine the impact of MFI-internal and external factors affecting MFIs profitability, the below general multiple regression equation was used as a base equation which was as well used in a similar study by Dissanayake, (2009).

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \cdots + \beta_n X_{nt} + \varepsilon_t \quad (1)$$

Therefore, the above general multiple regression equation was manipulated by the researcher to fit this study, the regression equation for this study was modified as follows:

$$ROE_t = \beta_0 + \beta_1 CAR_t + \beta_2 PYR_t + \beta_3 FER_t + \beta_4 PER_t + \beta_5 OER_t + \beta_6 GLPTTA_t + \beta_7 GDP_t + \beta_8 INFL_t + \varepsilon_t \quad (2)$$

ROE_t: Return on Equity as proxy of profitability for MFIs in Rwanda at time t

OER_t: Operating Expense Ratio for MFIs in Rwanda at time t

CAR_t: Capital Adequacy Ratio for MFIs in Rwanda at time t

PER_t: Provision Expense Ratio for MFIs in Rwanda at time t

PYR_t: Portfolio Yield Ratio for MFIs in Rwanda at time t

FER_t: Financial Expense Ratio for MFIs in Rwanda at time t

$GLPTTA_t$: Loan Portfolio to Total Asset Ratio for MFIs in Rwanda at time t

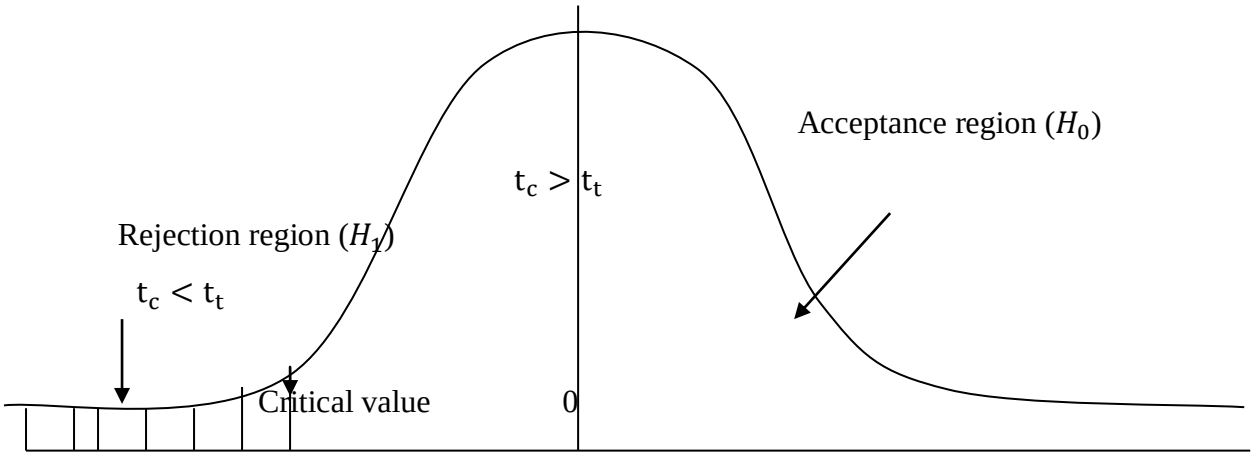
GDP_t: Real GDP growth for MFIs at time t (GDP)

$INFL_t$: Inflation rate for MFIs at time t (inflation)

3.3 Stationarity test

To estimate and test our variables we proceeded as follows. First, we tested the non-stationarity using the ADF test which is based on combining the *p-values* of the test-statistic for a unit root for each variable.

Figure 1: Region of acceptance and rejection



If t-test calculated is less than t-table ($t_c < t_t$), at level (I~(0)) and ADF P-value is less than 5% level of significance in a given lag (the preference lag_{max}) with testing equation (intercept, trend & intercept and none) to be sure for all alternative, null hypothesis (H_0) will be rejected and the variable has a unit root and there is stationarity. Testing: $H_0: t_c > t_t$: every variable is not stationary and H_1: otherwise.

3.4 Transforming of non-stationarity into stationarity.

If t-calculated is greater than t-table ($t_c > t_t$) with any given ADF p-value, null hypothesis can be accepted and there is no stationarity in the data, then it becomes necessary to transform the non-stationarity into stationarity. In the case of non-stationary of the model variables, the researcher determines the degree of integration. If the time series are non-stationary at the same level, thus, it is difficult to achieve long-term relationship between the variables of the study.

The transformation method depends on whether the times series are difference stationary processes (DSP) or trend stationary process (TSP) Gujarati, (2003). and the researcher considers each of these methods accordingly. If at I~(0) there is no stationarity, the

researcher proceeds to the first difference at I∼(1) to mean that $\Delta Y_t = \beta_1 + \beta_{2t} + \Delta Y_{t-1} + \Sigma\alpha i \Delta Y_{t-i} + \mu$ or $\Delta Y_t = \beta_1 + \beta_{2t} + \delta Y_{t-1} + \sum_{i=1}^{n} \alpha_i \Delta Y_{t-i} + \varepsilon_t$;

where $\Delta Y_{t-1} = (\Delta Y_{t-1} - \Delta Y_{t-2})$, $\Delta Y_{t-2} = (\Delta Y_{t-2} - \Delta Y_{t-3})$.

By using ADF to test unit root once again, and if on that level, $t_c < t_t$ the series has a unit root and there is stationarity while $t_c > t_t$, the time series data are not stationary and the researcher goes to the second difference noted I∼(2) continue to proceed the same manner (stationaries by differencing it n^{th} times) to transform the non-stationarity until he finds the stationarity in time series data.

3.5 Variables

3.5.1 Dependent variable

Return on Equity = Net Income ÷Average Equity CGAP,(2003)

The (ROE) Return on Equity is determined by taking net income after taxes excluding any grant or donation over average equity for a given period. Only paid-up capital is taken into consideration. Thus, committed capital but still not paid is not considered. The ROE reveals the profitability of an institution. For private owned firms, it is a metric of paramount importance as it measures the return of the owner's investment in an institution. Nevertheless, provided that several MFIs are not for-profit organisations that do not distribute dividends, the ROE is the most often used indicator as proxy for commercial viability and the strength of equity. Sebastian et al., (2014)

Performance for MFIs surveys depend on accounting and profit or efficiency cost indicators based on the efficiency and productivity analysis. Muriu, (2011). This survey will use accounting-based profitability indicators. The explained variable is Return on Equity which is a measurement for profitability.

ROE shows the ability of an MFI to make profit from its equity. Nevertheless, it can be disputed that such activities are negligible in MFIs. Muriu, (2011). The risk associated with gearing is probably substantial. This is despite the organisational innovations that MFIs embrace to compensate for informational asymmetries. ROE captures the return on shareholders' capital.

This study has selected ROE over ROA (return on assets) as a dependent variable for measuring the profitability of Rwandan MFIs. ROE is calculated by taking the adjusted net operating income net of tax dividend over the adjusted average total equity.

3.5.2 Independent variables

Profitability being assumed to be influenced by internal and external factors as in the findings of Murui, (2011) and Jorgensen, (2012) this research explores explanatory variables (internal) and macroeconomic (external).

A. Internal variables

MFIs specific characteristics that have been used in this study are provision expense ratio, operating expense ratio, financial/funding expense ratio, capital adequacy ratio, portfolio yield ratio, and loan portfolio to total assets ratio.

1. **Provision or Impairment Expense Ratio=** Provision Expenses over Average Gross Loan Portfolio **CGAP**, (2003)

The Impairment or Provision Expense Ratio is calculated by taking the impairment expense (also referred to as loan loss provision expenses) for the period over the period's average gross loan portfolio.

This ratio indicates the expense incurred by the institution from anticipated loan losses for the period, proportional to the size of the loan portfolio. An improvement in overall portfolio quality results to a decrease of the Impairment Expense Ratio.

Therefore, the expected sign of Impairment Expense Ratio in our estimated model can be anticipated; hence, the devised hypothesis according to the available literature is:

H1. There is a significant negative relationship between provision expense ratio and the MFIs ROE.

2. **Operating Expense Ratio =** Operating Expenses ÷Average Gross Loan Portfolio CGAP, (2003)

The Operating Expense Ratio is obtained by taking all the operating expenses over the average gross loan portfolio. Interest and provision expenses as well as extraordinary and expenses from previous periods are excluded.

This metric is the best indicator of the overall efficiency of a lending institution. Thus, it is also referred to as the Efficiency Ratio, measuring the institutional cost of delivering loan

services compared to the average loan size of its portfolio. Subsequently, a general rule is the lower the Operating Expense Ratio, the higher the efficiency.

Therefore, according to the literature available, the expected sign of operating efficiency can be predicted, and the devised hypothesis is:

H2. There is a significant negative relationship between operating expense ratio and MFIs ROE.

3. **Financial Expense Ratio =** Financial Expenses on Funding Liabilities over Average Gross Loan Portfolio CGAP, (2003)

The Financial Expense Ratio is calculated by dividing interest and fee expenses on funding liabilities by the average gross loan portfolio.

This ratio measures the total interest expense incurred by the institution to fund its loan portfolio. It is one of the three components used to determine the base rate an MFI must apply to cover its funding expenses. The base rate is obtained by adding the Loan Impairment Ratio, the Operating Expenses Ratio and the Financial Expenses Ratio.

Therefore, according to the literature available, the expected sign of the financial expense ratio can be forecasted, and the devised hypothesis is:

H3. There is a significant negative relationship between the financial expense ratio and MFIs profitability.

4. **Capital Adequacy Ratio =** Total Equity over Total Liabilities MicroRate, (2013)

The Capital Adequacy Ratio is obtained by taking the total equity over the total liabilities. Total equity (net assets) equals total assets net of total liabilities. Total liabilities include everything an MFI owes including deposits, borrowings, accounts payable and other liabilities.

The Capital Adequacy Ratio shows the overall gearing of an organisation. The Capital Adequacy Ratio is of special interest to lenders because it indicates the level of safety/cushion (in form of equity) an institution has, to absorb losses.

Therefore, according to the literature available, the expected sign of capital adequacy ratio can be predicted, and the devised hypothesis is:

H4. There is a significant positive correlation between the capital adequacy ratio and MFIs profitability.

5. **Portfolio Yield =** Financial Revenue from Loan Portfolio over Average Gross Loan Portfolio CGAP, (2003)

The Portfolio Yield is obtained by taking the financial revenues from the loan portfolio of the period over the average gross loan portfolio. Income from recovered write-offs are registered as "other income" as the concerned portfolio no longer exists in the institution's assets.

The Portfolio Yield showcase of how much an MFI collected in interest and other payments from its loan portfolio in a year. A comparison between the Portfolio Yield and the average effective lending rate indicates the institution's efficiency in collecting repayments from its borrowers. It as well provides insight on the portfolio quality as most MFIs use cash accounting provided that this ratio excludes accrued income that non-performing loans should have generated.

The portfolio yield ratio is globally used in the microfinance sector, where the true cost of loans is most of time higher than the nominal interest applied. Given that the portfolio yield considers all fees, discounts, and special charges it is a more reliable metric for the true cost to clients. On the other hand, the portfolio yield ratio understates the true cost to the extent that loans are in arrears.

An effective way to determine the profit margin for MFIs operations is by subtracting the three expense ratios (Operating Expense Ratio, Impairment Expense Ratio and Financial Expense Ratio) from the Portfolio Yield Ratio.

Therefore, according to the literature available, the expected sign of portfolio yield ratio can be predicted, and the devised hypothesis is:

H5. There is a significant positive correlation between the portfolio yield ratio and MFIs profitability.

6. **Loan portfolio to total assets ratio =** loan portfolio ÷ Total assets MicroRate, (2013)

The loan portfolio to total assets ratio is calculated by dividing loan book by total assets.

The loan portfolio to total assets ratio measures the portion of assets which has been invested in high earning assets, that also shows the level of intermediation of an MFI as well.

H6. There is a significant positive relationship between the gross loan portfolio to total assets ratio and MFIs profitability.

3.3.3 External variables

The external variables are out of control to MFIs managers. This research has used the GDP and inflation as proxy for external variables.

GDP

The GDP is possibly the most used single indicator for progress in economic development. In our context, poor economic conditions can worsen the quality of MFIs loan portfolio, subsequently have a negative impact on their profitability. On the other hand, an improvement in economic conditions can have a positive impact on MFIs profitability, Zergaw, (2015). The expected sign of GDP in our estimated model can be predicted, and the devised hypothesis is:

H7. There is a significant positive relationship between the real gross product (GDP) and MFIs profitability.

Inflation

Inflation is a galloping rise in price. Inflation has a significant negative impact, Athanasoglou, et al. (2008), found that inflation and cyclical output influence the banking performance negatively. In contrast, Pasiourasa and Kosmidou (2007) find inflation to be positively related to domestic banks, suggesting that during their study, levels of inflation were predicted by the latter's. That giving them an opportunity to adjust their interest rate and subsequently earning higher profits. As for foreign banks, inflation triggered a higher increase in cost than revenues resulting into a negative relationship between inflation and foreign banks profits.

From the above literature, expected sign of the inflation on the ROE in our estimated model is indeterminate, accordingly the devised hypothesis is:

H8. There is a significant relationship between Inflation and MFIs profitability.

Note that the accepted level of significance for the explanatory variables in this study is only ~5%.

Summary of definition and measurements of variables

#	Name of Variables	Variable code	Description	Expected relationship
Dependent/Explained variable				
1	Return on Equity (ROE) = Net Income ÷Average Equity	ROE	The ROE shows the profitability of an institution. For private owned firms, it is a metric of paramount importance as it measures the return of the owner's investment in an institution.	
Independent/Explanatory variables				
1	Provision/Impairment Expense Ratio = Impairment Expenses ÷Average Gross Loan Portfolio	PER	This ratio indicates the expense incurred by the institution from anticipated loan losses for the period, proportional to the size of the loan portfolio. An improvement in overall portfolio quality results to a decrease of the Impairment Expense Ratio.	-
2	Operating Expense Ratio = Operating Expenses ÷Average Gross Loan Portfolio	OER	This metric is the best indicator of the overall efficiency of a lending institution. Thus, it is also referred to as the Efficiency Ratio, measuring the institutional cost of delivering loan services compared to the average loan size of its portfolio. Subsequently, a general rule is the lower the Operating Expense Ratio, the higher the efficiency.	-
3	Financial Expense Ratio = Financial Expenses on Funding Liabilities over Average Gross Loan Portfolio	FER	This ratio measures the total interest expense incurred by the institution to fund its loan portfolio. It is one of the three components used to determine the base rate an MFI must apply to cover its funding expenses. The base rate is obtained by adding the Loan	-

			Impairment Ratio, the Operating Expenses Ratio and the Financial Expenses Ratio	
4	Capital Adequacy Ratio = Total Equity ÷ Total Liabilities	CAR	The Capital Adequacy Ratio measures the overall leverage of the institution. The Capital Adequacy Ratio is of particular interest to lenders because it indicates how much of a safety cushion (in the form of equity) there is in the institution to absorb losses.	+
5	Portfolio Yield = Financial Revenue from Loan Portfolio over Average Gross Loan Portfolio	PYR	The Portfolio Yield showcase of how much an MFI collected in interest and other payments from its loan portfolio in a year. A comparison between the Portfolio Yield and the average effective lending rate indicates the institution's efficiency in collecting repayments from its borrowers.	+
6	Loan portfolio to total asset ratio = loan portfolio ÷ Total assets	GLPTTA	The loan portfolio to total asset ratio measures the portion of assets which has been invested in high earning assets which also shows the level of intermediation of an MFI as well.	+
7	Gross Domestic Product	GDP	this is the most informative indicator of progress in economic development	+
8	Inflation	INFL	Inflation is a galloping rise in price	±

For the coefficient analysis two test will be used: t-test, which analyses the significance of each coefficient for every explanatory variable to the profitability and F-test, for the analysis of all combined coefficients to the explained variable.

3.6 Data

Secondary data were collected from the National Bank of Rwanda, where aggregated data were provided as all MFIs do report to BNR monthly. Data were collected from the BNR for the period of 7years from Q4, 2014 to Q3,2020 observations for 24 quarters. This contains a well detailed balance sheet, income statement account and some ratios which allowed us to compute several other ratios from the above-mentioned statements.

The table given below summarises the ratios computed from secondary aggregated data collected from BNR website and data collected from NISR website.

Table 1:Data presentation

PERIOD	ROE	CAR	PYR	FER	PER	OPER	LPTTA	GDP	INFL
Q4:2014	0.09	0.33	0.32	0.02	0.02	0.22	0.62	0.05	0.03
Q1:2015	0.09	0.33	0.34	0.03	0.04	0.23	0.55	0.08	0.00
Q2:2015	0.12	0.31	0.35	0.03	0.02	0.23	0.52	0.09	(0.02)
Q3:2015	0.12	0.31	0.34	0.03	0.03	0.22	0.55	0.08	0.01
Q4:2015	0.12	0.31	0.34	0.03	0.03	0.22	0.56	0.10	0.02
Q1:2016	0.12	0.32	0.33	0.02	0.04	0.21	0.58	0.11	0.02
Q2:2016	0.13	0.30	0.33	0.03	0.03	0.20	0.54	0.09	0.05
Q3:2016	0.14	0.33	0.33	0.02	0.03	0.20	0.59	0.03	0.05
Q4:2016	0.14	0.35	0.33	0.02	0.03	0.21	0.60	0.02	0.08
Q1:2017	(0.05)	0.34	0.30	0.02	0.12	0.20	0.60	0.00	0.11
Q2:2017	(0.00)	0.33	0.31	0.02	0.08	0.21	0.56	0.02	0.10
Q3:2017	0.05	0.36	0.32	0.02	0.05	0.21	0.57	0.07	0.07
Q4:2017	0.03	0.36	0.33	0.02	0.06	0.22	0.57	0.07	0.04
Q1:2018	0.04	0.34	0.32	0.02	0.03	0.23	0.54	0.10	0.00
Q2:2018	0.07	0.32	0.32	0.02	0.01	0.23	0.53	0.08	(0.00)
Q3:2018	0.08	0.35	0.32	0.02	0.01	0.22	0.59	0.07	(0.00)
Q4:2018	0.08	0.35	0.32	0.02	0.01	0.23	0.59	0.10	(0.02)
Q1:2019	0.14	0.34	0.35	0.02	0.00	0.25	0.55	0.06	0.00
Q2:2019	0.13	0.34	0.32	0.01	0.00	0.19	0.54	0.12	0.02
Q3:2019	0.13	0.35	0.30	0.02	(0.00)	0.22	0.56	0.11	0.02
Q4:2019	0.11	0.36	0.31	0.02	(0.00)	0.23	0.57	0.08	0.06
Q1:2020	0.08	0.36	0.34	0.02	0.04	0.26	0.57	0.04	0.08

Q2:2020	0.02	0.35	0.34	0.03	0.06	0.27	0.55	(0.12)	0.06
Q3:2020	0.07	0.36	0.29	0.02	0.03	0.22	0.57	(0.04)	0.09

Source: BNR, (2020) and NISR, (2020).

A descriptive survey design was judged appropriate for this study because the study seeks to describe the factors affecting the profitability of MFIs in Rwanda. This method was successfully used by Mulandi, (2010), in the survey of the components influencing the profitability of MFIs in Kenya.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1. Introduction

This chapter presents the results and analysis thereto on the study to investigate factors that determine the profitability of MFIs in Rwanda. The study had targeted MFIs in Rwanda using secondary aggregated data provided by the Central Bank of Rwanda and National Institute of Statistics of Rwanda covering 24 quarters from Q4, 2014 to Q3, 2020. Data analysis was done through Eviews7.

4.2 Discussion analysis and interpretation of the results

This section aims to analyse the existence of stationarity of the concerned variables by using e-views7 software, and regressing the econometric model testing its coefficients and interpret the results.

4.2.1 Test of stationarity

The stationarity test is very important for giving the obvious regression and avoiding spurious correlation. It is in this regard that for running the regression, the researcher decided to first test the stationarity by using the unit root test.

Unit root

The Dickey Fuller (DF) and Augmented Dickey-Fuller (ADF) (1981) test were performed to test the unit root in time series and student test was used to verify hypothesis. This test was conducted by augmenting the preceding equations by adding the lagged values of the dependent variable ROE. The guideline of ADF test stipulates that if $t_c < t_t$, the researcher can reject the null H_0 and if $t_c > t_t$, the H_0 cannot be rejected and there is no stationarity in the time series data.

Table 2:Unit root test of variables at level

Variable	Test equation	T-calculated (t-ADF)	T- table value at 5%	Lag	ADF P-value	Conclusion
ROE	Intercept	-2.564693	-2.998064	4	0.1144	$t_c > t_t, P_c > 0.05$
	Trend – intercept	-2.562836	-3.622033	4	0.2984	$t_c > t_t, P_c > 0.05$
CAR	Intercept	-1.902030	-3.029970	4	0.3243	$t_c > t_t, P_c > 0.05$
	Trend & intercept	-2.866744	-3.673616	4	0.1935	$t_c > t_t, P_c > 0.05$
PYR	Intercept*	-3.641272	-3.004861	4	0.0132	$t_c < t_t, P_c < 0.05$
	Trend & intercept*	-4.765567	-3.632896	4	0.0051	$t_c < t_t, P_c < 0.05$
FER	Intercept*	-3.276177	-2.998064	4	0.0282	$t_c < t_t, P_c < 0.05$
	Trend & intercept*	-4.163355	-3.622033	4	0.0169	$t_c < t_t, P_c < 0.05$
PER	Intercept	-2.488881	-2.998064	4	0.1309	$t_c > t_t, P_c > 0.05$
	Trend & intercept	-2.559502	-3.622063	4	0.2997	$t_c > t_t, P_c > 0.05$
OPER	Intercept*	-3.002332	-2.998064	4	0.0496	$t_c < t_t, P_c < 0.05$
	Trend – intercept	-3.365167	-3.622033	4	0.0810	$t_c < t_t, P_c > 0.05$
GLPTTA	Intercept*	-4.529678	-2.998064	4	0.0017	$t_c < t_t, P_c < 0.05$
	Trend - intercept*	-4.280303	-3.632896	4	0.0139	$t_c < t_t, P_c < 0.05$
GDP	Intercept	-1.861358	-2.998064	4	0.3434	$t_c > t_t, P_c > 0.05$
	Trend – intercept	-2.142310	-3.622033	4	0.4969	$t_c > t_t, P_c > 0.05$
INFL	Intercept*	-4.146321	-3.020686	4	0.0049	$t_c < t_t, P_c < 0.05$
	Trend - intercept*	-3.986084	-3.658446	4	0.0270	$t_c < t_t, P_c < 0.05$

This table above shows that, except PYR, FER, GLPTTA, INFL which are stationary at level to both intercept and trend & intercept (test of equation) with lag (4) where ADF statistic or t-calculated are less than critical value or t-table and p-value less than 0.05 of significance level; the remained variables namely ROE, CAR, PER, OPER, and GDP are not stationary at that level and necessitate pursuing the mechanism of unit root test-ADF to transform non stationarity into stationarity.

Transforming the ROE, CAR, PER, OPER, and GDP from non-stationarity into stationarity.

The problems associated with non-stationarity time series data are the spurious regression problem. It is crucial to avoid this problem by transforming the non-stationarity time series to make them stationary. The transformation method depends on whether the times series are difference stationary processes (DSP) or Trend stationarity process (TSP) Gujarati, (2003) and the researcher considers each of these methods accordingly.

Table 3:Unit root test of variables at 1st difference

Variable	Test equation	T-calculated (t-ADF)	T-table value at 5%	Lag	ADF P-value	Conclusion
ROE	Intercept**	-5.164095	-3.004861	4	0.0004	$t_c < t_t, P_c < 0.05$
	Trend – intercept**	-5.024612	-3.632896	4	0.0030	$t_c < t_t, P_c < 0.05$
CAR	Intercept	-6.225050	-3.012363	4	0.0000	$t_c < t_t, P_c < 0.05$
	Trend & intercept	-2.185567	-3.673616	4	0.4701	$t_c > t_t, P_c > 0.05$
PER	Intercept**	-5.320727	-3.004861	4	0.0003	$t_c < t_t, P_c < 0.05$
	Trend & intercept**	-5.186506	-3.632896	4	0.0021	$t_c < t_t, P_c < 0.05$
OPER	Intercept**	-5.454667	-3.004861	4	0.0002	$t_c < t_t, P_c < 0.05$
	Trend – intercept**	-5.305353	-3.632896	4	0.0016	$t_c < t_t, P_c < 0.05$
GDP	Intercept	-1.838937	-3.040391	4	0.3512	$t_c > t_t, P_c > 0.05$
	Trend – intercept	-1.758870	-3.690814	4	0.6817	$t_c > t_t, P_c > 0.05$

The summary of the results presented in the above table (table 3) shows that, except CAR and GDP other variables are stationary at first difference to both intercept and trend & intercept (test of equation) with lag (4) where ADF statistic or t-calculated are less than critical value or t-table and p-value less than 0.05 of significance level; the two mentioned variables are not stationary at the first difference and necessitate pursuing the mechanism of unit root test-ADF to transform non stationarity into stationarity at the second difference. Again, from the above table we can realise that the provision expense and operating expense ratios have a long run relationship with the ROE as they are stationary at the same level.

Table 4:Unit root test of variables at 2nd difference

Variable	Test equation	T-calculated (t-ADF)	T-table value at 5%	Lag	ADF P-value	Conclusion
CAR	Intercept	-8.712435	-3.029970	4	0.0000	$t_c < t_t, P_c < 0.05$
	Trend & intercept	-8.620483	-3.673616	4	0.0000	$t_c < t_t, P_c < 0.05$
GDP	Intercept	-4.684785	-3.040391	4	0.0019	$t_c < t_t, P_c < 0.05$
	Trend – intercept	-4.380030	-3.690814	4	0.0143	$t_c < t_t, P_c < 0.05$

The above table shows that, the two remaining variables namely CAR and GDP are stationary at second difference to both intercept and trend & intercept (test of equation) with lag (4) where ADF statistic or t-calculated are less than critical value or t-table and p-value less than 0.05 of significance.

4.3.2 Model estimation

ROE1 = C (1) + C (2) *CAR2 + C (3) *PYR + C (4) *FER + C (5) *PER1 + C (6) *OPER1 + C (7) *GLPTTA + C (8) *GDP2 + C (9) *INFL

Equation estimation from eviews7

Dependent Variable: ROE1
Method: Least Squares
Date: 01/04/21 Time: 10:33
Sample (adjusted): 2015Q2 2020Q3
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.244602	0.198458	-1.232514	0.2396
CAR2	0.392807	0.203366	1.931522	0.0755
PYR	0.880685	0.325627	2.704579	0.0180
FER	-0.868170	0.929193	-0.934327	0.3672
PER1	-1.500943	0.232213	-6.463662	0.0000
OPER1	0.432329	0.315068	1.372179	0.1932
GLPTTA	-0.038159	0.282196	-0.135221	0.8945
GDP2	0.143047	0.104189	1.372958	0.1930
INFL	-0.069900	0.122539	-0.570430	0.5781

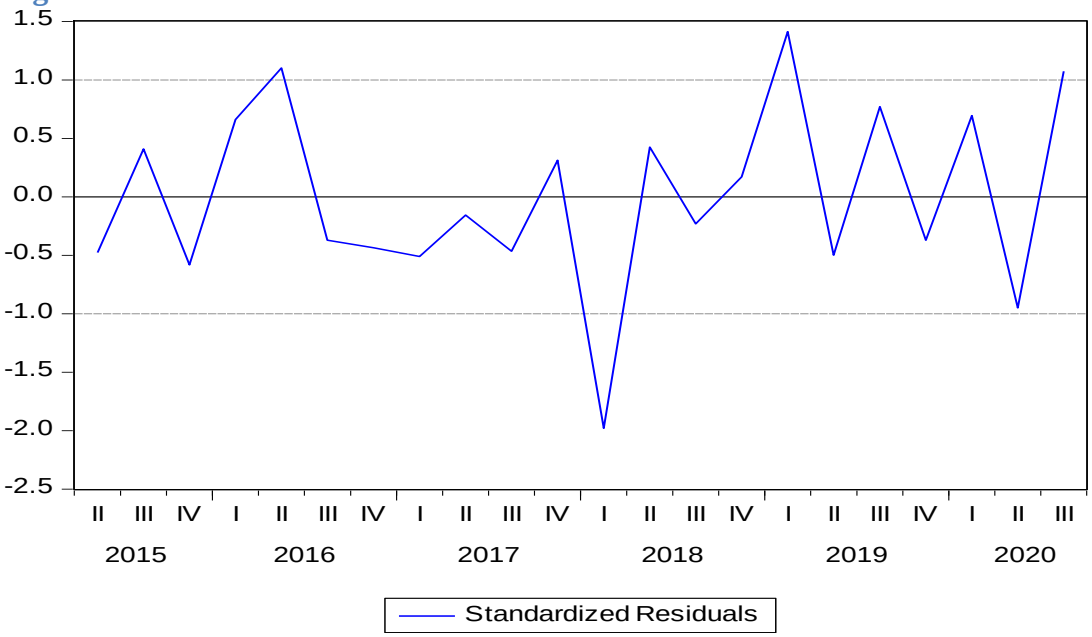
R-squared	0.925614	Mean dependent var	-0.000909
Adjusted R-squared	0.879838	S.D. dependent var	0.051075
S.E. of regression	0.017705	Akaike info criterion	-4.937869
Sum squared resid	0.004075	Schwarz criterion	-4.491533
Log likelihood	63.31656	Hannan-Quinn criter.	-4.832726
F-statistic	20.22053	Durbin-Watson stat	2.627528
Prob(F-statistic)	0.000004		

Substituted Coefficients:

ROE1 = -0.244602227346 + 0.392806505999*CAR2 + 0.880684710278*PYR - 0.868169698536*FER - 1.5009434597*PER1 + 0.432328982265*OPER1 - 0.0381588088137*GLPTTA + 0.143046882387*GDP2 - 0.0698996418289*INFL

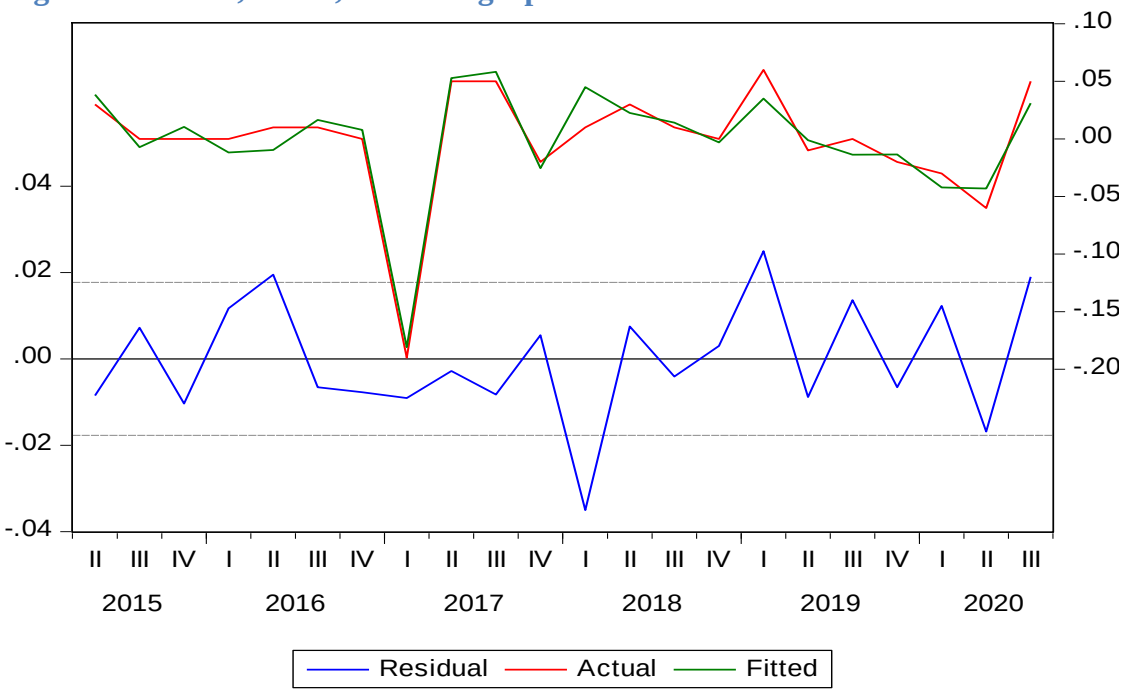
The findings from our estimation equation, out of 8 independent variables only 2 has given us unexpected signs which are respectively operating expenses ratio and gross loan portfolio to total assets. We expected a negative relationship between operating expenses and profitability and a positive relationship between gross loan portfolio to total assets and profitability which is not the case. We will elaborate more later in our interpretation.

Figure 2 : Standardised residuals.



The above graph showcase that the standardised residuals are randomly scattered and do not contradict the linear assumption as extracted from our model estimation through Eviews7 which confirms that our model is fit.

Figure 3 : Actual, Fitted, Residual graph



Idem as the previous graph.

Table 5 Coefficient Confidence Intervals

Coefficient Confidence Intervals
Date: 01/04/21 Time: 10:54
Sample: 2014Q4 2020Q3
Included observations: 22

		90% CI		95% CI		99% CI	
Variable	Coefficient	Low	High	Low	High	Low	High
C	-0.244602	-0.596058	0.106854	-0.673345	0.184140	-0.842413	0.353208
CAR2	0.392807	0.032658	0.752955	-0.046540	0.832153	-0.219789	1.005402
PYR	0.880685	0.304021	1.457349	0.177210	1.584160	-0.100194	1.861564
FER	-0.868170	-2.513708	0.777369	-2.875568	1.139229	-3.667154	1.930815
PER1	-1.500943	-1.912176	-1.089710	-2.002608	-0.999279	-2.200432	-0.801455
OPER1	0.432329	-0.125635	0.990293	-0.248333	1.112991	-0.516741	1.381399
GLPTTA	-0.038159	-0.537909	0.461592	-0.647806	0.571489	-0.888211	0.811894
GDP2	0.143047	-0.041465	0.327558	-0.082039	0.368133	-0.170799	0.456892
INFL	-0.069900	-0.286907	0.147108	-0.334628	0.194829	-0.439019	0.299220

The above table showcase coefficient confidence intervals for independent variables extracted from Eviews7 at respectively 90%, 95% and 99%, where all the coefficients are within the provided confidence intervals at all ranges, that giving us confidence of the model fitness.

4.3.3 Interpretation of the results

Based on the regression result, R-squared value is 0.925614 (92.5 %) and Adjusted R-squared coefficient being 0.879838 (87.9%) which implies 92.5% and 87.9% of fitness respectively suggesting that cumulatively independent variables explain the dependent variable at 92.5% and 87.9%. This can be further explained that 92.5% of the total variation in the financial performance (ROE) is explained by the independent variables (Capital Adequacy ratio, portfolio yield ratio, financial expense ratio, provision expense ratio, operating expense ratio, gross loan book to total assets, GDP, and inflation) jointly. The remaining 7.5% and 12.1% of change respectively is explained by other factors which are not included in the model. The Prob (F-statistic) value is 0.000004 which indicates strong statistical significance, which enhance the reliability and validity of the model. Each variable is described in detail under the following sections.

1. **Capital adequacy ratio (CAR)**

   The capital adequacy influences the ROE positively, as shown by its coefficient which is 0.392807 the latter is within the confidence interval of 90%, 95% and 99% limit provided by the t-student test referred to in table 5. It is in line with the theory suggesting that the more an institution is capitalised the more it has cushion to absorb chocks and subsequently attain profitability which agree with other researchers like Mulandi (2010), Zergaw, (2015) and other scholars who found that there is a positive correlation between the CAR and the ROE opposite to Muriu, (2011). Hence, it picked the reality of MFIs in Rwanda.

2. **Portfolio Yield Ratio (PYR)**

   As the study measured the portfolio yield of MFIs which is calculated as total interest income divided by the average size of the total loan portfolio, Aghion & Morduch, The Economics of Microfinance, (2005) as the prior studies used too, showed up a coefficient of (0.880685) and it was statistically significant at 1% significance level (P-value of 0.0180). The implication is that there is a positive relation between portfolio yield and profitability of Rwandan MFIs during the study period. The result is consistent with prior expectations and it agrees with the expected sign.

3. Financial Expense Ratio (FER)

The financial expense ratio influences the ROE negatively, as shown by its coefficient which is -0.868170 the latter is within the confidence interval of 90%, 95% and 99% limit provided by the t-student test referred to in table 5. The implication is that there is a negative relation between financial expenses and profitability of Rwandan MFIs during the study period. The result is consistent with prior expectations and it agrees with the expected sign.

4. Provision Expense Ratio (PER)

As the study measured the provision expense ratio of MFIs in Rwanda which is calculated by taking impairment of the year or annualised if otherwise divided by the average size of the total loan portfolio, Sebastian et al, (2014) as the prior studies used too, showed up a coefficient of (-1.500943) and it was statistically significant at 1% significance level (P-value of 0.000). The implication is that there is a negative relation between provision expenses and profitability of Rwandan MFIs during the study period. The result is consistent with prior expectations and it agrees with the expected sign.

5. Operating Expense Ratio (OER)

As the study measured efficiency or the MFIs management in terms of operating expense to average gross loan portfolio as the prior studies used too, showed up a coefficient of 0.432329 the latter is within the confidence interval of 90%, 95% and 99% limit provided by the t-student test referred-to in table 5 and showing that there is a positive relationship between operating expense ratio and MFIs profitability in Rwanda (ROE). It is opposing the theory suggesting that there is a negative relation between efficiency ratio and profitability. The result is contradicting prior expectations and it disagrees with X- efficiency theory which is stated as 'efficient firms (lower cost) tend to earn high profit'. This study has failed to reject the hypothesis which says, there is a significant negative relationship between efficiency and MFls profitability. The outcome agrees with Jorgensen (2012) and opposing the findings of Sima (2013), Dissanayake (2012), and Muriu (2011). i.e., operating expenses are kind of expenses driving income where we can probably guess areas like trainings, marketing, etc.

6. Gross Loan Portfolio to Total Asset Ratio (GLPTTA)

The gross loan portfolio to total asset ratio influences the ROE negatively, as shown by its coefficient which is -0.038159 the latter is within the confidence interval of 90%, 95% and 99% limit provided by the t-student test referred to in table 5. It is contradicting the theory suggesting that the more an institution's gross loan portfolio to total asset ratio grows the more income it generates and subsequently attain profitability which is not the case for MFIs in Rwanda during the period of our study.

7. Gross Domestic Product (GDP)

The GDP has a positive coefficient of 0.143047 i.e., it influences positively the ROE of MFIs in Rwanda as the latter is within the confidence interval of 90%, 95% and 99% limit provided by the t-student test referred to in table 5. The outcome disagrees with the findings of Sima (2013), Muriu (2011) and Jordan (2008). As the current study ascertained, GDP is a key determinant of profitability of Rwandan MFIs, the hypothesis which says there is a significant positive relationship between GDP and profitability of MFIs is accepted since the data support the theory.

8. Inflation (INFL)

The other external factor included in the study was inflation as measured with consumer price index, had a negative coefficient of -0.069900 i.e., it negatively influences the ROE of MFIs in Rwanda as the latter is within the confidence interval of 90%, 95% and 99% limit provided by the t-student test referred to in table 5. Accordingly, the hypothesis saying, there is a significant relationship between inflation and profitability of Rwandan MFls has been accepted as per the findings of the study. The result is contradicting with the findings of Muriu (2011) and. Jordan (2008).

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

From the analysis and data collected, the following discussions, conclusions and recommendations were made. The recommendations were based on the objectives of the study as to investigate the factors that determine the profitability of MFIs in Rwanda and determine to what extent the identified factors explain the profitability of MFIs in Rwanda.

5.2 Summary of the results

The main objective of this study was to investigate the internal and external factors affecting profitability of Rwandan MFIs. Previous studies on the determinants of profitability of MFIs in the Rwandan context are scarce. This study built on the existing findings and theories from different parts of the world as a base ground, assuming they are applicable for Rwandan MFIs context. The Profitability is believed to be extremely influenced by internal factors, as external factors contribute also to the same. The internal factors include: Capital Adequacy ratio, portfolio yield ratio, financial expense ratio, provision expense ratio, operating expense ratio, gross loan book to total assets, and more variables which are under the control of MFI managers. External factors include macroeconomic variable such as GDP, Inflation just to name a few.

Building on the earlier findings, this research has investigated the impact of internal and external factors affecting the profitability of Rwandan MFIs from 2014 to 2020. The specific factors included in this study were: Capital Adequacy ratio, portfolio yield ratio, financial expense ratio, provision expense ratio, operating expense ratio, gross loan book to total assets while the macroeconomic variables considered in this study are GDP and Inflation.

To reach out the set objectives of this research, quantitative research methodology was used. Aggregated data for all the MFIs in Rwanda were collected from the National Bank of Rwanda (BNR) website for internal factors, while external data were collected from the annual reports of National Institute for Statistics of Rwanda (NISR). From the collected secondary quantitative data, multiple regression analysis was run to test hypotheses formulated for this research, and empirical findings for this study revealed the following conclusions:

The Capital Adequacy ratio influences the ROE positively in Rwandan MFIs, it is in line with the theory suggesting that the more an institution is capitalised the more it has cushion to absorb chocks and subsequently attain profitability. Results of our study have showed that there is a positive relation between the portfolio yield and profitability of Rwandan MFIs throughout the studied period. Results are consistent with earlier expectations and agree with the expected sign which implies that increment in portfolio yield (effective interest rate) influences positively the profitability of Rwandan MFIs.

Contrary to the expected sign, results of our study have showed that during the studied period, the operating expense ratio influences MFIs profitability in Rwanda (ROE) positively. It disagrees with efficiency theory which states that "efficient firms (lower cost) tend to earn high profit". Our finding shows that MFIs in Rwanda in an aggregated way still have room to improve their bottom line (profitability) by increasing operating expenses which can be considered as driving income where we can probably guess areas like technology, trainings, marketing, etc. As per our expectations, financial expense and provision expense ratios influence the MFIs profitability in Rwanda negatively.

The loan book to total assets ratio contrary to the expected sign; results of our study have shown that this ratio has a negative relationship with MFIs profitability in Rwanda. In normal circumstances, the loan book is the most asset generating highest returns for MFIs where the case for aggregated data of MFIs in Rwanda suggests an abnormal trend which means that when the loan book grows the net profit decline i.e., the growth is in a wrong direction (none performing loans) which speaks into the abnormal behaviour of the operating expense ratio as well, earlier disclosed where Rwandan MFIs should invest in technology and trainings.

With regards to the external factors, results of our study have shown that the GDP has a positive relationship with MFIs profitability in Rwanda as it was expected while the inflation has a negative relationship with the ROE of MFIs in Rwanda.

5.3 Recommendations

According to the findings uncovered by this survey, we are humbled to formulate the following recommendations to the MFIs managers, policy makers and other stakeholders in Rwanda:

- ✓ Loan Portfolio quality is one of the major factors for profitability of Rwandan MFIs. Subsequently, management and policy makers need to put in place a good loan management policy and appraisal system. Which as a result will decrease impairments on loans (provision expenses) and make the loan portfolio growth have a positive impact to the Rwandan MFIs profitability.

- ✓ Cost management/Operational efficiency is another key profitability factor in every institution. Nevertheless, it seems to be not the case for Rwandan MFIs at least for the period covering our study. In this regard, the management, investors, and policy makers may strive to improve the level of investment in the expenses driving income and bring these to the optimal levels such as technology, training, marketing, personnel expenses just to name a few.

- ✓ Provided that some infrastructure needed for the betterment of MFIs sustainability are beyond their capabilities, given their role in financial inclusion and poverty reduction, the government should support MFIs in matter related to computerisation and continue close supervision for their development.

5.4 Direction for further research

This research explored some internal and external variables for a period of 7years (24 quarters) using secondary aggregated data. With no doubt out there are other variables that were not used in our research which might also better explain MFIs performance. Having further investigation with the inclusion of other variables using panel data instead of aggregated as for our case might give an improved view in finding other components which contribute to the profitability of Rwandan MFIs.

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Appendix - unit root test

With intercept

Null Hypothesis: ROE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.564693	0.1144
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

With intercept and trend

Null Hypothesis: ROE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.562836	0.2984
Test critical values:	1% level	-4.416345	
	5% level	-3.622033	
	10% level	-3.248592	

With intercept

Null Hypothesis: CAR has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.902030	0.3243
Test critical values:	1% level	-3.831511	
	5% level	-3.029970	
	10% level	-2.655194	

With intercept and trend

Null Hypothesis: CAR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.866744	0.1935
Test critical values:	1% level	-4.532598	
	5% level	-3.673616	
	10% level	-3.277364	

With intercept

Null Hypothesis: PYR has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.641272	0.0132
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

With intercept and trend

Null Hypothesis: PYR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.765567	0.0051
Test critical values:	1% level	-4.440739	
	5% level	-3.632896	
	10% level	-3.254671	

With intercept

Null Hypothesis: FER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.276177	0.0282
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

With intercept and trend

Null Hypothesis: FER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.163455	0.0169
Test critical values:	1% level	-4.416345	
	5% level	-3.622033	
	10% level	-3.248592	

With intercept

Null Hypothesis: PER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.488881	0.1309
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

With intercept and trend

Null Hypothesis: PER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.559502	0.2997
Test critical values:	1% level	-4.416345	
	5% level	-3.622033	
	10% level	-3.248592	

With intercept

Null Hypothesis: OPER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.002332	0.0496
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

With intercept and trend

Null Hypothesis: OPER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.365167	0.0810
Test critical values:	1% level	-4.416345	
	5% level	-3.622033	
	10% level	-3.248592	

With intercept

Null Hypothesis: GLPTTA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.529678	0.0017
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

With intercept and trend

Null Hypothesis: GLPTTA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.280303	0.0139
Test critical values:	1% level	-4.440739	
	5% level	-3.632896	
	10% level	-3.254671	

With intercept

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.861358	0.3434
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

With intercept and trend

Null Hypothesis: GDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.142310	0.4969
Test critical values:	1% level	-4.416345	
	5% level	-3.622033	
	10% level	-3.248592	

With intercept

Null Hypothesis: INFL has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.146321	0.0049
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

With intercept and trend

Null Hypothesis: INFL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.986084	0.0270
Test critical values:	1% level	-4.498307	
	5% level	-3.658446	
	10% level	-3.268973	

Transforming stationarity 1st difference
With intercept

Null Hypothesis: D(ROE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.164095	0.0004
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ROE,2)
Method: Least Squares
Date: 01/03/21 Time: 16:41
Sample (adjusted): 2015Q2 2020Q3
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ROE(-1))	-1.168281	0.226232	-5.164095	0.0000
C	-0.001445	0.011030	-0.130959	0.8971

R-squared	0.571440	Mean dependent var	0.002273
Adjusted R-squared	0.550012	S.D. dependent var	0.076962
S.E. of regression	0.051627	Akaike info criterion	-3.003034
Sum squared resid	0.053307	Schwarz criterion	-2.903848

Log likelihood	35.03337	Hannan-Quinn criter.	-2.979669
F-statistic	26.66788	Durbin-Watson stat	2.032364
Prob(F-statistic)	0.000047		

With intercept and trend

Null Hypothesis: D(DROE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.024612	0.0030
Test critical values:	1% level	-4.440739	
	5% level	-3.632896	
	10% level	-3.254671	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DROE,2)
Method: Least Squares
Date: 01/03/21 Time: 16:54
Sample (adjusted): 2015Q2 2020Q3
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DROE(-1))	-1.172049	0.233262	-5.024612	0.0001
C	0.001974	0.024988	0.078995	0.9379
@TREND(2014Q4)	-0.000274	0.001789	-0.153416	0.8797

R-squared	0.571970	Mean dependent var	0.002273
Adjusted R-squared	0.526914	S.D. dependent var	0.076962
S.E. of regression	0.052935	Akaike info criterion	-2.913363
Sum squared resid	0.053241	Schwarz criterion	-2.764584
Log likelihood	35.04699	Hannan-Quinn criter.	-2.878315
F-statistic	12.69470	Durbin-Watson stat	2.029962
Prob(F-statistic)	0.000316		

With intercept
Null Hypothesis: D(CAR) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.225050	0.0000
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(CAR,2)
Method: Least Squares
Date: 01/03/21 Time: 16:50
Sample (adjusted): 2015Q3 2020Q3
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CAR(-1))	-1.770771	0.284459	-6.225050	0.0000
D(CAR(-1),2)	0.540118	0.189733	2.846732	0.0107
C	0.003372	0.002994	1.126492	0.2748

R-squared	0.722773	Mean dependent var	0.001429
Adjusted R-squared	0.691970	S.D. dependent var	0.024553
S.E. of regression	0.013627	Akaike info criterion	-5.621949
Sum squared resid	0.003343	Schwarz criterion	-5.472732
Log likelihood	62.03047	Hannan-Quinn criter.	-5.589565
F-statistic	23.46442	Durbin-Watson stat	2.371063
Prob(F-statistic)	0.000010		

With intercept and trend

Null Hypothesis: D(CAR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.185567	0.4701
Test critical values:	1% level	-4.532598	
	5% level	-3.673616	
	10% level	-3.277364	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 19

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CAR,2)
Method: Least Squares
Date: 01/03/21 Time: 16:53
Sample (adjusted): 2016Q1 2020Q3
Included observations: 19 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CAR(-1))	-1.568727	0.717767	-2.185567	0.0477
D(CAR(-1),2)	0.208493	0.565092	0.368954	0.7181
D(CAR(-2),2)	-0.240563	0.380332	-0.632508	0.5380
D(CAR(-3),2)	-0.397085	0.224147	-1.771540	0.0999
C	0.009682	0.008131	1.190724	0.2551
@TREND(2014Q4)	-0.000377	0.000539	-0.699386	0.4966

R-squared	0.820442	Mean dependent var	0.000526
Adjusted R-squared	0.751382	S.D. dependent var	0.025489
S.E. of regression	0.012709	Akaike info criterion	-5.640859
Sum squared resid	0.002100	Schwarz criterion	-5.342615

Log likelihood	59.58816	Hannan-Quinn criter.	-5.590384
F-statistic	11.88003	Durbin-Watson stat	1.837939
Prob(F-statistic)	0.000179		

With intercept

Null Hypothesis: D(PER) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.320727	0.0003
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PER,2)
Method: Least Squares
Date: 01/03/21 Time: 17:08
Sample (adjusted): 2015Q2 2020Q3
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PER(-1))	-1.190505	0.223749	-5.320727	0.0000
C	-0.000108	0.005881	-0.018393	0.9855

R-squared	0.586008	Mean dependent var	-0.002273
Adjusted R-squared	0.565309	S.D. dependent var	0.041740
S.E. of regression	0.027519	Akaike info criterion	-4.261336
Sum squared resid	0.015146	Schwarz criterion	-4.162150
Log likelihood	48.87470	Hannan-Quinn criter.	-4.237971
F-statistic	28.31014	Durbin-Watson stat	1.989293
Prob(F-statistic)	0.000033		

With intercept and trend

Null Hypothesis: D(PER) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.186506	0.0021
Test critical values:	1% level	-4.440739	
	5% level	-3.632896	
	10% level	-3.254671	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PER,2)
Method: Least Squares

Date: 01/03/21 Time: 17:09
Sample (adjusted): 2015Q2 2020Q3
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PER(-1))	-1.191708	0.229771	-5.186506	0.0001
C	-0.001370	0.013298	-0.102989	0.9191
@TREND(2014Q4)	0.000101	0.000950	0.106436	0.9164

R-squared	0.586255	Mean dependent var	-0.002273
Adjusted R-squared	0.542703	S.D. dependent var	0.041740
S.E. of regression	0.028226	Akaike info criterion	-4.171023
Sum squared resid	0.015137	Schwarz criterion	-4.022244
Log likelihood	48.88125	Hannan-Quinn criter.	-4.135975
F-statistic	13.46100	Durbin-Watson stat	1.989075
Prob(F-statistic)	0.000229		

With intercept

Null Hypothesis: D(OPER) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.454667	0.0002
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(OPER,2)
Method: Least Squares
Date: 01/03/21 Time: 17:11
Sample (adjusted): 2015Q2 2020Q3
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OPER(-1))	-1.354587	0.248335	-5.454667	0.0000
C	0.000351	0.004461	0.078752	0.9380

R-squared	0.598017	Mean dependent var	-0.002727
Adjusted R-squared	0.577918	S.D. dependent var	0.031950
S.E. of regression	0.020757	Akaike info criterion	-4.825360
Sum squared resid	0.008617	Schwarz criterion	-4.726174
Log likelihood	55.07896	Hannan-Quinn criter.	-4.801995
F-statistic	29.75339	Durbin-Watson stat	1.918244
Prob(F-statistic)	0.000024		

With intercept and trend
Null Hypothesis: D(OPER) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.305353	0.0016
Test critical values:	1% level	-4.440739	
	5% level	-3.632896	
	10% level	-3.254671	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(OPER,2)
Method: Least Squares
Date: 01/03/21 Time: 17:12
Sample (adjusted): 2015Q2 2020Q3
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OPER(-1))	-1.376895	0.259529	-5.305353	0.0000
C	-0.003309	0.010077	-0.328338	0.7462
@TREND(2014Q4)	0.000297	0.000729	0.407225	0.6884

R-squared	0.601496	Mean dependent var	-0.002727
Adjusted R-squared	0.559548	S.D. dependent var	0.031950
S.E. of regression	0.021204	Akaike info criterion	-4.743141
Sum squared resid	0.008542	Schwarz criterion	-4.594363
Log likelihood	55.17455	Hannan-Quinn criter.	-4.708093
F-statistic	14.33913	Durbin-Watson stat	1.919789
Prob(F-statistic)	0.000160		

With intercept
Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.838937	0.3512
Test critical values:	1% level	-3.857386	
	5% level	-3.040391	
	10% level	-2.660551	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Date: 01/03/21 Time: 17:13
Sample (adjusted): 2016Q2 2020Q3
Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-1.557373	0.846887	-1.838937	0.0908
D(GDP(-1),2)	0.553046	0.746771	0.740583	0.4732
D(GDP(-2),2)	0.808479	0.669004	1.208483	0.2501

D(GDP(-3),2)	0.417076	0.596576	0.699116	0.4978
D(GDP(-4),2)	-0.626534	0.421674	-1.485826	0.1631
C	-0.008733	0.010242	-0.852665	0.4105

R-squared	0.802768	Mean dependent var	0.003889
Adjusted R-squared	0.720588	S.D. dependent var	0.079420
S.E. of regression	0.041981	Akaike info criterion	-3.242001
Sum squared resid	0.021149	Schwarz criterion	-2.945211
Log likelihood	35.17801	Hannan-Quinn criter.	-3.201078
F-statistic	9.768395	Durbin-Watson stat	1.389855
Prob(F-statistic)	0.000654		

With intercept and trend

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.758870	0.6817
Test critical values:	1% level	-4.571559	
	5% level	-3.690814	
	10% level	-3.286909	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Date: 01/03/21 Time: 17:15
Sample (adjusted): 2016Q2 2020Q3
Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-1.556312	0.884837	-1.758870	0.1063
D(GDP(-1),2)	0.556010	0.783117	0.709995	0.4925
D(GDP(-2),2)	0.811586	0.702621	1.155084	0.2725
D(GDP(-3),2)	0.417301	0.623077	0.669742	0.5168
D(GDP(-4),2)	-0.628484	0.442843	-1.419203	0.1835
C	-0.009998	0.032043	-0.312035	0.7608
@TREND(2014Q4)	9.03E-05	0.002155	0.041890	0.9673

R-squared	0.802799	Mean dependent var	0.003889
Adjusted R-squared	0.695235	S.D. dependent var	0.079420
S.E. of regression	0.043844	Akaike info criterion	-3.131050
Sum squared resid	0.021145	Schwarz criterion	-2.784794
Log likelihood	35.17945	Hannan-Quinn criter.	-3.083306
F-statistic	7.463451	Durbin-Watson stat	1.392938
Prob(F-statistic)	0.002243		

Transforming stationarity 2nd difference
With intercept

Null Hypothesis: D(CAR,2) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.712435	0.0000
Test critical values:	1% level	-3.831511	
	5% level	-3.029970	
	10% level	-2.655194	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 19

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CAR,3)
Method: Least Squares
Date: 01/03/21 Time: 17:17
Sample (adjusted): 2016Q1 2020Q3
Included observations: 19 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CAR(-1),2)	-3.697653	0.424411	-8.712435	0.0000
D(CAR(-1),3)	1.733334	0.295779	5.860231	0.0000
D(CAR(-2),3)	0.747449	0.168837	4.427049	0.0005
C	0.001450	0.003246	0.446692	0.6615

R-squared	0.902790	Mean dependent var	0.001053
Adjusted R-squared	0.883348	S.D. dependent var	0.041351
S.E. of regression	0.014123	Akaike info criterion	-5.497316
Sum squared resid	0.002992	Schwarz criterion	-5.298486
Log likelihood	56.22450	Hannan-Quinn criter.	-5.463666
F-statistic	46.43505	Durbin-Watson stat	1.911668
Prob(F-statistic)	0.000000		

With intercept and trend

Null Hypothesis: D(CAR,2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.620483	0.0000
Test critical values:	1% level	-4.532598	
	5% level	-3.673616	
	10% level	-3.277364	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 19

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CAR,3)
Method: Least Squares
Date: 01/03/21 Time: 17:19

Sample (adjusted): 2016Q1 2020Q3
Included observations: 19 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CAR(-1),2)	-3.739078	0.433743	-8.620483	0.0000
D(CAR(-1),3)	1.759730	0.301898	5.828887	0.0000
D(CAR(-2),3)	0.756525	0.171614	4.408286	0.0006
C	0.007971	0.009120	0.874005	0.3969
@TREND(2014Q4)	-0.000465	0.000606	-0.766696	0.4560

R-squared	0.906707	Mean dependent var	0.001053
Adjusted R-squared	0.880052	S.D. dependent var	0.041351
S.E. of regression	0.014321	Akaike info criterion	-5.433182
Sum squared resid	0.002871	Schwarz criterion	-5.184646
Log likelihood	56.61523	Hannan-Quinn criter.	-5.391120
F-statistic	34.01627	Durbin-Watson stat	1.956601
Prob(F-statistic)	0.000000		

With intercept

Null Hypothesis: D(GDP,2) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.684785	0.0019
Test critical values:	1% level	-3.857386	
	5% level	-3.040391	
	10% level	-2.660551	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,3)
Method: Least Squares
Date: 01/03/21 Time: 17:20
Sample (adjusted): 2016Q2 2020Q3
Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1),2)	-3.709585	0.791837	-4.684785	0.0004
D(GDP(-1),3)	1.959995	0.775433	2.527614	0.0252
D(GDP(-2),3)	1.666061	0.615164	2.708318	0.0179
D(GDP(-3),3)	1.174383	0.324607	3.617860	0.0031
C	-0.007799	0.011127	-0.700910	0.4957

R-squared	0.891229	Mean dependent var	0.013889
Adjusted R-squared	0.857762	S.D. dependent var	0.121080
S.E. of regression	0.045665	Akaike info criterion	-3.104841
Sum squared resid	0.027109	Schwarz criterion	-2.857516
Log likelihood	32.94357	Hannan-Quinn criter.	-3.070738
F-statistic	26.62939	Durbin-Watson stat	1.383559
Prob(F-statistic)	0.000004		

With intercept and trend

Null Hypothesis: D(GDP,2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.380030	0.0143
Test critical values:	1% level	-4.571559	
	5% level	-3.690814	
	10% level	-3.286909	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,3)
Method: Least Squares
Date: 01/03/21 Time: 17:21
Sample (adjusted): 2016Q2 2020Q3
Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1),2)	-3.694237	0.843427	-4.380030	0.0009
D(GDP(-1),3)	1.953121	0.810885	2.408629	0.0330
D(GDP(-2),3)	1.667676	0.640371	2.604232	0.0230
D(GDP(-3),3)	1.177855	0.340214	3.462099	0.0047
C	-0.010585	0.034724	-0.304845	0.7657
@TREND(2014Q4)	0.000199	0.002335	0.085108	0.9336

R-squared	0.891295	Mean dependent var	0.013889
Adjusted R-squared	0.846001	S.D. dependent var	0.121080
S.E. of regression	0.047515	Akaike info criterion	-2.994334
Sum squared resid	0.027092	Schwarz criterion	-2.697543
Log likelihood	32.94900	Hannan-Quinn criter.	-2.953410
F-statistic	19.67810	Durbin-Watson stat	1.388982
Prob(F-statistic)	0.000021		

FACTORS DETERMINING PROFITABILITY OF MICROFINANCE INSTITUTIONS IN RWANDA

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