

**THE EFFECT OF RISK MANAGEMENT ON FINANCIAL  
PERFORMANCE: A STUDY ON MICRO FINANCE  
INSTITUTIONS (MFIs) IN ETHIOPIA**

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## CERTIFICATION

This is to certify that the thesis entitles “*THE EFFECT OF RISK MANAGEMENT ON FINANCIAL PERFORMANCE: A STUDY ON MICRO FINANCE INSTITUTIONS (MFIs) IN ETHIOPIA*” submitted to Wolkite university in partial fulfillment of the requirements for the degree of Master of Science degree in Accounting and Finance is a research work carried out by Mr. Abdalnure ahmedamir under our guidance and supervision.

Therefore, we hereby declare that no part of this thesis has been submitted to any other university or institutions for the award of any degree or diploma.

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## **DECLARATION**

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of Chrinet bereda and Teferi Tadesse. All sources of material used for the thesis have been duly acknowledged. I further confirm that the thesis is original and has not been submitted either in part or in full to any other higher learning institutions for the purpose of earning any degree.

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**Name**

**Signature**

## **Abstract**

*In the aftermath of the global financial crisis, risk management became a major area of focus for the financial sector. This study was aimed to examine the effect of risk management on micro finance institutions financial performance in the context of Ethiopia. Financial performance indicator (Return on assets) is used as the dependent variables while credit, liquidity, operational, interest rate, and exchange rate risk were used as proxies for risk management. The study target population was all 42 micro finance institutions in Ethiopia and the study covered a period of 12 years from 2010 to 2021. To this end, the study adopts quantitative approach. Time Series Cross-Sectional balanced secondary panel data was analyzed. The data was obtained from published financial statements of accounts of eighteen (18) micro finance institutions in Ethiopia. Descriptive statistics, correlation, and regression analyses were applied to analyze the data. The results from regression analysis showed that Credit Risk, Interest Rate Risk and Operational Risk were have a positive and statistically significant effect on financial performance, while foreign exchange rate risk has a statistically significant and negative influence on the financial performance of the Ethiopian micro finance institutions. Based on the panel regression approach, the study concluded that the risk management variables considered in this study was a key factor in affecting the financial performance of micro finance institutions in Ethiopia. Thus, it suggested that Ethiopian micro finance institutions should maintain a proper balance between risk management practices and financial performance by engaging in appropriate credit, operational, interest rate and foreign exchange risk management practices that will ensure safety for their micro finance institution and yield positive profits.*

**Keywords:** *credit risk, microfinance institutions*

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## **ACRONYMS**

ACSI: Amhara Credit and Saving Institution

ADSCI: Addis Saving and Credit Institution

MFIs: Micro Finance Institutions

MSEs: Micro and Small Enterprises

MSMEs: Micro, Small and Medium Enterprises

NBE: National Bank of Ethiopia

NGO: non-governmental organization

OCSSC: Oromia Credit and Saving Share Company

OMI: Omo Microfinance Institution

SACCO: saving and credit cooperative

SFPI: Specialized Financial and Promotional Institute\

SMEs: Small and Medium Enterprises

# CHAPTER ONE

## INTRODUCTION

This chapter comprised of the background of the study, problem statement, thesis general and specific objectives, scope of the study, hypothesis and the study significance.

### 1.1 Background of the study

The financial sector plays a crucial role in intermediating surplus units to the deficit units for the development and growth of the economy. (Tassew, etal, 2019). Ethiopian financial sector is not serving needs of the economy Most of the economies in the country didn't efficiently mobilize their domestic financial resources. These phenomena's can in part be attributed to lack of a well-developed financial sector (such as capital markets, banks, and other financial institutions) and the poor economic policies and incompetent "institutions" in the country (Mesele S., 2019)

Micro finance is main concern in current time to the unbanked house hold over the world. Microfinance institution is a method that provides lesser loans to third world people in order to generate revenue and start their own small enterprises, it has the capacity to reduce poor as well as encourage Enterprises, community and financial development in poor social groups especially in rapid developing countries similar to Ethiopia. MFI are Established to small scale monetarily services to the low-income people who farm, unemployed, operate min-business, who have no access to financial services of modern banks (Perways A.,and P.krishna M., 2017). Micro finance provides financial support to those persons in the society who are unable to get support from bank. Most of these loans are small in size and distributed to poor people in order for them to create income and start their own businesses (Tesfaye K. 2020)

The definition given for risk by many authors is more or less the same, in which many authors add their wordings to the same thing. Risk is an uncertain potential event and condition that raises the chance of losses/gains which could influence the success of financial institutions, (Khalid & Amjad, 2012). On the other hand, Rejda & McNamara, (2017) defined; risk as uncertainty concerning the occurrence of a loss. According to this definition, a risk exists only if an uncertain action or event happens that leads to the occurrence of that risk.

Risk management is a constant process of evolution. In general, risks include credit risk, market risk (include liquidity risk, interest rate risk, and exchange rate risk), and operational risk. If financial institutions ignore the risks, they could not have a normal operation. Therefore, every organization should learn to apply effective methods and make these methods positively identify, analyze, evaluate, treatment and control business risks (Aliu, M., Sahiti, A., 2019).

Risk management is crucial for financial sector to sustain their better financial performance since those sectors has great contribution in the allocation of nation's limited savings among the most productive investments and enhance the efficient allocation of risks of those investments (Tassew, etal, 2019). The findings of Kiprop (2017) revealed that risk identification, evaluation, and monitoring policy systems had a significant impact on the financial performance of financial institutions. Wamalwa and Mukanzi (2018) argued that the risk identification process includes the recognition and documentation of expected risk happenings within its institution and it is repetitive because new risks might become known as operations continue.

Mwangi (2014) studied on the effect of risk management on financial performance of commercial banks in Kenya. The study found that there was a negative relationship between credit risk, insolvency risk, interest rate sensitivity and financial performance of commercial banks. The study additionally revealed that there was a positive relationship between capital adequacy, size of the banks, operational efficiency and financial performance of commercial banks.

Endaweke (2015) investigated the impact of risk management on bank performance on the Ethiopian bank performance. The results showed that credit risk indicator (NPLR), Liquidity risk indicator (LIQR) and operational risk indicator (CIR) had negative and statistically significant impact on banks performance. Despite his approach is more pragmatic, but he was missed market risks impact assessment on banks performance.

Amu (2018) argued that the kinds of risks in the microfinance business are practically endless. The financial performance of microfinance institutions has received a general global displeasure despite the fact that international and national development programs have been giving high priority on sustainable microfinance for many years ( Mabonga, M. W. & Kimani, E. N. 2017).

Amanuel (2015) studied on credit risk management and profitability in Ethiopian microfinance institutions. The findings reveal that credit risk management does have statistically significant effects on profitability of commercial banks. Between the four proxies of credit risk management, LLPR & WOR have a significant effect on the both ROE and ROA while PAR>30 days & RC have an insignificant effect on both ROE and ROA.

Regardless of the fact that the literature on risk management is sufficient with studies carried out mostly in the developed countries, this area is not well studied in Africa especially in Ethiopia. Therefore, this study constructed an empirical study with the aim of examining the effect of risk management practice on the financial performance of microfinance institutions in Ethiopia.

## **1.2 Statement of the problem**

Microfinance Institutions helps to expand coverage make financial services more affordable and secure, competitive and efficient by reducing transaction costs and protect customer's deposits and investment. Micro finance in developed countries is scarce, likely because the sector is still young and poorly delimited. The division between microcredit and small business financing remains unclear. Depending on the provider, similar loans are classified as micro-loans, conventional loans, consumer loans, or SME loans. Increase in unsafe lending and risky investments led to financial turmoil in the world and was particularly severe in the US and European Union countries in 2007 and 2008 (Kahuthu, K. M. 2016).

In order to guarantee the sustainability of the microfinance subsector, management of risk must be effectively carried out. MFIs must, thus, be aware of how relevant risk management practices are in the general strategic plan of a financial institution to avoid their collapse (Ewool & Quartey, 2021). The institution should have tried to familiarize employees with practical aspects of risk and risk management in the institution and should make understanding risk and risk management as an important factor for risk management practice of the institution since it is one of the basic risk management aspects. (Negusse, B 2017)

Risk management is considered as a yardstick for determining the failure or success of a financial institution. The objective of every business organization is to maximize the wealth of shareholders and to obtain significant profit either for expansion or for new growth. Across the

banking system, the most prominent area that erodes the mass of their profit is risks (i.e., credit, liquidity, and operational risk) (Adarkwa, 2011).

According to Mebratu, (2017) credit risk is mostly encountered in the financial institutions of Ethiopia. This is associated with the change in capitalization, liberalization, and globalization and the attempts to increase their presence in other markets have affected the efficiency and credit risk of the Ethiopian banking institutions. Additionally, to generate profit a business needs short-term funds to fulfill its day-to-day needs in operations and other requirements. As a result, liquidity measures the ability of a business firm to meet its liabilities in a short period, usually, one year of business operation (Ahmad, 2016).

The Study conducted by Worku (2006), indicated the presence of excess liquidity held by commercial banks in Ethiopia. Likewise, the operational risk also cannot be overemphasized. Inadequate operational risk management can result in unpredictable financial performances. Studies show that there is no universally accepted finding on the magnitude and direction of the effect of risk management on the financial performance of the financial institutions because countries vary with each other in their economic systems, financial systems, political systems, and operating environments.

According to Negussie, (2017) a study conducted on Ethiopian MFIs, revealed that in micro finance institution analyzing risk arises from credit transaction and practicing of risk monitoring (which is a review system and access that the risk management techniques are efficiently worked) as good and important will add value for the institution risk management practice. Credit risk analysis, risk identification and risk monitoring have a significant and substantial effect on the institutions risk management practice to be effective and efficient.

The issue of risk management effect on financial performance were studied by different researchers in the rest of the World out of Ethiopia such as the study conducted by Catherine (2014), (Zubairi and Ahson 2015), Mwangi (2014), Mohammed (2017), and Abdel-Ménaf (2015). Most of the studies conducted so far are mainly focusing on commercial banks other than micro finance institution. Those abroad studies were conducted on the relationship between risk management practice and financial performance of banks by drawing the theoretical link between good risk management practices and improved bank performance. Empirical results of

those previous studies show a mixed trend on the effect of risk management components on the financial performance with statistically significant (negative/positive), weak, and in some cases with insignificant or no effect of risk management practices on financial performance.

Clearly many types of risks affect MFIs, However, when coming to our country studies have been done mostly on examining the effect of risk management practice on the financial performance of Banks in Ethiopia not MFIs. The remaining studies on MFIs have been devoted to only look at the credit risk and its influence on profitability and firm performance as of Amanuel (2015), Endaweke (2015), Shibiru and Mebratu (2017), and Worku (2006). As per the researcher knowledge, there is no previous study undertaken that clearly shows the effect of risk management on the financial performance of microfinance institutions in Ethiopia. As such, there is a need for comprehensive and integral risk management in all financial institution and more so to MFIs to ensure increased better performance. Unlike the others past studies, this study focused on common types of risks namely credit risk, liquidity risk, operational risk, interest rate risk and foreign exchange risk.

Thus, the above problems evidence the need to fill the gap of the previous researches and to undertake extensive research on the effect of risk management on financial performance of microfinance institutions in Ethiopia. Therefore, this study constructed an empirical study that examine the effect of credit risk, liquidity risk, operational risk, interest rate risk as well as effect foreign exchange risk management on the financial performance of microfinance institutions in Ethiopia.

### **1.3. Objectives of the study**

#### **1.3.1. General Objective of the Study**

The general objective of this study is to examine the effect of risk management on the financial performance of micro finance institution.

#### **1.3.2. Specific Objectives of the Study**

Specifically, the study addresses the following objectives

- To examine the effect of credit risk on the financial performance of Microfinance institutions (MFIs)

- To investigate the effect of liquidity risk on the financial performance of Microfinance institutions (MFIs)
- To examine the effect of operational risk on the financial performance of Microfinance institutions (MFIs)
- To investigate the effect of interest rate risk on the financial performance of Microfinance institutions (MFIs)
- To examine the effect of foreign exchange rate risk on the financial performance of Microfinance institutions (MFIs)

## **1.4 Research Hypothesis**

Hypotheses are predictions about the outcome of the results, and they may be written as alternative hypotheses specifying the exact results to be expected (more or less, higher or lower of something (Creswell, 2009). Previous studies have assessed the effect of risk management on the financial performance. Empirical results of those previous studies show a mixed trend on the effect of risk management components on the financial performance.

***Ha1:** Credit risk has a significant effect on the financial performance of Microfinance institutions (MFIs) in Ethiopia.*

***Ha2:** Liquidity risk has a significant effect on the financial performance of Microfinance institutions (MFIs) in Ethiopia.*

***Ha3:** Operational risk has a significant effect on the financial performance of Microfinance institutions (MFIs) in Ethiopia.*

***Ha4:** Interest rate risk has a significant effect on the financial performance of Microfinance institutions (MFIs) in Ethiopia.*

***Ha5:** Foreign exchange rate risk has a significant effect on the financial performance of Microfinance institutions (MFIs) in Ethiopia.*

## **1.5 Scope of the Study**

The scope of this study is delimited to investigate the effect of five risk management variables namely; credit risk, liquidity risk, operational risk, interest rate risk, and foreign exchange risk on the financial performance of Microfinance institutions (MFIs) in Ethiopia. The study based on the annual data of 12 years (2010-2021) for sampled 18 MFIs (OCSSCO, OMO, Addis, SFPI, Vision, Sidama, Bus.Gon, peace, Meklit, Eshet, Wasasa, Harbu, Kendil, Metemamen, One, Digaf, Lefayeda, Dynamic micro finance). Indeed, the scope of this study is adequate to meet the requirement of the research methodology that was utilized in the study, and it sufficient to achieve the core objectives of the research.

## **1.6. Significance of the Study**

This study will have a significant role in enhancing various local works of literature to be conducted on the risk management related subject matters. Besides, it also signifies Microfinance institutions (MFIs) the country to evaluate their risk management mechanisms to reduce loss and be profitable and more liquid than before. The study will provide a better ground for Microfinance institutions (MFIs) managers, business professionals, business initiatives, and policymakers to know risk management and its impact on financial performance to design and implement effective risk management strategies. Moreover, the study will be greatly useful for academia by adding information to the existing body of literature and the study contributes to expanding the limited literature on risk management and financial performance of the Microfinance institutions (MFIs). Therefore, this study will also be used as a point of reference in analyzing risk management as well as its impacts on financial performance.

## **1.7 Organization of the paper**

This section gives a structure of every chapter that included in the thesis paper. The paper consists five chapters. Chapter one presents an introduction part including; background of the study, statement of the problem, objectives of the study, research hypothesis, and significance of the study. Chapter two contains a review of pieces of literature. Chapter three is about research design and methodology. Chapter four analyses the findings of the study. Finally, chapter five concludes the study and provides some recommendation.

## **CHAPTER TWO**

### **REVIEW OF RELATED LITERATURE**

#### **INTRODUCTION**

This chapter deals with different points about micro finance which starts from definition of microfinance and history of microfinance and followed by some general points about it, concept of risk management, common risks found in microfinance institution, concept of financial performance and its measurement. Finally, reviews of other studies conducted in different countries on issues regarding risk management.

#### **2.1. Theoretical literature review**

##### **2.1.1. Definition of microfinance**

Various definitions of microfinance have been given which give on insight to their aim, scale and nature of financial services provided by the MFIs and those which describe the characteristics of the users of these financial services.

The term microfinance refers to the provision of financial services primarily savings and credit to the poor and low-income households that don't have access to commercial banks (Arsyad, 2005). The other researcher defined about MFIs is that, it offers financial services to poor people. The aim of Access to financial services for poor people is help to alleviate risks, build their assets, improve their income, and furthermore contribute to development of the focal community (Cull *et al*, 2009).

Microfinance institutions (MFIs) have the function of providing financial services to the low-income households who are not able to access financial services from banks, including the self-employed and customers without collateral assets. Dedicated to improving the life of the poor in developing countries, MFIs provide to the poor much needed credit loans of small amount in order to finance their entrepreneurship projects, to finance their consumption and to cope to illness or for the education of their children without any collateral requirement (Ibtissem & Bouri, 2013).

Microfinance refers to small scale financial services for both credits and deposits that are provided to people who farm or fish or herd; operate small or microenterprise where goods are produced, recycled, repaired, or traded; provide services; work for wages or commissions; gain income from renting out small amounts of land, vehicles, draft animals, or machinery and tools; and to other individuals and local groups in developing countries in both rural and urban areas (Robinson, 2001).

According to Robinson, (2001) definition: Microfinance refers to small-scale financial services- primarily credit and savings-given to people who involved in farm or fish or herd; who work in small enterprises or microenterprises where goods are produced, recycled, repaired, or sold; who provide services; who work for wages or commissions; who gain income from renting out small amounts of land, vehicles, draft animals, or machinery and tools; and to other individuals and groups at the local levels of developing countries, both rural and urban (Robinson, 2001 p.9).

Ethiopian Proclamation No. 626/2009 defines micro financing business as "the provision of financial services like accepting saving, extend credit, drawing and accepting drafts payable, providing money transfer services. From General understanding of theoretical and empirical evidence in addition to distributing loans, MFIs also offer a wide range of financial services, such as savings and insurance options. They provide financial services like savings, credit, insurance, remittance, etc. in a very small quantity generally to the poor people

### **2.1.2. History of microfinance institutions**

The history of micro financing can be traced back to the middle of the 1800s when the theorist Lysander Spooner was writing over the benefits from small credits to entrepreneurs and farmers as a way getting the people out of poverty. But it was at the end of World War II with marshal plan the concept had big impact (Stanley, 2018). There have been informal and formal credit and savings institutions for the poor around the world for centuries, one of the earliest and longer - lived microcredit organizations, which provided small loans to rural poor without collateral, were the Irish loan fund system, founded by author and nationalist Jonathan Swift at the beginning of the eighteenth century. In the 19th century, a wide range of larger and more savings and credit institutions started to emerge in Europe. These institutions which were organized primarily

among the rural and urban poor were known as people's Banks savings and credit co-operatives and credit unions (Morin, 2018).

Professor Muhammad Yunus who was the Nobel Prize winner in 2006, disbursed first loans from his own pocket to a group of rural women in Jobra in 1976 and successfully developed the concept of microfinance with his Grameen Bank throughout the country and later the whole world (Ledgerwood, 1999). The Grameen bank, which is now serves more than 2.4 million clients (94 % of them women) and is a model for many countries (Ledgerwood, 1999).

According to “microfinance Barometer” (2017), in the year 2016 there were 123 million customers at microfinance institution worldwide for a loan of \$ 102 billion. India was the leader in terms of microfinance in 2016, with 47 million borrowers and roughly \$ 15 billion in outstanding loans. Vietnam was second, followed by Bangladesh, Peru and Mexico. The ranking shows strong momentum in South Asia. The region accounts for roughly 60 % of all borrowers and has the highest growth in terms of loans, up to 23.5% in 2016. Latin America and the Caribbean are also highly active in microfinance, with \$ 42.5 billion in outstanding loans, compared with \$9.3 billion in Europe and \$8.7 billion in Sub-Saharan Africa. Most borrowers were women in living in rural areas. They made up 84 % of borrowers in 2016, with people in rural areas representing roughly 60 % of the market.

### **2.1.3. Micro Finance institution in Ethiopia**

Initially, micro-credit started as a government and non-government organizations motivated plan. Following the 1984/85 severe drought and famine, many NGOs started to offer micro credit along with their relief activities although this was on a limited scale and not in a sustained manner (Alemayehu, 2008)

According Emanu (2009) In Ethiopia the concept of microfinance is not new but, as an industry it is relatively new phenomenon. Traditional financial institutions were an institution that people have saved with and taken small loans from informal channels for unexpected events from the so called Iqub and Idir. Iqub is a nonprofit association of people having common objective mobilizing finance and distribute it to members through rotating. Other traditional institution was

Idir also nonprofit which is a funeral insurance established and operated by the volunteer community.

Micro financing institution in Ethiopia mean a company licensed under the Proclamation No. (626/2009) to engage in micro-financing business in rural and urban areas.

However, the micro-credit sector in Ethiopia has been strictly regulated since 1996. Following an assessment of revolving funds managed in the framework of NGO development projects, a piece of law was promulgated with the aim of professionalizing the sector by reducing imprudent lending practices, lenient financial discipline and distortions due to unrealistic interest rates (Melkamu, 2012). Formal microfinance in Ethiopia started in 1994/5. In particular, the Licensing and Supervision of Microfinance Institution Proclamation of the government during 1996 encouraged the spread of Microfinance Institutions in both rural and urban areas as it authorized them among other things, to legally accept deposits from the general public, to draw and accept drafts, and to manage funds for the micro financing business.

Hence, the main purpose of a micro-financing institution in Ethiopia is to collect deposits and extend credit to rural and urban farmers and people engaged in other similar activities as well as micro and small scale rural and urban entrepreneurs, the maximum amount of which may be determined by the National Bank Proclamation No (626/2009).

#### **2.1.4. The concept of risk management**

Risk management is the process to manage the potential risks by identifying, analyzing and addressing them. The process can help to reduce the negative impact and emerging opportunities. The outcome may help to mitigate the likelihood of risk occurring and the negative impact when it happens (Partnerships BC, 2005).

Risk management is a central part of any organization's strategic management. It is the process whereby organizations methodically address the risks attaching to their activities with the goal of achieving sustained benefit within each activity and across the portfolio of all activities. The focus of good risk management comprises the identification and treatment of risks. The objective of good risk management is to add maximum sustainable value to all the activities of the organization (IRM, 2002). It also used for the understanding of the potential upside and

downside of all those factors which can affect the organization. It increases the probability of success, and reduces both the probability of failure and the uncertainty of achieving the organization's overall objectives. Risk management should be a continuous and developing process which runs throughout the organization's strategy and the implementation of that strategy. It should address methodically all the risks surrounding the organization's activities past, present and in particular, future (FERMA, 2003).

Cielens (2010) stresses the discipline aspect of risk management. Risk management is a discipline for dealing with the possibility that some future event will cause harm. It provides strategies, techniques, and an approach to recognizing and confronting any threat faced by an organization in fulfilling its mission. Also lingered that risk management information is used along with other corporate information, such as feasibility, to arrive at a risk management decision, transferring risk to another party, lessening the negative effect of risk and avoiding risk altogether are considered risk management strategies. Examples of risk management practices include: purchasing insurance; installing security systems; maintaining cash reserves; and diversification.

Several risk management standards have been developed including the Project Management Institute, the National Institute of Science and Technology, actuarial societies, and ISO standards. Methods, definitions and goals vary widely according to whether the risk management method is in the context of project management, security, engineering, industrial processes, financial portfolios, actuarial assessments, or public health and safety (Simkins and Fraser, 2010).

The strategies to manage risk typically include transferring the risk to another party, avoiding the risk, reducing the negative effect or probability of the risk, or even accepting some or all of the potential or actual consequences of a particular risk. In conducting RM, the following are listed as some of the areas or aspects of the organization that a risk manager needs to look into namely: the people, intellectual assets, brand values, business expertise and skills, principal source of profit stream and the regulatory environment (Searle, 2008).

Generally, the increased emphasis on risk management in microfinance institutions (MFIs) is a reflection of fundamental Shifting among managers and regulators to better anticipate risks

rather than just react to them. Proactive risk management is an essential management tool to the long-term sustainability of a microfinance institution.

### **2.1.5. Risk Management Theory**

Wenk (2010), states that the risk management model consists of risk identification, risk assessment, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, transfer and control the probability and/or impact of unfortunate events or to maximize the realization of opportunities. Risks can come from uncertainty in financial markets, project failures, legal liabilities, credit risk, accidents, natural causes and disasters as well as deliberate attack from an adversary, or events of uncertain or unpredictable root-cause.

Risk management is the identification, assessment, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events or to maximize the realization of opportunities (Wenk, 2005). Risk management is a constant process of evolution. In general, risks include credit risk, market risk (include liquidity risk, interest rate risk, and exchange rate risk), and operational risk. If financial institution ignores the risks, they could not have a normal operation. Therefore, every organization should learn to apply effective methods and make these methods positively identify, analyze, evaluate, treatment and control business risks (Aliu, M., Sahiti, A., 2019).

The study anchored its variables on the theories namely (i). liquidity risk theory which is linked with liquidity risks (ii) Finance distress theory which is linked with the credit and liquidity risks, (iii) Shiftability Theory is linked with liquidity risks, and (iv) Extreme value theory that is linked with market risks.

#### **2.1.5.1. Liquidity Risk Theory**

Liquidity risk is a major exposure that precedes any relentless market catastrophe. It is argued that it is the definitive indicator that leads to the explosion of credit risks in addition to market risks, and it is referred to as the means, which modifies remote loss dealings into widespread collapses of financial institutions. The unmatched crisis in the United States mortgage market in 2007 makes no exception. Acerbi and Scandolo (2007) depicts that any

financial institution should be in a position to classify as well as categorize the liquidity risk to which it is exposed. In the case of microfinance institutions, their liquidity requirements along with the sources of liquidity on hand to convene these requirements rely extensively on the institution's dealings, product portfolio, cash flows report as well as well as their balance sheet makeup. Therefore, it is required of any financial institution to evaluate its liquidity position to avoid a declining effect on its earnings and capital.

The relevance of this theory to this study is that, it aids in quantifying the liquidity risk arising from non-performing loans and portfolios at risk consequentially affecting the financial stability and performance of MFIs. This theory also aids in identifying the relevant changes in revenue and capital affecting the overall performance of the MFIs.

#### **2.1.5.2. Finance distress theory**

Baldwin & Mason, (1983) purported that when a firm's business deteriorates to the purpose where it cannot meet its liability, the firm is claimed to possess entered the state of financial distress. The primary signals of financial distress are violations of debt payments and failure or reduction of dividends payouts. Whitaker, (1999) defines an entry in financial distress because the first year during which cash flows is less than current maturities' long-term debt. The firm has enough to pay its creditors as long because the cash flows exceed the present debt obligations. The key considers identifying firms in financial distress is their inability to fulfill contractual debt obligations. However, substantial financial distress effects are incurred well before default. Wruck, (1990) stated that firms enter into financial distress as a result of economic distress, declines in their performance, and poor management, especially on risks.

Boritz, (1997) depicts a process of financial distress that begins with a period characterized by a collection of bad economic conditions and poor management which commits costly mistakes. Bank's inability to supply cash to depositors and loans to borrowers when the demand may constitute a financial condition and other creditors also have to be compelled to be taken into consideration when firms are setting up place risk management measures. Credit risks in banks also have to be compelled to be addressed since it's going to cause financial distress. Loan portfolio management is a vital determinant of the firm's liquidity. The banks should manage the credit and liquidity risk to avoid financial distress.

The theory of financial distress emanates from the liquidity and credit risk facing a firm. This theory provides for a non-biased perspective on the link between credit risk and financial performance variables employed by the study. By providing information that the results of financial distress occur before default risk, the theory offers a neutral platform to undertake an incisive empirical analysis of this relationship within the commercial banks.

### **2.1.5.3. Shiftability theory of liquidity**

Formally developed by Harold G. Moulton in 1915, the shiftability theory held that banks could most effectively protect themselves against massive deposit withdrawals by holding, as a type of liquidity reserve, credit instruments that there existed a ready secondary market. The theory relies on the proposition that the bank's liquidity is maintained if it holds assets that would be shifted or sold to other lenders or investors for cash. Also, these assets can be shifted to the central bank for cash without material loss just in case necessarily than hopping on maturities to resolve their liquidity problems (Ngwu, 2006).

This theory posits that a bank's liquidity is maintained if it holds assets that would be shifted or sold to other lenders or investors for cash. Now of view contends that a bank's liquidity might be enhanced if it always has assets to sell and provided the central bank and also the discount market stands able to purchase the asset offered for a discount. Thus, this theory recognizes and contends that shiftability, marketability, or transferability of a bank's assets could be a basis for ensuring liquidity. This theory further contends that the highly marketable security held by a bank is a superb source of liquidity. Dodds, (1982) contends that to confirm convertibility immediately and appreciable loss, such assets must meet three requisites. liquidity management theory consists of the activities involved in obtaining funds from depositors and other creditors and determining the appropriate mix of funds for a, particularly bank. Liquidity theory has been subjected to critical review by various authors.

The consensus is that during the period of distress, a bank may find it difficult to obtain the desired liquidity since the confidence of the market may have seriously affected and credit worthiness would invariably be lacking. However, for a healthy bank, the liabilities constitute an important source of liquidity. The liquidity shiftability theory provides for an explicit understanding of how the liquidity risk affects the financial performance using liquidity coverage and net stable funding ratios as stated by the new Basel III framework. The analysis of this study

provides information as to whether liquidity maintained by the commercial banks affects the returns to the shareholders.

#### **2.1.5.4. Extreme Value Theory**

In 1709, Bernoulli discussed the mean largest distance from the origin when  $n$  points lie haphazardly on a line of length (Johnson et al., 1995). A century later Fourier stated that, within the Gaussian case, the probability of a deviation being over 3 times the square root of two standard deviations from the mean is about 1 in 50,000, and consequently can be omitted (Kinnison, 1985). The financial institutions with significant amounts of trading activity proved to be very susceptible to extreme market movements and, in time, the measurement of market risk became a primary concern for regulators and also for internal risk control. This requires indicators showing the risk exposure of firms and also the effect of risk-reducing measures. Value-at-Risk (VaR) has been established as a regular tool among financial institutions to depict the downside risk of a market portfolio. It measures the utmost loss of the portfolio value which will occur over some period at some specific confidence level because of risky market factors (Jorion, 1997).

Banks and bank holding companies with a vital trading portfolio are subject to plug risk requirements. They need been required to carry capital against their defined market risk exposures, and, the required capital could be a function of banks' risk estimates. As a result, several alternative methods have been proposed for estimating VaR, one among which being the intense Value Theory (EVT). EVT methods make VaR estimations based only on the information within the tails as against fitting the complete distribution and can make separate estimations for left and right tails (Diebold, F.X., Schuermann, T., & Stroughair, 2000).

Proper estimation of VaR is critical in this it has to accurately capture the extent of risk exposure that the firm is exposed to, but if it overestimates the risk level, then the firm will set unnecessarily put aside excess capital to cover the risk when that capital could have been better invested elsewhere (Hull, 2012). Extreme value theory helps in determining the minimum and therefore the maximum capital that ought to be put aside to cover the market risks. To attain this goal, the banks have to be compelled to manage the market risk by managing the financial leverage.

### **2.1.6. Common risks found in Microfinance Institutions**

Financial intermediation involves some risks, with one major challenge facing financial institutions being to identify such risks and to hedge against them. The risks vary in type and intensity for different financial institutions, whether or not they operate in the same business environment. Each microfinance, therefore, has to identify its own unique set of risks and to manage it in its own way if it wishes to continue to sustain its operations.

According to Fernando (2008), risk management, in relation to an MFI is the process of controlling the likelihood and potential severity of an adverse event; it is about systematically identifying, measuring, limiting, and monitoring risks faced by an institution. Services are relatively small and simple when a new microfinance commences operations. During the setting up of a new microfinance it tends to be very aware of the financial risks that it faces, causing it to make a conscious effort to mitigate them. However, as microfinance grows in size and diversifies its loan portfolios, different types of risks, other than the obvious financial ones, tend to begin to manifest them. Generally, the following three categories of risks that might face microfinance business have been identified.

#### **2.1.6.1. Liquidity risks**

According to Craig and Dan (2011), liquidity risk arises when a microfinance is unable to meet its cash requirements or payment obligations timely and in a cost-efficient manner. Microfinance have to plan the volume of loans to be approved and disbursed, the withdrawal pattern of their saving clients (where MFI is allowed to mobilize deposits), and other fund requirements for operational purposes, and should be able to match available funds against such requirements. According to Kolari et al, in order to reduce liquidity risk, each microfinance branch needs to prepare a daily fund plan that guides the matching of cash inflows from loan repayment and saving deposits (that usually take place in the afternoon) with cash outflows (from draw-downs, customer withdrawals and operational expenses) for the branch on a daily basis. Any positive balance or surplus fund should be deposited with a correspondent MFIs daily, while any anticipated shortfall should be covered by withdrawing cash from the early in the day. No overnight cash should be held by the branch, in order to eliminate the risk of fraud or theft. As in the case of the daily fund plan, each branch should also prepare a monthly fund plan that should outline the amount of loans to be granted, the volume of saving withdrawals from customers, and

the anticipated operational expenses. The preparation of the plan assists the finance department to anticipate the funding requirements of the various branches, thereby allowing the determination in advance of any potential cash shortfall or surplus facing the branches concerned. The funds should then be moved to a position where they can address the situation, while any arising idle funds are invested appropriately.

#### **2.1.6.2. Credit Risk**

Credit risk is defined as the probability that some of a MFI 's assets, especially its loans, will decline in value and possibly become worthless. Because MFIs hold little owners 'capital relative to the aggregate value of their assets, only a small percentage of total loans need to go bad to push a MFIs to the brink of failure. Thus, management of credit risk is very important and central to the health of a MFI and indeed the entire financial system. As MFI s makes loans, they need to make provisions for loan losses in their books. The higher this provision becomes, relative to the size of total loans, the riskier a MFIs becomes. An increase in the value of the provision for loan losses relative to total loans is an indication that the MFI 's assets are becoming more difficult to collect. Credit risk is the risk of a loss resulting from the debtor's failure to meet its obligations to the MFI in full when due under the terms agreed (R.S. Raghavan 2003).

#### **2.1.6.3. Operational risk**

Operational risks arise because of possible system or human errors in service or product delivery. Potentially, unexpected financial losses might occur as a result of a variety of issues, such as inadequate or deficient information systems, operational challenges, incompetent personnel, inadequate skill, deliberate breaches, or fraudulent tendencies. The management of such risks requires that the internal control framework is effective, the information technology (IT) used is adequate, the integrity of the employees is guaranteed, and the operating processes are streamlined. Given the various sources of operational risk, the most obvious is the interaction of loans and clients involving financial transactions. In the case of normal traditional banks, the staff undertaking credit assessment is usually well trained, with multiple levels of crosschecking put in place. Unfortunately, in the case of MFIs, there are usually numerous short-term loans of small amounts, making elaborate crosschecking not cost effective. As a result, the possibility of both errors of assessment and deliberate fraud is relatively high (Mersland and Strom 2007)

#### **2.1.6.4. Interest rate risk**

The acceptance and management of financial risk is inherent to the business of banking and banks' roles as financial intermediaries. To meet the demands of their customers and communities and to execute business strategies, banks make loans, purchase securities, and take deposits with different maturities and interest rates. These activities may leave a bank's earnings and capital exposed to movements in interest rates. This exposure is known as interest rate risk. English (2002) argued that banks and their supervisors have spent considerable time and effort in recent years developing systems for monitoring and managing interest rate risk. Wide deposit-lending interest rate margin could be indicative of banking sector inefficiency or a reflection of the level of financial developments (Folawewol and Tennant, 2008).

Falling interest rate are accompanied by recession, causing an increase in loan losses and a slower growth in loans. Crowley (2007) defined loan repayment rate as money borrower pays for the use of money they borrow from a lender, financial institutions or fee paid on borrowed assets. Interest has indirect impact on financial performance through impacting economy, high interest rate to borrowers discourages borrowing this result to shrank investment through multiplier effects savings are reduced and this will have negative impact on banks performance argued by Ngugi (2004). Stiglitz and Weiss (1981) believe that high interest rates are responsible for higher defaults and declining bank profit. These clearly provide support to our hypothesis that high interest rates are positively correlated to loan defaults in developing countries. Amonoo et al, (2003) suggested that real rate of interest must be lower than real return on capital. It means that as the financial market becomes more and more efficient with the process of development, lending rates should be lowered than before which may contributes towards reduced level of loan defaults.

Calice, Chando, & Sekious (2012) Argued that the majority of the banks (56 percent) allow past SME losses to affect the pricing of future loans, specifically interest rates. Hassan and Khan (2010) assert that when lending rates rise, banks on average attract riskier investments which require a higher return on investment. They continued to assert that higher interest rates also made lot of credit worthy borrowers to shy off from borrowing.

#### **2.1.6.5. Foreign Exchange Risk**

Exchange rates tell us how many units of one currency may be bought or sold for one unit of another currency. The spot rate is the exchange price for transactions for immediate delivery. The forward rate applies to a deal that is agreed upon now but where the actual exchange of currency is not due to take place until some future date. The exchange of currencies at the future date will be at the rate agreed upon now. Bessis, (2011) defines foreign exchange risk as incurring losses due to changes in exchange rates.

Exchange rate risk occurs as a result of either transaction risk or economic risk. Transaction risk occurs from the effect of changes in nominal exchange rates that affect the company's contractual cash flows in foreign currencies. It relates to contracts already entered into but which have yet to be settled. Thus, a company is subject to transaction risk whenever it imports goods from or export goods to another country which are paid at a later date, or where a company borrows or invests in a foreign currency or uses derivatives denominated in a foreign currency (Collier, 2009). Foreign Exchange risk arises when a bank holds assets or liabilities in foreign currencies and impacts the earnings and capital of the bank due to the fluctuations in the exchange rates (Sabri, 2011).

#### **2.1.7. The concept of Financial Performance and its Measurement**

As defined by Gibson (2012), financial performance may be referred to as the extent to which financial goals and objectives of a financial institution have been accomplished or are being attained. It is a process of matching up the revenue generated to the institution's set policies. It is a key measure for assessing the financial health of particular organization within the set time.

Several financial institutions to measure their financial stability and performance utilize profitability ratios. These ratios are key indicators of credit analysis in most banks as well as MFIs, as they are linked to the results that are attributable to the performance of management (Gibson, 2012). Regularly used ratios are Return of equity as well as return on assets. The superiority level of return on equity should be at least 15% and 30%, for Return on Assets; it should be at least 1%. ROE is a significant indicator in measuring profitability, consequentially, financial performance. Further, ROE evaluates the efficiency of MFIs illustrating the level at which MFIs reinvest their earnings to generate their projected future revenue.

As defined by Öttker-Robe and Podpiera (2010), ROE is measured by dividing a corporation's net annual income after tax by shareholder equity. It establishes the revenue derived from equity. An increase in ROE might indicate that an institution's revenue is on the rise without necessarily adding more capital. Thus, a rise on return on equity as well as return on assets indicates that the institution is financially stable. A superior return on equity or return on assets indicate enhanced revenue projection for a MFI expansion and pliability to shocks, and thus leads to lower credit risk (Öttker-Robe & Podpiera, 2010)

ROE and ROA are commonly used as indicators of the profitability and financial performance. Chirwa (2003) mentioned that in the previous studies, various indicators are used, including ROE, ROA and return on capital (ROC).

Al-Matari, Al-Swidi and Fadzil (2014) indicated that the most widely used performance measure in risk management literature in terms of accounting-related determinants is Return on Assets (ROA). This is estimated as the net income divided by total assets and is a pointer of short-term performance.

Al-Matari et al. (2014) indicated that Return on Equity (ROE) is a profitability ratio measured by dividing net profit over shareholders' equity. It shows how well the MFI can use equity investments to earn profit for investors.

**Return on Assets (ROA)** The mathematical definition of return on assets is Although used widely, ROA is an odd measure because its numerator measures the return to shareholders (both equity and preference) whereas its denominator represents the contribution of all investors (shareholders as well as lenders).

***Return on Assets (ROA) = Profit after tax / Average total Assets***

**Return on Equity (ROE)** Mathematically: It is a measure, which is of great interest to equity shareholders. The numerator of this measure is equal to profit after tax minus preference dividends. The denominator, on the other hand, is made up of all contributions made by equity shareholders (i.e., Paid-up capital + reserves and surplus).

The ROE, or return on net worth, measures the profitability of equity funds invested in the firm. Because shareholders' wealth maximization is the primary objective of every firm, ROE is the

essential measure of performance in an accounting sense (Prasanna Chandra, 2011 P.82) 38. Several factors influence ROE: earning power, debt-equity ratio, the average cost of debt funds, and tax rate. Generally, ROE and ROA are the most used measures of profitability. Since they are accounting rates of return, the proper names for these measures may be; return on book equity and return on book assets respectively.

***Return on Equity (ROE) = Equity earning /Average Equity***

Performance of an institution shall be measured from the objectives of the organization angel. Microfinance's goal is to eradicate poverty. In the early days when MFI started, they were financed by donor funds that have a poverty eradication goal. Therefore, the performance of the MFI was measured on how much MFI reach to the poor (outreach) and how the lives of those who get financial services are changing as compared to those who don't get these services (impact). However, as the microfinance industry grew in size, the need for increased financing coupled with unpredictability of donor funds trigger the issue of a sustainable MFIs that stand on their own leg that is MFIs shall start covering their own cost of operation from their program revenues as quoted by Letenah (2009).

## **2.2. Review of Related Empirical Studies**

To achieve the objective of the study the researcher was reviewed the studies conducted regarding on risk management, the studies which are conducted in different business sector in general, financial sector and more specifically in MFI provided herein under.

Zubairi and Ahson (2015) investigated the strength of correlation between present risk management practices and the profitability of five (5) Islamic banks in Pakistan. Risk management practices of the banks were studied and quantified over a seven-year period. The study adopted both primary (survey questionnaires) and secondary data (annual reports) to collect data. The study estimated pooled regression and verified the reliability of the estimated model via the Augmented Dickey-Fuller test and found that risk management system had a statistically significant negative influence on profitability using ROA and ROE during the period under review.

(Almas & Mukhtar, 2015), tried to measure the performance and achievement of MFIs incorporating using data collected from financial statements of microfinance institutions.

Subsidy, dependence index and outreach index in Pakistan. They tried to compare subsidy dependence and financially self-sufficiency index using data from the years of 2006 to 2012. Their study revealed that some MFIs in Pakistan are subsidy in terms of FSS. They recommended that MFIs should struggle to reduce operational costs; otherwise, they would not reach their clients in far off places.

Mohammed (2017) Have been conducted research in the titled “Risk management practices of select microfinance institutions in Telangana State, India” to examine the use of risk management practices and techniques in dealing with different types of risks and to investigate the relationship between risk management practices and various techniques used to manage risk. Finally, the author approved that risk variables such as understanding risk and risk management, and Risk Identification were positively and significantly affecting risk management practices of micro finance institutions and the variables of Risk assessment and analysis, and risk monitoring and control had positive but insignificant impact of risk management practices.

Ahmad et al (2013) conducted a study to examine the risk management practice and to identify factors that affect risk management practice by obtaining empirical evidence from Bahrain, the UAE and Pakistan banks for Country-specific regression analysis and findings. The authors ensured that risk management understanding (RMU), risk analysis and assessment (RAA), identification of risk (IR) and credit risk analysis (CRA) were statistically significant. RMU was most influential and significant variable and RM was found positive but insignificant in the model both in Bahrain and UAE banks.

Abdel-Ménaf (2015) investigated risk management practices in MFIs focusing on two key institutions in Togo, involving Federation of Savings and Loans Cooperative (FUCEC) and Women and association for gain both economic and Social (WAGES). The study used a qualitative survey research design and collected data through semi-structured interviews, using 40 respondents in both institutions and analyzed data utilizing descriptive statistics. The results indicated that the risks faced by the institutions included institutional, operational, financial management, and external risks but concentrated more on credit risk. Furthermore, the study found that the major threat to credit risk management was the lack of training and bad selection of staff in charge of credits.

According to Muriu, (2011) empirical study on determinants of profitability of African MFIs, under the study “what explains the low profitability of MFIs in Africa” tried to find the factors contributing to profitability of MFIs. He used Generalized Method of 25 Moments (GMM) system using an unbalanced panel dataset comprising of 210 MFIs across 32 countries operating from 1997 to 2008. The proxies for profitability were both ROA and ROE. Credit risk measured by the sum of the level of loans past due 30 days or more (PAR>30) and still accruing interest is negatively and significantly related to MFI profitability. This study therefore finds evidence to support the conjecture that increased exposure to credit risk is normally associated with lower MFI profitability.

Gathigia (2016) examined the effect of financial risk on financial performance of commercial banks in Kenya. The quantitative research design was adopted in the study. The target population of this study was the 43 commercial banks. Panel data was used and secondary data was obtained from published financial statements for ten years from 2005 to 2014. Researcher found that credit, market, liquidity and operational risks have significant negative effect on return on equity. The component of financial risk that had the most impact on financial performance was cost to income ratio, i.e., operational risk. Despite, researcher looked at major risks impact on financial performance of commercial banks, but we have some context difference that needs to be customized as per Ethiopian context, particularly financial liberalization aspect.

Kenny et al. (2014), studied on risk management practices and financial performance: evidence from the Nigerian deposit money banks, the study used secondary data gathered through content analysis of the selected banks’ annual reports and accounts. The cross-sectional data were analyzed using descriptive statistics to show pattern and robust standard errors OLS regression to estimate significant influence between banks’ risk management practices (credit, liquidity, operating and capital risk practices) and their financial performance. Risk management practices have a significant influence on banks’ performance. While the credit and capital risk display significant positive influence on ROA.

Mwangi (2014) studied on the effect of risk management on financial performance of commercial banks in Kenya. Descriptive research design was used in the study. Secondary Data was collected from Central Bank and banks financial reports and multiple regression analysis used in the data analysis. The study found that there was a strong positive relationship between

risk management and financial performance of commercial banks in Kenya. The study also found that there was a negative relationship between credit risk, insolvency risk, interest rate sensitivity and financial performance of commercial banks. The study additionally revealed that there was a positive relationship between capital adequacy, size of the banks, operational efficiency and financial performance of commercial banks.

Catherine (2014), has conducted study on the effects of risk management on financial performance of insurance companies in Kenya, data collected from 44 insurance companies and published reports for a period of 2008 - 2012. The study established that a majority of insurance companies in Kenya had adopted risk management practices in their operations and that this had a strong effect on their financial performance. Risk identification was found the most significant in influencing financial performance, followed by risk mitigation, risk management program implementation & monitoring and risk assessment & measurement respectively. The study concluded that there was a positive relationship between the adoption of risk management practices and the financial performance of insurance companies in Kenya.

### **Local Studies**

Abdi & Batra, (2018) made research on performance analysis of MFIs in Ethiopia. Their study methodologies were secondary data of 31 MIFs for the period of 2010-2016 collected from the NBE, journals AEMFI and the primary data were collected using questioners. The data have been descriptive statistics and financial ratios to measure the performance of MFIs in the country. In general, the study result shows that the Ethiopian MFIs are serving clients which are not poor and this leads to that their performance can be said poor

Worku (2006) conducted the study on the impact of liquidity risk on the performance of commercial banks of Ethiopia. He argued that liquidity has an impact on the performance of commercial banks in Ethiopia and there was an inverse relation between deposit/net loan and ROE. And the coefficient of liquid asset to total asset was positive and directly related with ROE. In addition, the study also found that the capital adequacy of all banks in Ethiopia were above threshold, means there was sufficient capital that can cover the risk-weighted assets. Depositors who deposit their money in all banks were safe because all the studied banks fulfilled NBE requirement.

Shibiru and Mebratu (2017) assessed the impact of credit risk management on the performance of six private commercial banks in Ethiopia for a 14 period (2000 to 2013). The data were collected from audited financial statement and National Bank of Ethiopia. The collected data were analyzed by using panel data regression model and the result showed capital adequacy ratio, total loan ratio, nonperforming ratio, bank size and liquidity ratio have a significant impact on the performance (ROA and ROE). Though, the study attempted to examine credit risk from different perspective, it was limited to credit risk only instead of inculcating other risks and it missed government commercial bank which has lion share in the market.

Endaweke (2015) investigated the impact of risk management on bank performance on the Ethiopian bank performance. Balanced fixed effect panel regression was used for the data of eight commercial banks from 2002 to 2013. Four risks were seen as independent variable that affects banks performance were used and analyzed. The results of panel data regression showed that credit risk indicator (NPLR), Liquidity risk indicator (LIQR) and operational risk indicator (CIR) had negative and statistically significant impact on banks performance. Despite his approach is more pragmatic, but he was missed market risks impact assessment on banks performance.

Amanuel (2015) studied on credit risk management and profitability in Ethiopian microfinance institutions. The main purpose of the research is to investigate if there is a relationship between credit risk management and profitability of microfinance institutions in Ethiopia. In the research model, ROE and ROA are defined as proxies of profitability while PAR>30 days, LLPR, WOR & RC are defined as proxies of credit risk management. The data were collected from 12 microfinance institutions in Ethiopia from 2003 to 2012 and formulates two hypotheses which are related to the research question. A series of statistical tests are performed in order to test if the relationship exists. The findings reveal that credit risk management does have statistically significant effects on profitability of commercial banks. Between the four proxies of credit risk management, LLPR & WOR have a significant effect on the both ROE and ROA while PAR>30 days & RC have an insignificant effect on both ROE and ROA

### **2.3. Summary of empirical evidence and Identified literature gap**

This section summarized the existing literature on risk management and financial performance. Financial performance is influenced by a combination of factors facing the firm; a review of the literature provides evidence as to why firms should concern themselves with risk management. The studies revealed that the awareness and willingness of companies in managing their risks have increased in the emerging economies due to the impact of events such as the European financial crisis. That is, the demand for risk management is increasing, especially in the past few years.

Studies show that there is no universally accepted finding on the magnitude and direction of the effect of risk management on the financial performance of the financial institutions because countries vary with each other in their economic systems, financial systems, political systems, and operating environments. The above empirical review of literature emphasizes that most of the studies so far conducted are mainly focusing on financial institution other than micro financial institution. Most studies conducted on the relationship between risk management practice and financial performance of banks by drawing the theoretical link between good risk management practices and improved bank performance.

The issue of risk management effect on financial performance were studied by different researchers in the rest of the World out of Ethiopia such as the study conducted by Catherine (2014), (Zubairi and Ahson 2015), Mwangi (2014), Mohammed (2017), and Abdel-Ménaf (2015). Those abroad studies were conducted on the relationship between risk management practice and financial performance of banks by drawing the theoretical link between good risk management practices and improved bank performance mainly focusing on commercial banks other than micro finance institution.

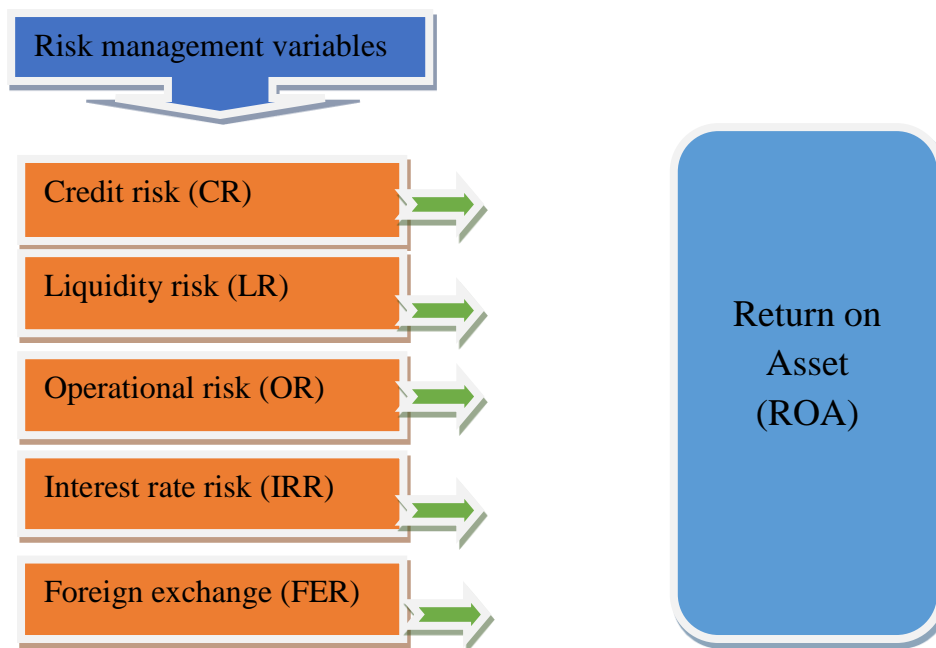
When coming to our country, various studies have been done. But still the area is not well studied in Ethiopia, there is very little related empirical evidence available as of Amanuel (2015), Endaweke (2015), Shibiru and Mebratu (2017), and Worku (2006). Some of them tried to examine the effect of risk management on financial performance of Banks in Ethiopia. Other researchers tried to show the effect of only credit risk management practice on financial performance of either microfinance institutions or banks in Ethiopia. As per the researcher

knowledge, there is no previous study undertaken that clearly shows the effect of risk management on the financial performance of microfinance institutions in Ethiopia.

Thus, the above problems evidence the need to fill the gap of the previous researches and to undertake extensive research on the effect of risk management practice on financial performance of microfinance institutions in Ethiopia. Therefore, this study tried to construct an empirical study that examine the effect of credit risk, liquidity risk, operational risk, interest rate risk as well as effect foreign exchange risk management on the financial performance of microfinance institutions in Ethiopia.

## 2.4. Conceptual framework

A conceptual framework is a research tool intended to assist a researcher to develop awareness and understanding of the situation under scrutiny and to communicate it. When clearly articulated, a conceptual framework has potential usefulness as a tool to assist a researcher to make meaning of subsequent findings. It forms part of the agenda for negotiation to be scrutinized, tested, reviewed, and reformed as a result of an investigation and it explains the possible connections between the variables (Smith, 2004).



**Figure 2.1: conceptual framework (organized by the researcher based on literatures)**

## **CHAPTER THREE**

### **RESEARCH DESIGN AND METHODOLOGY**

This chapter outlines and explains the methodology adopted to achieve the research objective and test the research hypotheses formulated in the study. The first section provides an overview of the research design followed by section two with the research approach and section three discussed population and sampling techniques adopted in the study, section four the model specifications Section five presents' variable measurements used in the study respectively.

#### **3.1. Research Design**

The primary aim of this study is to examine the effects of risk management on the financial performance of micro finance institution in Ethiopia. The purpose of explanatory research design is to gain familiarity in unknown areas. It is used to formulate a problem for specific investigations or aim at formulating research Design thus when the universe of study is an unidentified community, this design forms the first step of research, to achieve this objective explanatory research design was employed in the study. The explanatory type of research design helps to identify and evaluate the causal relationships between the different variables under consideration (Marczyk et al., 2005).

#### **3.2. Research Approach**

When conducting research, there are different ways of approaching the problem. This study adopted quantitative approach in order to investigate the effect of risk management on financial performance of micro finance institution in Ethiopia. According to Creswell (2009) there are three types of research approach, namely qualitative, quantitative and mixed approach. Qualitative approach used mostly when the researcher needs to develop a complex, holistic picture, analyzes words, reports, detailed view of informants, and conducts the study in a natural setting and involves studies that do not attempt to quantify their results through statistical summary or analysis (Creswell, 2009). The rational reason for adoption of quantitative approach includes: to develop knowledge of cause and effect thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, and the test of theories, employee strategies of inquiry such as experiments and surveys. The mixed research approach is

a means to collect both qualitative and quantitative data and analyses together to answer the research questions. In other words, it involves the collecting and “mixing” or integration of both quantitative and qualitative data in a study. A mixed methods approach is one in which the researcher tends to base knowledge claims on pragmatic (Creswell, 2009). Even though, each approach has its own objective and application time, in the selection process one should take into account the nature of the research problem or issues being addressed. Consequently, the study in hand requires analyzing the relationship between variables based on theories and hypothesis testing using statistical procedures due to the nature of the study. By saying so, this study adopted quantitative approach in order to investigate the effect of risk management on financial performance of micro finance institution in Ethiopia.

### **3.3. Target population, sample size, and sampling technique**

#### **3.3.1. Target population of the study**

The population in a statistical study is the entire group of individuals about which we want information (Moore et al., 2009). According to Kothari (2006), the population of a study is simply the entire set of individuals or items that are described in the study as being the area of study and which the researcher is trying to observe their characteristics or behavior. Thus, the target populations of the study are all 42 micro finance institutions registered by NBE and operating in Ethiopia. The MFIs in Ethiopia are Acsi, Decsi, Ocscso, Omo, Addis, Cons A, Sfp, Gasha, Vision, Sidama, Bus.Gon. Peace, Meklit, Eshet, Wasasa, Ben. Gum., Dire, Aggar, Harbu, Cons. B, AVFS, Kendil, Metemamen, One, Digaf, Harar, Lefayeda, Tesfa, Gembella, Dynamic, Somali, Lideta, Nisir, Adeday, Afar, Rays, Kershi, Debo, Sheger, Yemisrach, Grand, Cons. C

#### **3.3.2. Sampling technique and sample size**

As noted in Jonker & Pennink (2010) it is obvious that researchers are typically unable to study the entire population. Therefore, researchers typically study a subset of the population which is known as a sample. Sample is the part of the population from which we actually collect information used to draw conclusions about the whole (Moore et al., 2009). The sampling techniques can broadly be divided into probability sampling and non-probability sampling (Leedy & Ormrod, 2005). Singh (2006) when the subjects used in the sample are homogeneous;

using the purposive sampling technique is appropriate that is part of non-probability sampling. Hence, the purposive sampling method will be employed to draw sample from the population.

To achieve the objective of the research the sampling selection criteria that will be adopted is availability of accessible financial data for 12 years to the most recent date (from 2010-2021). Using purposive sampling technique 18 MFIs from the industry were found legible. The sampling units that satisfy the criteria are:

<b>No</b>	<b>Name of micro finance institution</b>
1	specialized Financial and Promotional Institute (SFPI),
2	Gasha Micro Finance
3	Sidama Micro Finance
4	Peace Micro Finance
5	Meklit Micro Finance,
6	Eshet Micro Finance,
7	Wassasa Micro Finance
8	Benshangul Gumuz Micro Finance, ,
9	Harbu Micro Finance,
10	Oromia Credit and Saving Share Company (OCSSC),
11	Omo Micro Finance,
12	Addis Credit and saving Institutions
13	Kendile Micro Finance
14	Metemamen Micro Finance
15	One Micro Finance,
16	Digaf Micro Finance
17	Lafeyada, Micro Finance
18	Dynamic micro finance

The remaining 24 MFIs that are excluded from the sample are those MFIs without 12 years financial data. This is because those MFIs were either they haven't a working experience of more than 12 years or they are MFIs with more than 12-year experience but their full 12 years financial data to the most recent date (2010-2021) is not accessible in the National bank of Ethiopia data base.

### **3.4. Data analysis and Interpretation**

According to (Mugenda & Mugenda, 2003) the data collected must be cleaned, coded and analyzed from the results of which the researcher is able to make sense of the data. After relevant data regarding the study area are collected, the researcher analyzed and interpreted those data based on their nature. Considering that, in this study to test statistical analysis descriptive was also used to test the hypotheses.

Descriptive statistics was used to convert the raw data in to more meaning full form which enables the researcher to understand the ideas clearly and interpret with statistical description including standard deviation, mean, and minimum & maximum. Inferential statistics also used to see the effect of explanatory or independent variables on the dependent variable. The researcher used Eviews software to analyze the data obtained.

### **3.5. Model specification**

According to William et al. (2010), model building involves specifying relationships between two or more variables through extending to the development of equations. To test the hypothesis of this study and to determine the relative importance of each independent variable in influencing the financial performance of Microfinance institutions (MFIs) in Ethiopia multiple linear regression analyses will be undertaken. An OLS estimation model which best fits the analysis of effect of risk management on financial performance of micro finance institution in Ethiopia will be employed. The general regression equation for all independent variables i.e., CR, LR, OR, IRR, and FER will be regressed to investigate their effect on ROA as an indicator of the financial performance of Microfinance institutions (MFIs) in Ethiopia. Where Microfinance institutions (MFIs) financial performance is represented by return on assets, and risk management variables are represented by credit risk, liquidity risk, operational risk, interest rate risk, and foreign exchange rate risk. The study will use a regression model that is specified as follows:

$$ROA_{it} = \beta_0 + \beta_1 CR_{it} + \beta_2 OR_{it} + \beta_3 LR_{it} + \beta_4 IRR_{it} + \beta_5 FER_{it} + \varepsilon_{it}$$

Where;

- $ROA_{it}$  = Return on Assets of MFIs  $i$  for year  $t$
- $CR_{it}$  = Credit Risk of MFIs  $i$  for year  $t$
- $OR_{it}$  = Operational Risk of MFIs  $i$  for year  $t$
- $LR_{it}$  = Liquidity risk of MFIs  $i$  for year  $t$
- $IRR_{it}$  = Interest Rate Risk of MFIs  $i$  for year  $t$
- $FER_{it}$  = Foreign exchange rate risk of MFIs  $i$  for year  $t$
- $B_i$  = Coefficients of the variables
- $\varepsilon_{it}$  = Error term

As mentioned in Brooks (2008), there are basic assumptions required to show that the estimation technique, OLS had several desirable properties. If these Classical Linear Regression Model (CLRM) assumptions hold, then the estimators determined by OLS will have several desirable properties and are known as Best Linear Unbiased Estimators (BLUE). Therefore, for this study, diagnostic tests will be performed to ensure whether the assumptions of the CLRM are BLUE or not in the model.

### 3.6. Variable description and measurement

This study aims to determine the impact of risk management on the financial performance of micro finance institutions in Ethiopia. To achieve this objective, the study adopted financial performance as the dependent variable. Credit risk, liquidity risk, operational risk, and market risk constituted the explanatory variables for the study. This section provides details of how each of the study variables is measured and operationalized. The following subsections present the dependent variable and the independent variables.

#### 3.6.1. Dependent variable

In the literature, there are different alternative measures of financial performance. The most commonly used financial performance ratio is a return on assets (ROA), return on equity (ROE), and net interest margin (NIM). ROA is used as a better measure of profitability than other ratios and it reveals how much profit a company earns for its assets (Malik, 2011). Return on asset (ROA) in the company measures the ratio of net income after tax for its total asset of the given companies (Tomislava et al, 2017).

$$\text{Return on Asset} = \frac{\text{net income}}{\text{total asset}}$$

#### 3.6.2. Independent variable

In this study, the researcher chooses five independent variables namely credit risk, liquidity risk, operational risk, interest rate risk and foreign exchange risk because these variables are the major indicators of risk management that affect the performance of financial institutions in Ethiopia (NBE, 2010)

**Credit risk:** defined as the risk of losses from the refusal or inability of credit customers to pay what is owed in full and on time Davide and Thangavel, (2008). There are many ways to calculate credit risks such as nonperforming loans and risk-weighted assets. However, loan loss provision to total loans will be used to assess credit risk in this research. Loan loss provision is an amount that banks set aside to mitigate expected loss on bank loan portfolios as part of their credit risk management function (Laeven and Majnoni, 2003). A higher ratio means the bank can withstand future losses better, including unexpected losses beyond the loan loss provision. The ratio is calculated as follows:

$$\text{Credit risk} = \frac{\text{loss loan provision}}{\text{total loans}}$$

**Liquidity risk:** liquidity risk happens when a bank is not capable of meeting short-term obligations. This occurs when the bank does not have enough funding or if its investments and assets cannot be sold quickly for cash without incurring unnecessary losses (Almarzoqi, et al. 2015). Thus, according to him, liquidity is inversely related to liquidity risk. This means when liquidity risk is high, there is a tendency for illiquidity. Therefore, liquidity risk is estimated by the ratio of liquid assets to total assets. Liquid Asset to Total Asset (LA/TA) Based on the risk return hypothesis, more liquidity risk is associated with higher expected returns. The ratio is calculated as follows:

$$\text{Liquidity risk ratio} = \frac{\text{liquid asset}}{\text{total asset}}$$

**Operational risk:** the cost to income ratio is also known as the Efficiency Ratio or Expense to Income Ratio. The components of the ratio are cost and income and, hence, the measure is indirectly related to bank profitability. A reduction in costs for a given level of income will reflect increased profits and vice versa. Increased profits, in turn, will result in improved return on equity, and a share price of the bank is of great interest to investors. Hence, volatility in a bank's cost to income ratio might be a better measure of volatility in a bank's cost performance (Correa, and Raju, 2008). The cost-to-income ratio is calculated as follows:

$$\text{Cost to income ratio} = \frac{\text{operating expense}}{\text{operating income}}$$

**Interest rate risk:** it can be defined as the risk that a bank's income and/or market value will be adversely affected by interest rate movements and this risk stems from the peculiar nature of the banking business. The study captured the effect of interest rate as a measure of market risk since a change in interest rate could lead to a mismatch between interest paid on deposit and the interest received on loans. Fluctuations in net interest margins could be an important source of uncertainty in bank profitability and could surely have adverse effects for particular banks. The bank's position concerning interest rates sensitivity can be measured in several ways. One of the methods is the ratio between the interest-sensitive assets and the interest-sensitive liabilities. A ratio of interest-sensitive assets to interest-sensitive liabilities equal to 1 shows a balanced

position. The proxy for interest rate risk used is the ratio of maturity gap (Rate Sensitive Assets Less Rate Sensitive Liabilities) to total capital.

**Foreign exchange rate risk:** it arises because of exchange rate movements in the period from the original commercial contract, to the time of settlement of the domestic equivalent of the foreign currency amount. No one can predict what the exchange rate will be in the next period, it can move in either upward or downward direction regardless of what the estimates and predictions were. This uncertain movement poses a threat to the earnings and capital of the bank if such a movement is in an undesired and unanticipated direction (Evans. O, 2014). In this study, the Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market.

**Table 3.1 Summary of variables with their measurement**

The following table presents the summary of variables, their measurement, and expected sign for the influence of the independent variables on the Microfinance institutions (MFIs) performance in Ethiopia.

Table 3.1 Summary of the study variables

	<b>Variables</b>	<b>Notation</b>	<b>Measurement</b>
<b>Dependent variables</b>	Return on Asset	ROA	$= \frac{\text{net income}}{\text{total asset}}$
<b>Independent variable</b>	Credit risk	CR	$= \frac{\text{loss loan provision}}{\text{total loans}}$
	Liquidity risk	LR	$= \frac{\text{liquid asset}}{\text{total asset}}$
	Operational risk	OR	$= \frac{\text{operating expense}}{\text{operating income}}$
	Interest rate risk	IRR	Rate Sensitive Assets - Less Rate Sensitive Liabilities / total capital
	Exchange rate risk	FER	<i>ETB to US dollar</i>

## CHAPTER FOUR

### 4. DATA ANALYSIS AND PRESENTATION

The major objective of this study is to examine the effect of risk management on financial performance based on the selected balanced panel data of eighteen MFIs of Ethiopia starting from, 2010 up to 2021. This chapter deals with the analysis and presentation of the results of the study. The result of descriptive statistics, the correlation matrix, and regression analysis of the selected variable was reported. The panel data was diagnosed to check for the presence of normality, heteroskedasticity, multicollinearity problem, and autocorrelation.

#### 4.1. Finding of Descriptive statistics

The descriptive statistics of the dependent and independent variables for the sample micro finance institutions were summarized in table 4.1. The total number of observations for each variable was 216 (i.e., data for 18 MFIs for the period from the year 2010 to 2021). Key figures, including mean, median, maximum, minimum, and standard deviation are reported below. The dependent variables return on asset is used to measure the financial performance of micro finance institutions. The remaining are the independent variables such as, credit risk, operational risk, liquidity risk, interest rate risk, weighted average exchange rate which are analyzed by using E-views 9 software.

Table 4.1: Summary of Descriptive Statistics

	<b>ROA</b>	<b>OR</b>	<b>LR</b>	<b>IRR</b>	<b>CR</b>	<b>FER</b>
<b>Mean</b>	0.144321	0.040574	0.223354	0.128093	0.04132	24.16073
<b>Maximum</b>	1.012343	0.077	0.7117	0.341	0.0721	49.6029
<b>Minimum</b>	-0.01323	0.018	0.0104	0.028	0.0132	12.8909
<b>Std. Dev.</b>	0.0813	0.01381	0.161029	0.081218	0.01665	10.09282
<b>Observations</b>	216	216	216	216	216	216

Source: E-Views 9 output from survey data, 2022

Financial performance (ROA): As indicated in the above table 4.1, the financial performance measured in terms of ROA reveal that micro finance institutions (MFIs) achieved on average a

positive 0.144321 after-tax profit. This indicates that the Ethiopian MFIs attained, on average, a good performance over the last twelve years. For the total sample, the mean of ROA was 0.144321 with a minimum of -0.01323 and a maximum of 1.012343. This means that the most profitable MFIs among the sampled micro finance institutions earned 1.012343 cents of profit after tax for a single birr invested in the asset of the firm. On the other hand, the least profitable micro finance institution of the sampled MFIs lost 0.01323 cents of loss after tax for each birr invested in the asset of the firm. The standard deviation statistics for ROA was 0.0813 which indicates that the financial performance variation between the selected MFIs was large. The result implies that these MFIs need to utilize optimum level use of their asset to boost the return on of the MFI.

Credit Risk is measured using the ratio of loss loan provision to total loan. As can be shown from table 4.1 above, for the total sample, the average of loss loan provision was 0.04132 with a minimum of 0.0132 and a maximum of 0.0721. This indicates that, from the total loans that Ethiopian MFIs disbursed, an average of 4.1 % was maintained as loss loan provision over the sample study period. The lowest loss loan provision ratio that Ethiopian MFIs experienced over the sample period was 1.3 %. On the other side, the highest loss loan provision ratio of Ethiopian MFIs experienced was 7.2 %. The standard deviation 1.6% of loss loan provision shows a little bit of variation of NPLs among Ethiopian micro finance institution from the mean.

Liquidity Risk test measures the proportion of liabilities covered by cash and quickly convertible investments. It is measured using a ratio of total liquid assets to total assets. As presented in table 4.1 above its liquidity risk has a mean and standard deviation of 0.223354 and 0.161029 respectively. The mean value implies that for each 1-birr current deposit there were 0.223354 cents liquid assets to meet the obligation and the value of standard deviation 0.161029 indicates that a little deviation of liquidity ratio across the mean value micro finance institutions. The overall maximum and minimum value for liquidity ratio is 0.7117 and 0.0104 respectively. In past ten years highly liquid micro finance institutions has 0.7117 liquidity ratios and MFIs struggle with liquidity problem has 0.0104 liquidity ratio.

Operational Risk is a measured by the cost-to-income ratio which was the range between 4% and 7.7 %. The cost-to-income ratio during the selected study period has a mean value of 4.0574% and 1.381% standard deviations. The maximum and the minimum value of the management

efficiency index was 0.077 and 0.018 respectively. This indicates that the most efficient manager incurs 0.077 cents for each 1 Birr income generated and the poorly performed operation manager incurs 0.018 cents for each 1 Birr income generated. The standard deviation of 0.01381 is medium and indicated the performance of most of the managers do not vary and is near from the mean value.

Interest rate risk measures the real interest rate which has a mean value of 0.128093 with the maximum and minimum of 0.341 and 0.028 respectively. The standard deviation of 0.028 is small and indicates the interest rates do not vary and is near from the mean value.

Foreign exchange rate risk is measured by the currency exchange rate of ETB to US dollar. It has a mean value of 24.16073 with a standard deviation of 10.09282 this implies that the foreign exchange rate in Ethiopia during the study period remains highly unstable

#### **4.2. Classical Linear Regression Model (CLRM) Assumptions Test**

In this section, the researcher carried out relevant diagnostic testing to identify any violation in the underlining assumption of the classical linear regression model (CLRM). Five assumptions tests were conducted which ensure that the estimation technique, ordinary least squares (OLS), to have several desirable properties, and that hypothesis tests regarding the coefficient estimates could validly be conducted. Specifically, it was assumed that average values of the error-term are zero, the variance of the errors are constant (homoscedastic), the error terms are normally distributed (normality), the covariance between the error-terms is zero (no autocorrelation), and explanatory variables are not correlated (absence of multicollinearity).

The errors have zero mean: The first assumption required is that the average value of the errors is zero. According to Brook, (2008) if the constant term is included in the regression equation, the assumption will not be violated and if the regression did not include an intercept and the average value of the errors was non-zero. In this study, the model consisted of a constant term called an intercept. In addition, by including the intercept we can avoid two main undesirable consequences; first, R-square, could never be negative, and second, a regression with intercept parameter could not lead to potentially severe biases in the slope coefficient estimates.

The errors have zero mean  $E(U_t) = 0$ .

### 4.2.1. Heteroscedasticity Test

Heteroscedasticity test: According to Brooks (2008), it has been assumed that the variance of the disturbance is constant. This is known as the assumption of homoscedasticity. If we estimate regression models on data in which the variance is not constant, they will still result in errors that are zero on average (i.e., our predictions are still correct), but this may cause some independent variables not to be significant, whereas, in reality, they are. If the errors do not have a constant variance, they are said to be heteroscedastic.

The hypothesis for testing the presence of Heteroscedasticity:

Null Hypothesis: There is no Heteroscedasticity

Alternative Hypothesis: There is Heteroscedasticity

To check the presence of heteroskedasticity problem the Breusch-pagan test was employed. As shown below Table 4.2, the probability value of chi-square is 0.1069 which is greater than the Breusch-pagan test decision point (0.05). Therefore, it indicates that there was no heteroscedasticity problem on the error terms of the ROA model. This means that the null hypothesis was not rejected which says that the error variance is constant.

Table 4.2: - Heteroskedasticity Test for ROA: Breusch-Pagan test

Heteroskedasticity Test for ROA

Periods included: 12

Cross-sections included: 18

Total panel observations: 216

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	175.0690	153	0.1069
Pesaran scaled LM	0.232609		0.8161
Pesaran CD	-1.337531		0.1810

Source: Own computation of summary of Breusch-pagan test using Eviews

### 4.2.2. Test of Normality

The examination of the normal distribution of the data is one of the fundamental requirements for linear regression analysis between the study variables. One of the most commonly applied tests for normality is the Bera-Jarque (BJ) test. Jarque-Bera uses the property of a normally distributed random variable that the entire distribution is characterized by the first two moments the mean and the variance. The standardized third and fourth moments of distribution are known as its skewness and kurtosis. A normal distribution is not skewed and is defined to have a coefficient of kurtosis of 3. It is possible to define a coefficient of excess kurtosis, equal to the coefficient of kurtosis minus 3 a normal distribution will thus have a coefficient of excess kurtosis of zero. A normal distribution is symmetric and said to be mesocratic. If the residuals are normally distributed, the histogram should be bell-shaped and the Bera-Jarque statistic test would not be significant. This means that the p-value given at the bottom of the normality test screen should be bigger than 0.05 to not reject the null of normality at the 5% level. (Brooks,2008)

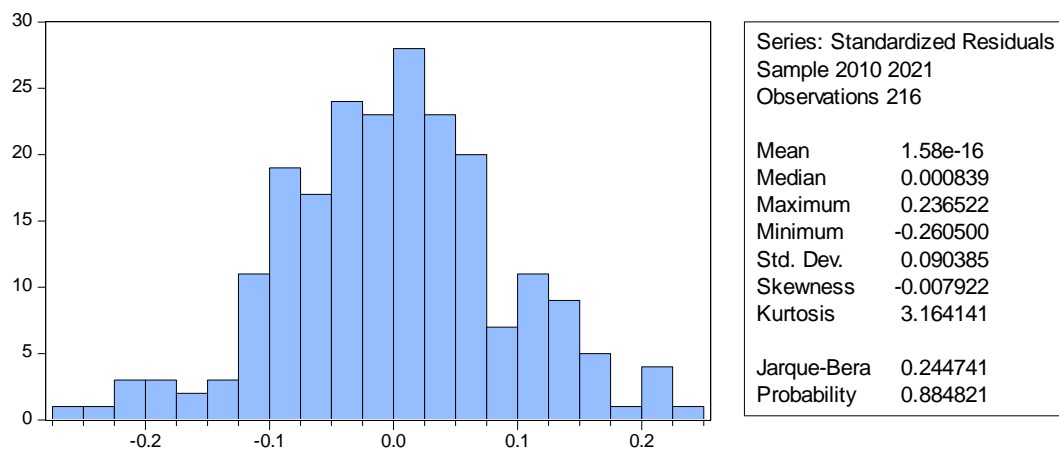
The test hypothesis is;  $H_0$ : Error term is normally distributed.

Alternative hypothesis: Error term is not normally distributed

Decision Rule: Reject  $H_0$  if the P-value of Jarque-Bera tests less than significant level 0.05.

Otherwise, do not reject the null hypothesis.

Figure 4.1: Normality Test Result for ROA



Source: Financial statements of MFIs Own computation using EViews 9

The result of normality tests for this study is as shown in figure 4.1 above where the coefficient of kurtosis is around 3, and the Bera-Jarque statistic had a P-value of 0.884 it implied that the residual of this study is normally distributed and the data were consistent with a normal distribution assumption which should not be rejected since the p-value was considerably more than 0.05.

#### 4.2.2. Test of Multicollinearity

Test of Multicollinearity: Multicollinearity problems exist when there is a correlation between variables employed in the regression model (when the assumption that  $Cov(X_1, X_2) = 0$  is violated). That is the existence of a perfect or exact linear relationship among some or all explanatory variables of a regression model (Gujarati, 1995). This phenomenon presents a problem because the estimates of the sample parameters become inefficient and entail large standard errors, which makes the coefficient values and signs unreliable. It also hides the real impact of each variable on the dependent variable (Anderson et al., 2008).

Table 4.3: - Correlation Matrix between explanatory variables

	OR	LR	IRR	CR	FER
OR	1.000000				
LR	0.222473	1.000000			
IRR	-0.105018	-0.042146	1.000000		
CR	0.623577	0.230742	-0.074842	1.000000	
FER	-0.074077	-0.058421	0.138015	0.054457	1.000000

Source: Financial statements of MFIs, NBE reports, and own computation

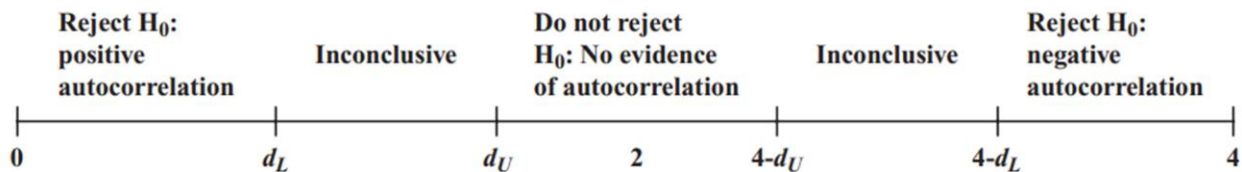
There were different arguments towards the multicollinearity problem. (Gujarati D, 2004) Stated that multicollinearity problems exist when the correlation coefficient among variables is greater than 0.75. (Cooper & Schendlar, 2003) also suggested that, a correlation above 0.8 between explanatory variables should be corrected. Lastly, (Hair JF, 2006) argued that also correlation coefficient below 0.9 may not cause a serious multicollinearity problem. In contrary to this, (Kennedy, 2008) argued that any correlation coefficient above 0.7 could cause a serious multicollinearity problem leading to inefficient estimation and less reliable results. This study adopts the conservative view of (Kennedy, 2008) among the others and accepts the problem of multicollinearity if the value is exceeding 0.7.

As it appears in the correlation matrix table 4.3, there was no such high correlation between the explanatory variables. Thus, there is no problem of multicollinearity for this study. Besides, the other statistical tool used to check multi-collinearity among the independents variable is variance inflation factor (VIF), as stated by Gujarati (2004), if the VIF is below 10 there is no multicollinearity problem. Therefore, in this study, the variance inflation factors of all variables are below 10 so it is concluded that there is no multicollinearity problem on the study model i.e., ROA.

#### 4.2.3. Test for Autocorrelation

Autocorrelation: As noted in Brooks (2008) this is an assumption that the covariance between the error terms over time is zero. In other words, it is assumed that the errors are uncorrelated with one another. If the errors are not uncorrelated with one another, it would be stated that they are “autocorrelated” or that they are serially correlated. Durbin-Watson (DW) is used to test the independent variables of errors (autocorrelation), for a level of significance of 0.05 (Nagib, et al, 2012) as cited in (Field, 2009).

Figure 4.4: Rejection and Non-Rejection Regions for Durbin-Watson Test



As mentioned in the previous chapter to empirically analyze the effect of risk management on financial performance in MFIs, 216 observations and 5 regressors along with an intercept term were used in the model. Accordingly, the relevant critical values for 216 observations and 5 regressors in the Durbin-Watson test statistic table have shown an upper critical value ( $d_U$ ) of 1.715 and a lower critical value ( $d_L$ ) of 1.25 which is an intermediate region where the null hypothesis of no autocorrelation can neither be rejected nor not rejected.

Table 4.5: - Autocorrelation Test: Durbin Watson for ROA

Variables	DW test static result
MFIs specific factors	1.501471

Source: Financial statements of MFIs, NBE reports Own computation using E-view 9

As shown in Table 4.5, the Durbin-Watson test statistic of this study (1.501471) was clearly between the upper limit (1.715) and the lower limit (1.25) and thus the null hypothesis of no autocorrelation neither rejected nor not rejected.

In general, all tests illustrated above were evidence as to the employed model was not sensitive to the problems of violation of the CLRM assumption. The required Best Linear Unbiased Estimators (BLUE) conditions are also fulfilled through these assumptions test and discussed in the above section. Additionally, all the above tests of basic classical linear regression model assumptions for OLS estimation proved that the results obtained from the regression model in this study are consistent, free from bias, and efficient since the assumption holds and the next step is analyzing and discussing the outputs of the regressions.

### 4.3. Fixed effect versus Random effect

To examine the effect of risk management on the financial performance of MFIs in Ethiopia panel regression method was employed. As an analysis by Hsiao (2009) Panel data more accurate inference of model parameters and contain more degrees of freedom. The panel has a greater capacity for capturing the complexity of human behavior than a single cross-section or time-series data. Many researchers face challenges of which model is appropriate, fixed effect or random effect model, but it depends on the assumptions of the correlation between the individual or cross-specific, the error component, and X's regressors. It assumed that, if the error and the X's regressors are not uncorrelated, the random effect is feasible. While the error and the X's regressors are correlated fixed effect is appropriate (Gujarat, 2004, pp.372)

To choose between the fixed and random, the Hausman specification test was used. As indicated below by the Hausman test result the probability value of ROA for Corresponding CR of the test shows 0.9885 which is greater than the decision rule of 0.05, so that fixed effect is not an appropriate model.

Table 4.6. Correlated Random Effects - Hausman Test

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.15	5	0.9885

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
OR	5.616716	5.459097	-0.093206	0.0000
LR	0.003653	0.005303	-0.000001	0.0000
IRR	0.309521	0.309782	-0.000814	0.0000
CR	0.599859	0.597718	0.000157	0.8644
FER	-0.071510	-0.070026	-0.000012	0.0000

Source: Financial statements of MFIs, Own computation using E-view 9

#### 4.4. Regression Results and Analysis

Under the following regression outputs, the beta coefficient may be negative or positive; beta indicates that each variables level of influence on the dependent variable. P-value indicates at what percentage or precision level of each variable is significant.  $R^2$  values indicate the explanatory power of the model and in this study adjusted  $R^2$  value which takes into account the loss of degrees of freedom associated with adding extra variables were inferred to see the explanatory powers of the models.

Regression analysis between return on Asset and explanatory variables is given by the following model:

$$ROA = \beta_0 + \beta_1OR + \beta_2LR + \beta_3IRR + \beta_4CR + \beta_5FER + \varepsilon$$

Table 4.7: - Model regressed using ROA as a proxy of financial performance

Dependent Variable: ROA

Method: Panel EGLS (Cross-section random effects)

Date: 05/18/22 Time: 06:13

Sample: 2010 2021

Periods included: 12

Cross-sections included: 18

Total panel (balanced) observations: 216

Swamy and Arora estimator of component variances

White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.299711	0.050487	5.936412	0.0000
OR	5.459097	0.508431	10.73715	0.0000
LR	0.005303	0.003630	1.461015	0.1455
IRR	0.309782	0.087854	3.526094	0.0005
CR	0.597718	0.030960	19.30602	0.0000
FER	-0.070026	0.020421	-3.429185	0.0007

Effects Specification				
			S.D.	Rho
Cross-section random			0.044311	0.2281
Idiosyncratic random			0.081503	0.7719

Weighted Statistics				
R-squared	0.750578	Mean dependent var		0.652965
Adjusted R-squared	0.744639	S.D. dependent var		0.160847
S.E. of regression	0.081281	Sum squared resid		1.387398
F-statistic	126.3893	Durbin-Watson stat		1.392201
Prob(F-statistic)	0.000000			

Unweighted Statistics

R-squared	0.728530	Mean dependent var	1.392361
Sum squared resid	1.756437	Durbin-Watson stat	1.099690

Source: Financial statements of MFIs, NBE reports Own computation using E-View 9

Based on the results shown in the above table 4.7, four independent variables have a significant effect on MFIs' financial performance. Namely, Credit Risk, Interest Rate Risk, Weighted Average Exchange Rate and Operational Risk were significant at a 5% significance level since the p-value for these variables were less than 0.05 for each of them while liquidity risk is significant with 14.55% significance level. Besides, Table 4.7 also shows that the coefficient of Credit Risk, Interest Rate Risk, Operational Risk and liquidity risk against ROA were positive as far as the coefficient for this variable is 5.459097, 0.005303, 0.309782, 0.597718 respectively. This indicates that there was a direct relationship between the aforementioned independent variable and ROA. Thus, the increase of this variable will lead to an increase in ROA. On the other hand, only Foreign Exchange risk had a negative relationship with return on asset as far as their coefficients were negative. This revealed that there was an inverse relationship between the Foreign Exchange and return on asset. In general, as per the regression results provided in Table 4.7 among the five regressors used in this study four of them were significant.

Additionally, the R-squared and Adjusted R-squared values of the regression result shows 0.75 and 0.744 respectively are an indication that the model is a good fit. This means more than 75% of variations in return on Assets of Ethiopian MFIs were explained by independent variables included in the model. However, the remaining 25% changes in Return on Assets of Ethiopian MFIs are caused by other factors that are not included in the model.

#### 4.4.1. Credit Risk and ROA

The random-effects panel data model regression result of this study on Table 4.7 shows that credit risk had a positive and significant influence on the ROA of the Ethiopian MFIs for the study period of 2010-2021. The relation is significant at a 1% significant level with a coefficient of (0.597718) in determining the ROA of the Ethiopian MFIs. This implies that when credit risk (CR) increased by one percent, return on asset (ROA) of sampled Ethiopian MFIs would also increase by 59.77%, and statistically significant at a 1% of the significance level. The effect is

positive as expected and this positive relationship between performance and credit risk implies that an increase in credit risk ratio leads to deterioration of performance in terms of ROA. The result of this study contradicts with the findings of (Tassew & Hailu, 2019), (Mitku, 2015), (Eneyew, 2013) which were conducted their study in Ethiopian banks. However; it is consistent with the finding of (Louzis et al. (2012)). Therefore, Ethiopian MFIs should develop their credit risk management capacity by considering the practice of other developing countries which have better experience in the industry- the high level of provision held for poorly performing assets mainly loans and advances is affecting the performance of MFIs.

#### **4.4.2. Liquidity Risk and ROA**

The effect of liquidity risk on MFI financial performance is positive and statistically insignificant. The coefficient estimates of liquidity risk measured by the ratio of liquid asset to total deposits revealed a positive association with financial performance in terms of ROA reported by Ethiopian MFIs. The positive coefficient estimate (0.0053) implies the existence of a direct association between liquidity risk and financial performance. However, the magnitude of the coefficient estimate was statistically insignificant since it has 14.55% significance level. That means the significance of liquidity risk in explaining the variation of financial performance in the Ethiopian Financial industry was not significant under the period of study. As far as liquidity risk is the risk that the MFI inability to increase fund in assets and meet deposit withdrawals or new loan applications as they come due, without incurring unacceptable losses. Accordingly, MFIs may or may not be forced to borrow emergency funds at an excessive cost that may not adversely affect the financial performance of MFIs. This result was also agreed with previous studies of (Kargi, 2011), (Eneyew, 2013),(Mitku, 2015), which were conducted on Ethiopian banks.

#### **4.4.3. Operational Risk and ROA**

The coefficient estimates of the ratio of cost to income provide information on the efficiency of the management regarding operating expenses relative to operating income. Table 4.7 above depicted that, the coefficient of the operational risk measured by the ratio of cost to income is 5.459 and its P-value is 0.0000. Holding other independent variables constant at their average value, when by a ratio of cost to income increased by one percent, return of asset (ROA) of

sampled Ethiopian MFIs would increase by 549%, and statistically significant at 1% of the significance level. In other words, there is a significant positive relationship between operational risk and financial performance (ROA) of sampled Ethiopian MFIs. This showed that maximizing MFIs' operating costs in Ethiopia would certainly improve the MFI's financial performance. This finding was in contradiction with many previous studies conducted in Ethiopian and other abroad MFIs as of (Tassew & Hailu, 2019), (Mitku, 2015), (Puji and Mirza, 2018), (Sufian and Chong, 2008) and (Gathigia, 2016). The study found that an increase in operational risk would lead to a significant increase in the financial performance of MFIs in Ethiopia.

#### **4.4.4. Interest Rate Risk and ROA**

The coefficient estimates of interest risk measured by the annual real interest rate showed a positive relation with the financial performance of Ethiopian MFIs in terms of ROA. The positive coefficient estimate revealed that the existence of a direct relationship between interest rate risk and ROA. This indicates that in the scenario of rising interest rate, when liabilities re-price faster than assets, interest spread would rise and hence financial performance of the MFI would be affected. This positive relationship was found statistically significant even at a 1% significance level (p-value =0.0005). Hence, the findings suggested that there was significant association between interest rate risk and financial performance of Ethiopian MFIs as far as the parameter for this variable was statistically significant as illustrated by the p-values of 0.0005. The finding of this is in line with the finding of (Aruwa & Musa, 2014). In the same way, Naceur (2003) highlights a positive relationship between interest rate risk and financial performance (ROA).

#### **4.4.5. Foreign Exchange Rate Risk and ROA**

The random-effects panel data model regression result of this study on table 4.7 revealed that foreign exchange rate risk had a negative and significant influence on ROA of the Ethiopian MFIs for the study period of 2010-2021. The relation is significant at a 1% significant level with a coefficient of (0.0007) in determining the ROA of the Ethiopian MFIs. This implies that the variation in exchange rate had a negative influence on the Ethiopian MFI's performance during the study period. It indicated that during the study period an increase of USD to ETB by one birr (depreciation of Ethiopia birr) caused the Ethiopian MFIs performance (ROA) to decrease by

0.07% or a decrease of USD to ETB by one birr (appreciation of Ethiopian birr) caused the Ethiopian MFI's performance (ROA) to increase by 0.07%. The negative relationship between the exchange rate and financial performance of the Ethiopian MFIs may reflect how fluctuating and volatile exchange rates may have contributed to the growth of the performance of MFIs. This may be attributed to the fact that many imports are paid by the locals using the dollar and, with the birr weakening against the dollar, the MFIs are making an arbitrage loss. The finding of this study is in contradiction with the findings of Meselech Amsalu, (2019), (Osuagwu, 2014), (Carolyn, 2013). Consistent with, Evans, (2014) and Songul, (2013) highlight a negative and significant relationship between foreign exchange rate risk and financial performance (ROA).

## **CHAPTER FIVE:**

### **SUMMARY, CONCLUSION, AND RECOMMENDATION**

#### **5.1. Introduction**

This chapter presents the summary of major findings of the study, relevant discussions, conclusions, and the necessary recommendations. The summary is done in line with the objectives of the study based on the output of statistical analyses guided to test the research hypothesis of the study. The chapter also suggests areas for further research.

#### **5.2. Summary of findings**

The main objective of the study was to determine the effects of risk management on the financial performance of the Micro-Finance Institutions of Ethiopia. The researcher analyzed by examining available empirical literature reviews conducted in various countries and by selecting 5 variables considering the nature and data availability of the selected MFI's. The study tried to examine the critical risk management that managers should consider when setting their optimum financial performance. According to the review of the empirical literature on risk management & its effect performance areas theories, the micro-finance-specific factors that were used in this study include variables such as credit risk, liquidity risk, operational risk, interest rate risk, and foreign exchange rate risk.

To comply with the objective of this research, and by considering the nature of the study, the quantitative research approach was used. To collect the necessary data the study used a survey of documents (structured review of financial records). To achieve the proposed general objective, descriptive statistics, CLRM assumptions tests, selection of appropriate model, multiple regression results, and test of hypothesis have been run using statistical package software E-View 9. The study used indicator of financial performance to check the consistency of the effect of risk management factors on financial performance and this factor was modeled by ROA. The appropriate model that has selected for this study was the Random effect model for the ROA equation. Since the diagnostic tests of all assumptions are valid and met, as a result, it is possible to conclude that the model is adequate, statistically good fit, and data were represented reliably.

The first objective of the study was to establish whether credit risk affects the financial performance of MFIs in Ethiopia. The findings revealed that MFI credit risk has a significant positive effect on the financial performance of MFIs in Ethiopia. This implies that MFIs increased exposure to credit risk increases financial performance. It may result from the fact that the health of a MFI's loan portfolio may be reflected by changes in credit risk and affect the financial performance of MFIs.

The second objective of the study was to set and establish whether liquidity risk affects the financial performance of MFIs in Ethiopia. The results for this study show that the Liquid asset to total asset ratio is positively insignificant associated with MFI financial performance in terms of ROA.

The third objective sought to examine the effect of operational risk on the financial performance of MFIs in Ethiopia. The finding of the study was that the cost-income ratio which is a proxy of operational risk exerts the most significant positive effect on the ROA across the MFIs. This, therefore, calls for better management of operational risks in a manner that boosts depositors' confidence.

The fourth objective of the study was set to establish whether market risk affects the financial performance of Ethiopian MFIs. Market risk domain consisted of interest rate risk and foreign exchange rate risk dimensions. The results for this study show that interest rate risk is positively associated with MFI financial performance. Foreign exchange rate risk has a negative and significant influence on the financial performance of MFIs in Ethiopia.

### **5.3. Conclusion**

According to the panel data model regression result Interest rate risk, Credit Risk and operational risk have a statistically significant impact and positive relationship on ROA, while foreign exchange rate risk has a statistically significant but negative influence on the financial performance (ROA) of the Ethiopian MFIs. Liquidity risk also has a positive effect and is insignificant in its value. Thus, the main risks that influence the financial performance of the sampled Ethiopian MFIs are credit risk, operational risk, Interest Rate Risk and foreign exchange rate risk as they have a statistically significant impact at a confidence level of 99% and 95%. This conclusion indicates that any increase/decrease in result credit risk, interest rate risk, and

operational risk leads to a decrease/increase in the financial performance of the sampled MFIs (ROA). While foreign exchange rate risk has a significant impact on ROA with a negative relationship; which means any decrease/increase in the value of this variable leads to an increase/decrease in the financial performance of MFIs (ROA). However, Liquidity Risk has an insignificant and Positive effect on the performance (ROA) of the sample Ethiopian MFIs.

In general, managing MFIs' risk by itself is a difficult task as managing one risk solely may affect the other risks Positively, so managing risks in MFIs should go hand to hand with each other, and balancing accordingly is mandatory. It is, therefore, important for the Micro-Finance industry to be focused on the integration of the whole MFI risks. Similarly, the study concludes that there is a strong relationship between risk management and financial performance of the MFIs in Ethiopia as explained by the model variables explanatory adjusted R-Square was 75% ROA of MFI in Ethiopia is explained 25% by variables other than the studied variables.

#### **5.4. Recommendation**

Based on the objectives of the study and the conclusion drawn, the following recommendations were reached.

- The study found that among the risk management variables considered; Credit risk had a significant positive effect on the financial performance of MFIs in Ethiopia. Because of this finding, the study, therefore, recommended that the MFIs should enhance their capacity in credit analysis and loan administration. Clear credit policies and lending guidelines should be established. Management also is required to make sure that the terms and conditions are adhered to loan approval. This will reduce the loss on nonperforming loans and improve the asset quality management which raises MFIs' expenses and consequently increase financial performance. As finance distress theory states that credit risk is one of the components that financial distress emanates from, the shareholder's wealth may be affected by an increase of returns on their equity at a decreasing rate.
- The study also recommends that MFIs should explore ways to enhance capacities within MFIs for managing market risks. MFIs are required to consider finding ways of mitigating the market risks through the use of financial asset securitization which will reduce their interest rate and foreign currency risk exposure. Regarding interest rate risk, the study

recommended that the MFI of Ethiopia should implement sound policies and measures of maintaining interest rates in the economy. This can be ensured by studying other factors such as inflationary trends and money supply which have influences on interest rates. With the respect to foreign exchange rate risk, the study strongly recommends to the Ethiopian government and MFIs of Ethiopia regarding the issues related to foreign exchange rate should always be taken into account in efforts to improve MFIs' foreign exchange transactions and financial performance of the Ethiopian MFIs. Adequate measures and policies should be formulated to check the level of the foreign exchange rate. This could be through deflation of local currency relative to foreign currencies. On the other hand, should adopt appropriate risk management strategies like hedging and forwards as it regards fluctuation in exchange rates.

- Generally, as findings reveal that the variables of risk management drivers of performance of MFIs in Ethiopia and significantly related to return on asset that is the dependent variable. Therefore, MFIs of Ethiopia should pay greater attention to these significant variables in determining their financial performance in general and profitability in particular. Additionally, efficient and effective risk management systems should be put in place in MFIs as these will help in curtailing the adverse effect of severe risk exposures in the financial performance of MFIs in Ethiopia. This in turn will lead to a sustainable Micro Finance sector in Ethiopia.

## **5.5. Suggestions for further research**

This study helped to examine the effect of risk management on the financial performance of Ethiopian MFIs. The study did not include all the MFI risks and there is a need to analyze the effect of other MFI risks which includes legal, technological, and strategic risks. It is recommended for further study can be extended by including more variables such as macroeconomic variables (GDP and Inflation etc.). This study also captured the only available secondary data for the period 2010 to 2021 which are in Ethiopia MFIs records and a further study is recommended to include a longer period for the time series data. This would help in capturing the potential effects across the various business cycles.

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# Appendix

## Regression Result

Dependent Variable: ROA

Method: Panel Least Squares

Date: 05/18/22 Time: 01:52

Sample: 2010 2021

Periods included: 12

Cross-sections included: 18

Total panel (balanced) observations: 216

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.297123	0.086721	3.426206	0.0007
OR	5.105826	0.521358	9.793328	0.0000
LR	0.009528	0.004271	2.230637	0.0268
IRR	0.308821	0.076963	4.012588	0.0001
CR	0.586354	0.046093	12.72103	0.0000
FER	-0.066797	0.039674	-1.683621	0.0937
R-squared	0.730344	Mean dependent var		1.392361
Adjusted R-squared	0.723923	S.D. dependent var		0.173475
S.E. of regression	0.091149	Akaike info criterion		-1.925262
Sum squared resid	1.744703	Schwarz criterion		-1.831504
Log likelihood	213.9283	Hannan-Quinn criter.		-1.887383
F-statistic	113.7538	Durbin-Watson stat		1.125049
Prob(F-statistic)	0.000000			

## Cointegration Test

Pedroni Residual Cointegration Test

Series: ROA OR LR IRR CR FER

Date: 05/18/22 Time: 01:58

Sample: 2010 2021

Included observations: 216

Cross-sections included: 18

Null Hypothesis: No cointegration

Trend assumption: No deterministic trend

User-specified lag length: 1

Newey-West automatic bandwidth selection and Bartlett kernel

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Alternative hypothesis: common AR coeffs. (within-dimension)

	<u>Statistic</u>	<u>Prob.</u>	Weighted	
			<u>Statistic</u>	<u>Prob.</u>
Panel v-Statistic	-1.213668	0.8876	-2.570840	0.9949
Panel rho-Statistic	2.828044	0.9977	3.042033	0.9988
Panel PP-Statistic	-8.223706	0.0000	-8.203458	0.0000
Panel ADF-Statistic	0.565406	0.7141	-0.461075	0.3224

Alternative hypothesis: individual AR coeffs. (between-dimension)

	<u>Statistic</u>	<u>Prob.</u>
Group rho-Statistic	4.459758	1.0000
Group PP-Statistic	-11.54289	0.0000
Group ADF-Statistic	0.878914	0.8103

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Cross section specific results

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Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
1	-0.544	0.000489	0.000489	0.00	11
2	-0.342	0.002859	0.001774	3.00	11

3	-0.446	0.001191	0.000654	4.00	11
4	-0.415	0.002949	0.003130	1.00	11
5	-0.104	0.000588	0.000222	6.00	11
6	-0.215	0.001993	0.000447	10.00	11
7	-0.266	0.001371	0.001381	1.00	11
8	-0.036	0.002705	0.002705	0.00	11
9	-0.043	0.000874	0.000141	10.00	11
10	-0.588	0.000638	0.000638	0.00	11
11	-0.580	0.001032	0.000739	4.00	11
12	-0.636	0.001442	0.001006	3.00	11
13	-0.123	0.004401	0.000631	10.00	11
14	0.096	0.001662	0.001493	2.00	11
15	-0.745	0.000422	0.000422	0.00	11
16	-0.358	0.000992	0.000980	2.00	11
17	-0.228	0.001212	0.000996	3.00	11
18	-0.273	0.001695	0.001695	0.00	11

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
1	-0.585	0.000475	1	--	10
2	-0.659	0.002968	1	--	10
3	-0.763	0.000788	1	--	10
4	-0.211	0.003175	1	--	10
5	-0.441	0.000521	1	--	10
6	-0.730	0.001417	1	--	10
7	-0.367	0.001481	1	--	10
8	0.061	0.002608	1	--	10
9	-0.568	0.000658	1	--	10
10	-0.681	0.000609	1	--	10
11	-0.701	0.001078	1	--	10

12	-0.759	0.001525	1	--	10
13	-0.675	0.003670	1	--	10
14	-0.204	0.001593	1	--	10
15	-1.026	0.000234	1	--	10
16	-0.346	0.000407	1	--	10
17	-0.405	0.001306	1	--	10
18	-0.091	0.001795	1	--	10

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### Cointegration Test

Kao Residual Cointegration Test

Series: ROA OR LR IRR CR FER

Date: 05/18/22 Time: 02:00

Sample: 2010 2021

Included observations: 216

Null Hypothesis: No cointegration

Trend assumption: No deterministic trend

User-specified lag length: 1

Newey-West automatic bandwidth selection and Bartlett kernel

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	t-Statistic	Prob.
ADF	-5.801698	0.0000
Residual variance	0.008531	
HAC variance	0.004561	

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Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RESID)

Method: Least Squares

Date: 05/18/22 Time: 02:00

Sample (adjusted): 2012 2021

Included observations: 180 after adjustments

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.841497	0.093797	-8.971471	0.0000
D(RESID(-1))	0.100684	0.074374	1.353757	0.1775

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R-squared	0.381722	Mean dependent var		3.35E-05
Adjusted R-squared	0.378249	S.D. dependent var		0.094035
S.E. of regression	0.074148	Akaike info criterion		-2.354466
Sum squared resid	0.978624	Schwarz criterion		-2.318988
Log likelihood	213.9019	Hannan-Quinn criter.		-2.340081
Durbin-Watson stat	2.066694			

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Pedroni Residual Cointegration Test

Series: ROA OR LR IRR CR FER

Date: 05/18/22 Time: 02:02

Sample: 2010 2021

Included observations: 216

Cross-sections included: 18

Null Hypothesis: No cointegration

Trend assumption: No deterministic trend

User-specified lag length: 1

Newey-West automatic bandwidth selection and Bartlett kernel

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Alternative hypothesis: common AR coeffs. (within-dimension)

	Weighted			
	<u>Statistic</u>	<u>Prob.</u>	<u>Statistic</u>	<u>Prob.</u>
Panel v-Statistic	-1.213668	0.8876	-2.570840	0.9949
Panel rho-Statistic	2.828044	0.9977	3.042033	0.9988
Panel PP-Statistic	-8.223706	0.0000	-8.203458	0.0000

Panel ADF-Statistic            0.565406      0.7141      -0.461075      0.3224

Alternative hypothesis: individual AR coefs. (between-dimension)

	<u>Statistic</u>	<u>Prob.</u>
Group rho-Statistic	4.459758	1.0000
Group PP-Statistic	-11.54289	0.0000
Group ADF-Statistic	0.878914	0.8103

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
1	-0.544	0.000489	0.000489	0.00	11
2	-0.342	0.002859	0.001774	3.00	11
3	-0.446	0.001191	0.000654	4.00	11
4	-0.415	0.002949	0.003130	1.00	11
5	-0.104	0.000588	0.000222	6.00	11
6	-0.215	0.001993	0.000447	10.00	11
7	-0.266	0.001371	0.001381	1.00	11
8	-0.036	0.002705	0.002705	0.00	11
9	-0.043	0.000874	0.000141	10.00	11
10	-0.588	0.000638	0.000638	0.00	11
11	-0.580	0.001032	0.000739	4.00	11
12	-0.636	0.001442	0.001006	3.00	11
13	-0.123	0.004401	0.000631	10.00	11
14	0.096	0.001662	0.001493	2.00	11
15	-0.745	0.000422	0.000422	0.00	11
16	-0.358	0.000992	0.000980	2.00	11
17	-0.228	0.001212	0.000996	3.00	11

18	-0.273	0.001695	0.001695	0.00	11
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Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
1	-0.585	0.000475	1	--	10
2	-0.659	0.002968	1	--	10
3	-0.763	0.000788	1	--	10
4	-0.211	0.003175	1	--	10
5	-0.441	0.000521	1	--	10
6	-0.730	0.001417	1	--	10
7	-0.367	0.001481	1	--	10
8	0.061	0.002608	1	--	10
9	-0.568	0.000658	1	--	10
10	-0.681	0.000609	1	--	10
11	-0.701	0.001078	1	--	10
12	-0.759	0.001525	1	--	10
13	-0.675	0.003670	1	--	10
14	-0.204	0.001593	1	--	10
15	-1.026	0.000234	1	--	10
16	-0.346	0.000407	1	--	10
17	-0.405	0.001306	1	--	10
18	-0.091	0.001795	1	--	10

Dependent Variable: ROA

Method: Panel EGLS (Cross-section random effects)

Date: 05/18/22 Time: 02:03

Sample: 2010 2021

Periods included: 12

Cross-sections included: 18

Total panel (balanced) observations: 216

Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.299711	0.087110	3.440587	0.0007
OR	5.459097	0.570243	9.573289	0.0000
LR	0.005303	0.004273	1.240970	0.2160
IRR	0.309782	0.069140	4.480517	0.0000
CR	0.597718	0.050413	11.85633	0.0000
FER	-0.070026	0.035611	-1.966429	0.0506

Effects Specification

	S.D.	Rho
Cross-section random	0.044311	0.2281
Idiosyncratic random	0.081503	0.7719

Weighted Statistics

R-squared	0.750578	Mean dependent var	0.652965
Adjusted R-squared	0.744639	S.D. dependent var	0.160847
S.E. of regression	0.081281	Sum squared resid	1.387398
F-statistic	126.3893	Durbin-Watson stat	1.392201
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.728530	Mean dependent var	1.392361
Sum squared resid	1.756437	Durbin-Watson stat	1.099690

**Correlated Random Effects - Hausman Test**

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.858744	5	0.7218

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
OR	5.616716	5.459097	0.056820	0.5085
LR	0.003653	0.005303	0.000001	0.1647
IRR	0.309521	0.309782	0.000013	0.9425
CR	0.599859	0.597718	0.000442	0.9189
FER	-0.071510	-0.070026	0.000005	0.5123

Cross-section random effects test equation:

Dependent Variable: ROA

Method: Panel Least Squares

Date: 05/18/22 Time: 02:04

Sample: 2010 2021

Periods included: 12

Cross-sections included: 18

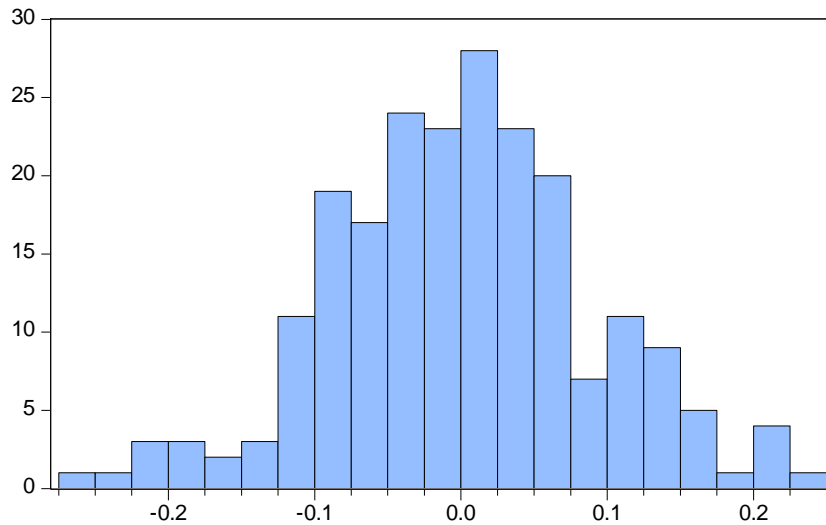
Total panel (balanced) observations: 216

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.303721	0.090665	3.349915	0.0010
OR	5.616716	0.618059	9.087671	0.0000
LR	0.003653	0.004435	0.823609	0.4112
IRR	0.309521	0.069235	4.470617	0.0000
CR	0.599859	0.054624	10.98155	0.0000
FER	-0.071510	0.035683	-2.004045	0.0465

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.801850	Mean dependent var	1.392361
Adjusted R-squared	0.779263	S.D. dependent var	0.173475
S.E. of regression	0.081503	Akaike info criterion	-2.075976
Sum squared resid	1.282052	Schwarz criterion	-1.716572
Log likelihood	247.2054	Hannan-Quinn criter.	-1.930776
F-statistic	35.50035	Durbin-Watson stat	1.501471
Prob(F-statistic)	0.000000		



Series: Standardized Residuals	
Sample 2010 2021	
Observations 216	
Mean	1.58e-16
Median	0.000839
Maximum	0.236522
Minimum	-0.260500
Std. Dev.	0.090385
Skewness	-0.007922
Kurtosis	3.164141
Jarque-Bera	0.244741
Probability	0.884821

Dependent Variable: ROA

Method: Panel Least Squares

Date: 05/18/22 Time: 02:07

Sample: 2010 2021

Periods included: 12

Cross-sections included: 18

Total panel (balanced) observations: 216

Variable	Coefficient	Std. Error	t-Statistic	Prob.
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OR	5.616716	0.618059	9.087671	0.0000
LR	0.003653	0.004435	0.823609	0.4112
IRR	0.309521	0.069235	4.470617	0.0000
CR	0.599859	0.054624	10.98155	0.0000
FER	-0.071510	0.035683	-2.004045	0.0465
C	0.303721	0.090665	3.349915	0.0010

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Effects Specification

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Cross-section fixed (dummy variables)

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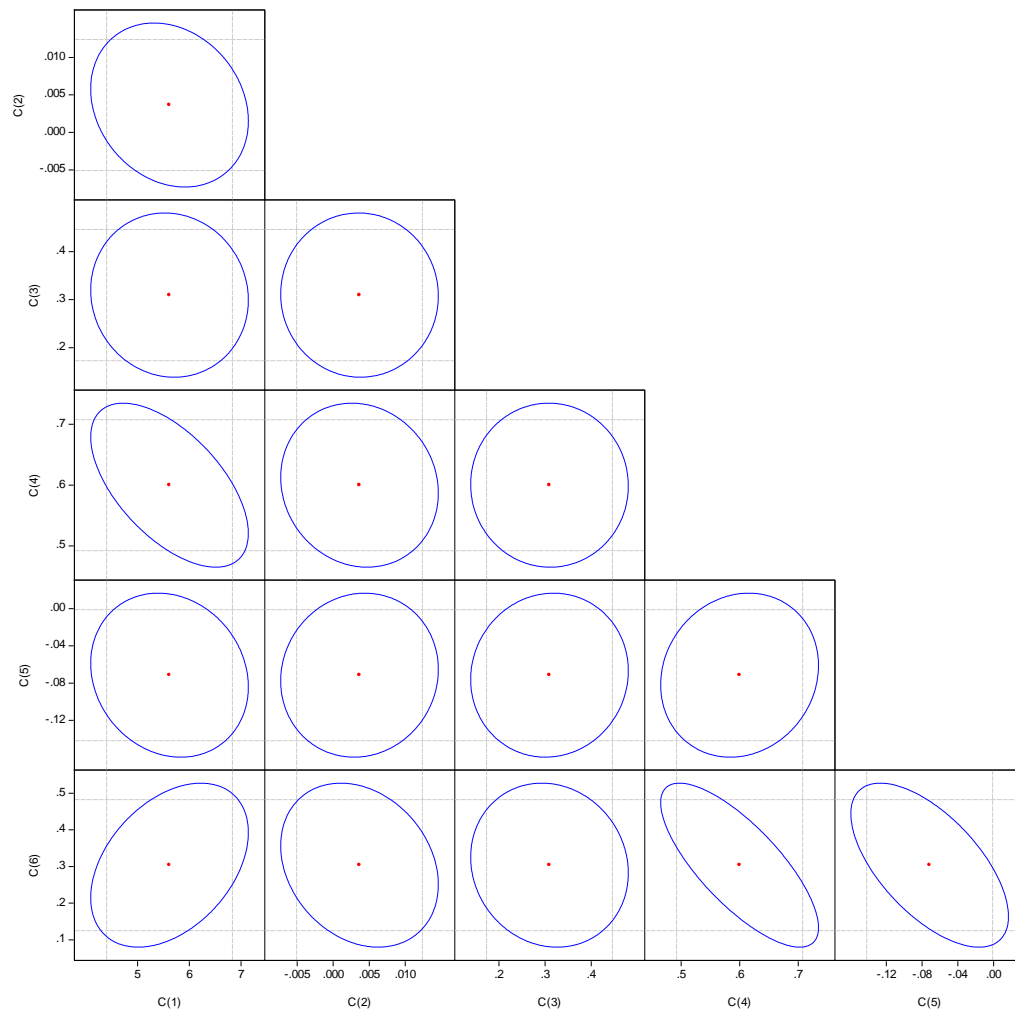
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R-squared	0.801850	Mean dependent var	1.392361
Adjusted R-squared	0.779263	S.D. dependent var	0.173475
S.E. of regression	0.081503	Akaike info criterion	-2.075976
Sum squared resid	1.282052	Schwarz criterion	-1.716572
Log likelihood	247.2054	Hannan-Quinn criter.	-1.930776
F-statistic	35.50035	Durbin-Watson stat	1.501471
Prob(F-statistic)	0.000000		

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	ID	Effect
1	1	0.036878
2	2	0.016418
3	3	-0.090310
4	4	0.005147
5	5	0.036048
6	6	0.064309
7	7	-0.009538
8	8	-0.064425
9	9	0.003653

10	10	0.035927
11	11	-0.049669
12	12	-0.060272
13	13	0.072213
14	14	0.058068
15	15	-0.020566
16	16	-0.033425
17	17	-0.041680
18	18	0.041224

	ROA	OR	LR	IRR	CR	FER
ROA	1.000000	0.767218	0.249017	0.087479	0.693643	0.014143
OR	0.767218	1.000000	0.222473	-0.105018	0.623577	-0.074077
LR	0.249017	0.222473	1.000000	-0.042146	0.230742	-0.058421
IRR	0.087479	-0.105018	-0.042146	1.000000	-0.074842	0.138015
CR	0.693643	0.623577	0.230742	-0.074842	1.000000	0.054457
FER	0.014143	-0.074077	-0.058421	0.138015	0.054457	1.000000

Pedroni Residual Cointegration Test

Series: ROA OR LR IRR CR FER

Date: 05/18/22 Time: 04:37

Sample: 2010 2021

Included observations: 216

Cross-sections included: 18

Null Hypothesis: No cointegration

Trend assumption: No deterministic trend

User-specified lag length: 1

Newey-West automatic bandwidth selection and Bartlett kernel

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Alternative hypothesis: common AR coeffs. (within-dimension)

Weighted

	<u>Statistic</u>	<u>Prob.</u>	<u>Statistic</u>	<u>Prob.</u>
Panel v-Statistic	-1.213668	0.8876	-2.570840	0.9949
Panel rho-Statistic	2.828044	0.9977	3.042033	0.9988
Panel PP-Statistic	-8.223706	0.0000	-8.203458	0.0000
Panel ADF-Statistic	0.565406	0.7141	-0.461075	0.3224

Alternative hypothesis: individual AR coefs. (between-dimension)

	<u>Statistic</u>	<u>Prob.</u>
Group rho-Statistic	4.459758	1.0000
Group PP-Statistic	-11.54289	0.0000
Group ADF-Statistic	0.878914	0.8103

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
1	-0.544	0.000489	0.000489	0.00	11
2	-0.342	0.002859	0.001774	3.00	11
3	-0.446	0.001191	0.000654	4.00	11
4	-0.415	0.002949	0.003130	1.00	11
5	-0.104	0.000588	0.000222	6.00	11
6	-0.215	0.001993	0.000447	10.00	11
7	-0.266	0.001371	0.001381	1.00	11
8	-0.036	0.002705	0.002705	0.00	11
9	-0.043	0.000874	0.000141	10.00	11
10	-0.588	0.000638	0.000638	0.00	11
11	-0.580	0.001032	0.000739	4.00	11
12	-0.636	0.001442	0.001006	3.00	11
13	-0.123	0.004401	0.000631	10.00	11

14	0.096	0.001662	0.001493	2.00	11
15	-0.745	0.000422	0.000422	0.00	11
16	-0.358	0.000992	0.000980	2.00	11
17	-0.228	0.001212	0.000996	3.00	11
18	-0.273	0.001695	0.001695	0.00	11

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
1	-0.585	0.000475	1	--	10
2	-0.659	0.002968	1	--	10
3	-0.763	0.000788	1	--	10
4	-0.211	0.003175	1	--	10
5	-0.441	0.000521	1	--	10
6	-0.730	0.001417	1	--	10
7	-0.367	0.001481	1	--	10
8	0.061	0.002608	1	--	10
9	-0.568	0.000658	1	--	10
10	-0.681	0.000609	1	--	10
11	-0.701	0.001078	1	--	10
12	-0.759	0.001525	1	--	10
13	-0.675	0.003670	1	--	10
14	-0.204	0.001593	1	--	10
15	-1.026	0.000234	1	--	10
16	-0.346	0.000407	1	--	10
17	-0.405	0.001306	1	--	10
18	-0.091	0.001795	1	--	10

Dependent Variable: ROA

Method: Panel Least Squares

Date: 05/18/22 Time: 04:40

Sample: 2010 2021

Periods included: 12

Cross-sections included: 18

Total panel (balanced) observations: 216

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.297123	0.086721	3.426206	0.0007
OR	5.105826	0.521358	9.793328	0.0000
LR	0.009528	0.004271	2.230637	0.0268
IRR	0.308821	0.076963	4.012588	0.0001
CR	0.586354	0.046093	12.72103	0.0000
FER	-0.066797	0.039674	-1.683621	0.0937
R-squared	0.730344	Mean dependent var		1.392361
Adjusted R-squared	0.723923	S.D. dependent var		0.173475
S.E. of regression	0.091149	Akaike info criterion		-1.925262
Sum squared resid	1.744703	Schwarz criterion		-1.831504
Log likelihood	213.9283	Hannan-Quinn criter.		-1.887383
F-statistic	113.7538	Durbin-Watson stat		1.125049
Prob(F-statistic)	0.000000			

#### Residual Cross-Section Dependence Test

Null hypothesis: No cross-section dependence (correlation) in residuals

Equation: Untitled

Periods included: 12

Cross-sections included: 18

Total panel observations: 216

Note: non-zero cross-section means detected in data

Cross-section means were removed during computation of correlations

Test	Statistic	d.f.	Prob.
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Breusch-Pagan LM	175.0690	153	0.1069
Pesaran scaled LM	0.232609		0.8161
Pesaran CD	-1.337531		0.1810

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**Correlated Random Effects - Hausman Test**

Equation: Untitled

Test cross-section random effects

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Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	5	1.0000

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\* Cross-section test variance is invalid. Hausman statistic set to zero.

\*\* WARNING: robust standard errors may not be consistent with  
assumptions of Hausman test variance calculation.

Cross-section random effects test comparisons:

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Variable	Fixed	Random	Var(Diff.)	Prob.
OR	5.616716	5.459097	-0.093206	NA
LR	0.003653	0.005303	-0.000001	NA
IRR	0.309521	0.309782	-0.000814	NA
CR	0.599859	0.597718	0.000157	0.8644
FER	-0.071510	-0.070026	-0.000012	NA

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Cross-section random effects test equation:

Dependent Variable: ROA

Method: Panel Least Squares

Date: 05/18/22 Time: 04:55

Sample: 2010 2021

Periods included: 12

Cross-sections included: 18

Total panel (balanced) observations: 216

White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.303721	0.048052	6.320674	0.0000
OR	5.616716	0.406566	13.81501	0.0000
LR	0.003653	0.003445	1.060322	0.2903
IRR	0.309521	0.083090	3.725128	0.0003
CR	0.599859	0.033406	17.95685	0.0000
FER	-0.071510	0.020117	-3.554747	0.0005

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.801850	Mean dependent var	1.392361
Adjusted R-squared	0.779263	S.D. dependent var	0.173475
S.E. of regression	0.081503	Akaike info criterion	-2.075976
Sum squared resid	1.282052	Schwarz criterion	-1.716572
Log likelihood	247.2054	Hannan-Quinn criter.	-1.930776
F-statistic	35.50035	Durbin-Watson stat	1.501471
Prob(F-statistic)	0.000000		