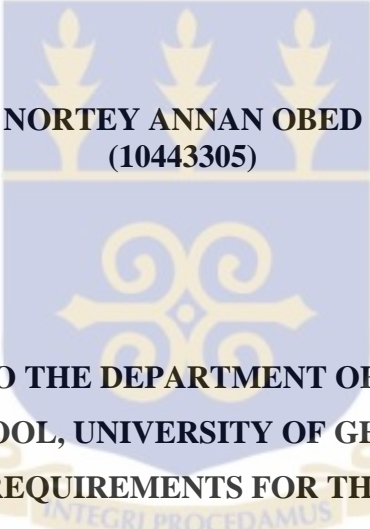


UNIVERSITY OF GHANA

DETERMINANT OF LOAN PORTFOLIO AT RISK IN MICROFINANCE

INSTITUTIONS: EVIDENCE FROM SUB SAHARAN AFRICA



**NORTEY ANNAN OBED
(10443305)**

**A THESIS SUBMITTED TO THE DEPARTMENT OF FINANCE, UNIVERSITY
OF GHANA BUSINESS SCHOOL, UNIVERSITY OF GHANA, LEGON IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTER
PHILOSOPHY (FINANCE) IN BUSINESS ADMINISTRATION (FINANCE) DEGREE**

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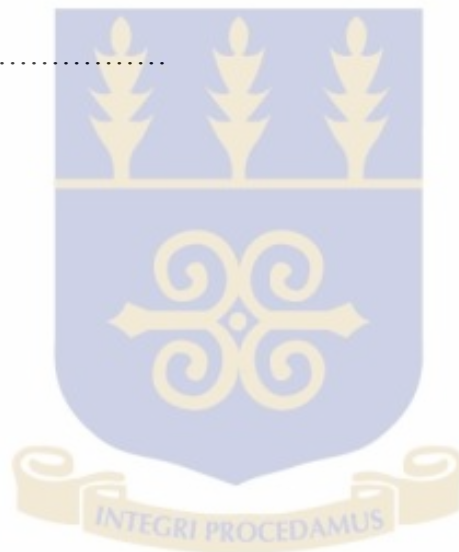
DECLARATION

I, Nortey Annan Obed, a Master Philosophy (Finance) student of the University of Ghana Business School do hereby declare that this thesis is the product of my own original research. I further declare that this piece of research or a part thereof has not been presented by anyone in this or any other University.

Candidate's Signature:

Nortey Annan Obed
(10443305)

Date:



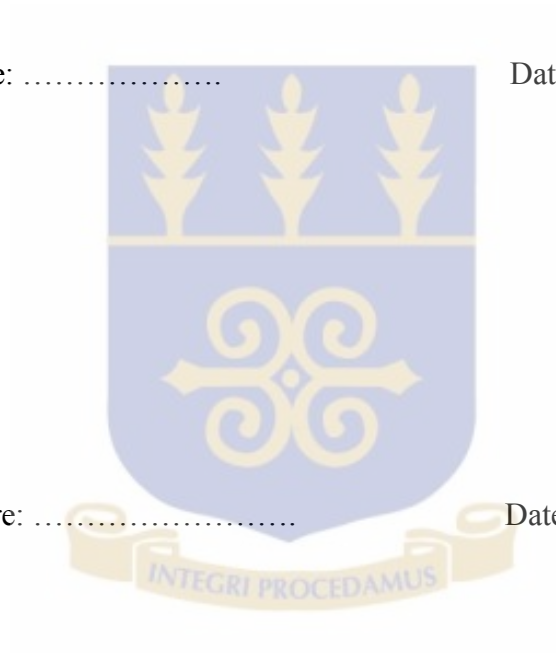
CERTIFICATION

I hereby certify that this thesis was supervised in accordance with the procedures laid down by the University of Ghana.

1st Supervisor's Signature:

(Dr. E. K Agbloyor,)

Date:



2nd Supervisor's Signature:

(Prof.J. Y Abor)

Date:

DEDICATION

I dedicate this work to the Nortey family most especially father and mother Mr. and Mrs. J.N. Adjetej, who gave me immense support in all forms in my bid to attain this academic height and my siblings.



ACKNOWLEDGEMENTS

Mine is the firm conviction that the quantum of all the daylong sweat and toil as well as the sleepless nights to see to the realization of this piece of research work are a manifestation of the abundant grace the Almighty God bestowed on me throughout my study. To Him therefore be the glory.

My immense gratitude goes to Dr. E. K Agbloyor and Prof. J. Y Abor, my lecturers and supervisors for their guidance and support that helped me realize the completion of this study. Indeed, the useful suggestions and maximum patience they had for me in the course of this study is, simply put, incomparable. To them therefore, I say: “Infinite Thanks”.

My sincere and heart-felt thanks also go to Mr. Daniel kontie and Mr. Emmanuel Yeboah. I thank them for the inspiration and encouragement they gave me during my studies at the University.

Parents, siblings, and study mates, Baah Aye Kusi, Abasi Alex, Papa Ekow Armah, Micheal Ewudzie and all my other benefactors did a yeoman’s job by contributing in no small measure and in various and diverse forms to help me realize my dream . To them all, I say: “God Bless”.

Finally, I do take cognizance of the fact that in the course of the study I was to some extent informed and influenced in one way or the other by other sources, all which I am very grateful.

The above notwithstanding, I hastened to emphasise that any flaws or shortcomings that might be found in this research work are entirely mine.

ABSTRACT

The aim of microfinance is to alleviate poverty through the delivery of financial support services such as microcredit facilities particularly to the poor entrepreneurs and micro enterprises. Extending microcredit is one of the core businesses of microfinance institutions. However not all the microcredit granted to the poor entrepreneurs perform well in addition of generating the expected returns. This adverse effect has a significant influence on the loan portfolio at risk. In reference to the major role the microfinance industry plays, the study was conducted to establish the determinants of loan portfolio at risk in the microfinance industry. The purpose of this study is to examine the determinants of loan portfolio at risk in the microfinance industry of sub Saharan Africa. The study used fixed and robust fixed effect regression empirical model to estimate the significant influence of each variable on loan portfolio at risk. Furthermore, dataset of 162 microfinance institutions from the MIX market within the sub region (SSA) was used for the empirical estimation. The results from the tested empirical estimation show that extent to saving, inefficiency and number of client outstanding has a strong influence on loan portfolio at risk (statistically significant at $p < 0.05$). Likewise leverage was statistically significant at $p < 0.1$ level. The other remaining variables were not statistically significant. The findings suggest that lack of adequate information and monitoring are attributes of higher loan portfolio at risk. Hence it will be of importance that Microfinance adopts the following measures, capacity building programs, information sharing mechanisms and increase in monitoring activities. Understanding the factors that affect loan portfolio at risk is essential for portfolio risk management. This paper adds to empirical literature on the determinants of loan portfolio at risk in the microfinance industry of Sub-Saharan Africa.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

In the past four decades, access to financial services, especially microcredit, has played an increasing role in the development of most economies. Microcredit facilities have been made accessible to many households and Small and Medium Enterprises (SMEs) through microfinance (Grameen Bank of Bangladesh, 2004; Delali, 2006; Bank of Ghana (BoG), 2007; Arup & Goswami 2013). In promoting economic development, governments and non-governmental organizations (NGOs) are strongly committed to the inclusion of the poor entrepreneurs through the provision of financial services like microloans, interest-free subsidies and other financial services, since these small firms are excluded from the universal banking system due to their high risk status (Papias & Ganesan, 2009; Grameen Bank, 2004). Waweru and Gary (2012) posit that universal banks consider the less privileged less credit worthy. This suggests that microcredit facilities, which are usually given to the less privileged, are associated with high probability of defaults in repayments.

Nonetheless, Field and Rohini, (2007), Nawai and Shariff, (2012) argue that the poor have a lower default rate with loan portfolio when they are productive. This suggests that, even without collateral, the poor could be less risky and would be able to make loan repayments when they engage in productive activities such as farming, trading, and as artisans when capital is allocated to them. Nonetheless, even microfinance institutions (MFIs) that lend to the productive poor are

still faced with credit risk which puts their loan portfolio at risk, posing significant challenge to their operations (Campbell, 2010; Weber & Musshoff, 2012). Portfolio at risk is the likelihood that borrowers may not pay their credit with interest on time (Ramesh, 2006).

Microcredit facilities (also known as microloans) have remained vital to the growth of local economies, as they seek the alleviation of poverty and the reduction in inequality in the economy. Several studies carried out in the area of economic development and growth support the colossal role microfinance institutions play in the growth of many developing or emerging economies (see for example Crabb & Keller 2006; Crabb, 2008; Collier, Ani & Skees 2008; Campbell 2010; Guush & Gardebroek 2011). Furthermore, many local economies have achieved technological advancement and improvement in consumer life through microloans, (Delali, 2006; Crabb 2008; Campbell, 2010; Son, Tim & Prasada, 2011; Arup & Goswami 2013). This suggests that, when the credit needs of the marginalized in the community are met, they are able to enhance the following aspect of their life: education, healthcare, and techniques for agrobusinesses which could foster local economic development (Campbell, 2010).

Due to the fact that microcredit has served as a vehicle for poverty reduction and made the poor self-sufficient by engaging in sustainable productive activities, this has led to an increase in the demand for microcredit which in turn has had an effect on the loan portfolio quality.

MFIs access funds from the money market to fund their microcredit portfolio, as they seek to attain financial sustainability (Kyereboah-Coleman, 2007; BoG, 2007). This access of funds by MFIs from the money market could lead to them to commercialize their loan portfolio, which in turn could lead to microcredit growth. A growth in microcredit by MFIs indicates financial stability risk (Wagner & Winkler, 2013), that is, as MFIs extend credit facilities to their clients

via lowering their standard they face a high rate of default (Alhassan, Kyereboah-Coleman & Andoh, 2014). A study by the Consultative Group to Assist the Poor (CGAP, 2013) from 2004 to 2007 indicates that the microcredit market in Bangladesh faced a microcredit crisis due to an increased level of their microcredit from 15% to 28% annually in that period. This is an indication that, as MFIs increase their outreach by extending more credit to the less privileged; their loan portfolio quality tends to be riskier. The increasing level of credit risk and over-indebtedness in MFIs are considered to be the largest risk facing the MFI's industry (CSFI, 2014).

One of the ways by which microcredit has been used as a vehicle for poverty reduction is to mostly target women (UNDP, 2002). This is to promote gender equality through the advancement of the economic status of women. Opinions and views of people have however differed as to default rate in relation to gender (Mohd Zaini & Roslan 2009; Calum & Kong, 2010; D'espallier, Gue´rin & Mersland; Pearlman, 2012; Nawai & Sheriff, 2012; Boeche & Cruz, 2013).

These diversities in opinions (and views) are very important for the determination of portfolio at risk in MFIs. Some researchers assume that women are associated with a higher risk than men, since women are the poorest in the community and men tend to control the funds or the credit lent to these women, thereby making repayment difficult (Crabb & Keller, 2006). On the other hand, D'espallier et al., (2011); Hulme and Mosley, (1996); Cull, Demiguel-kunt and Morduch, (2007); Gibbons and Kasim, (1991); Kevane and Wydick, (2001) found that there is a higher default rate among men than women; thus it is less risky lending to women than to men since repayment among women is higher as compared to men. In spite of these studies, there is a need for more studies to assess previous results in different contexts and in different micro-economic

activities in order to lend support to better understanding of the determinants of portfolio at risk in microfinance in developing economies like Sub Saharan Africa.

1.2 Problem Statement

Loan portfolio risk is a major challenge facing the financial sector and could result in reputation damage. As a result, many studies have been advanced in the industry to enhance understanding on loan portfolio risk management issues since it could have a significant effect on their financial operation (Abd & Tan Be Lay, 2002; Alhassana Kyereboah-Coleman 2014; Badar & Javid, 2013; Amare & Bekabil, 2008; Sharma & Zeller, 1997; Al-Azzam, Hill & Sarangi, 2012; Behr & Simon 2012; Chaibi & Ftiti, 2015; Louzis, Angelos & Vasilios 2012). However, recent literature on credit risk determinants are less focused on Non-Banking Financial Institutions. Thus, studies on loan portfolio risk determinants has focussed mainly on the commercial and traditional banking institutions, with less attention to the Microfinance sector (Chaibi & Ftiti, 2015, Louzis et al. 2012; Behr & Simon 2012; Abd & Tan Be Lay, 2002).

In addition, there are few scholarly studies in the area of loan portfolio risk issues within microfinance institutions. Studies that examined loan portfolio risk issues within the industry focussed primarily on non-profit making MFIs and loan repayment matters among gender (Godquin, 2004; Nawai & Shariff, 2012; Field & Rohini, 2007; Sharma & Zeller, 1997; Al-Azzam, Hill & Sarangi, 2012). Likewise the empirical evidence of Papias and Ganesan (2009) and Boche and Cruz (2013) focus on repayment issues within cooperative societies. Crabb and Keller (2006) examined loan portfolio risk within a Christian organization, especially concentrating on how the lending methodology mitigates the loan portfolio. However, this study considers all forms of microfinance institutions within the industry, without giving preference to

specific area of concentration. Thus, the study will focus on both profit and nonprofit-making MFIs. At the same time, this study focuses on all factors that influence loan portfolio risk within the MF industry. Furthermore, this study examines all the various loan issues within the period of the study, without giving much attention to concentration of risk as the work of (Mohd Zaini & Roslan 2009; Amare & Bekabil 2008; Weber & Musshoff 2012) concentrated on risk associated to loan portfolios extended to Agro Business and farmers.

Researches on loan portfolio risk management within the microfinance industry largely focus on Arab economies (Godquin, 2004; Nawai & Shariff, 2012; Field & Rohini, 2007; Sharma & Zeller, 1997; Al-Azzam, Hill & Sarangi, 2012) which have financial systems different from other economies. This study concentrates on Sub Saharan Africa (SSA) since most SSA countries have different economic and socio-economic conditions compared to the Arab nations and other sub regions. Besides, surveys have shown that the funding structure of the microfinance industry in SSA is mainly constituted by deposit and borrowing from the capital market (MIX and CGAP, 2008, 2010, 2011). In addition, surveys have revealed that SSA is the region that receives least donor investment, compares to South Asia (SA), Eastern Europe, Central Asia (ECA), Latin America and the Caribbean (LAC). Surveys also indicate that external funding for MFIs has decreased by 12% in the SSA region in 2008. Moreover, the study focuses mainly on Sub Saharan Africa due to the world bank report that revealed that Sub Saharan Africa is the fastest growing economy in the world with a growth rate of 4.0% in 2012, 4.2% in 2013 and 4.5% in 2014 (www.worldbank.org).

Against these backdrops this study intends to investigate the loan portfolio at risk in Sub-Saharan Africa (SSA). This study therefore explores the determinants of loan portfolio risk in the microfinance industry, giving specific attention to the Sub Saharan Africa region. This paper

specifically identifies the prevailing practices and factors that contribute to client delinquency in MFI's operations and specifically on how these factors influence loan portfolio risk in the microfinance industry in SSA.

1.3 Research Purpose

The aim of this study is to examine the determinants of loan portfolio at risk in microfinance institutions in Sub Saharan Africa countries. The study seeks to critically examine the nature of the relationship between the determinants and the loan PaR and to ascertain the significant determinants of loan portfolios at risk in MFIs.

The specific objectives of this study are:

- i. To ascertain the level of loan portfolio at risk (PaR) in MFIs.
- ii. To examine the determinants of loan PaR in MFIs.

1.4 Significance of the Research

The study of determinants of portfolios at risk in microfinance institutions in developing economies has much significance. This study is significant because as a whole it will add to the body of knowledge in this area of study. It is clearly noted, though arguable, that very little has been done on this research area. Most of the study or research on the determinants of portfolio at risk has been concentrated on the macroeconomic level, specifically on the aggregate of economic growth. This study concentrates on whether or not females have a positive or negative impact on the loan portfolio and to which extent saving mitigates or contributes to loan portfolio risk. Further studies could be carried out for a closer analytical study of the research area.

The study will also serve as a guide for policy makers from government and especially financial institutions or agencies. This study clearly looks at what policy makers can do to improve on the existing policies in their contribution to economic development through loan portfolio management in microfinance institutions.

1.5 Research Limitation

The research is limited due to the impossibility to include all countries in Sub Sahara Africa, as a result of unavailability of data. Future research could look at a broader scope in Africa. Also the limitation could be as a result of incomplete data, since it is concerned with Sub-Saharan Africa; this might be due to some missing data within the period under consideration. The selection of the countries is based on the availability of the data from 2000 to 2012.

1.6 The Organization of the Chapters

The study is organized into six (6) chapters: Chapter One discusses the general background of the study, the research problem and the research objectives. The chapter also provides the scope of the research as well as the outline of the study. Chapter Two reviews the trend of event in MFIs within the sub region: growth trend of borrowers, female borrowers', depositors and extent of saving are discussed, in addition to funding structure of MFIs in SSA. Chapter Three provides a review of the theoretical and empirical literature in the area. Both theoretical and empirical reviews are considered. Chapter Four discusses and gives details of the research methods and techniques that were used for the study. The chapter offers the basis for selecting specific

methods and provides detailed outline of the data collation and presentation for the research. (Greater clarifications of quantitative methodology were employed for this research). Chapter Five presents an analysis of the organized data and the findings of the research issues identified for discussion. In addition, summaries of tables of statistical data, figures and charts on results are presented to give more explanations to readers. Finally, Chapter Six gives a summary of the findings, the conclusion and recommendations of the research and the contributions to knowledge based on the findings and the recommendation.

1.7 Chapter Summary

In conclusion this chapter presented the background of the research and the research gap the study sought to address. In addition, the chapter presented the objectives alongside the research questions to be answered in the course of this study, as well as the significance of the research to the subject area. Finally, this chapter presented a synopsis of how chapters have been arranged in this study.

CHAPTER TWO

OVERVIEW OF MICROFINANCE INSTITUTIONS IN SUB SAHARAN AFRICA

2.1 Introduction

The overview of the studies will review development of the MF industry by concentrating on growth trends of loan portfolio at risk in SSA, borrower growth trends, more specifically growth trends of female borrowers, capital structure and deposits growth trends of MFIs in the region. MIX and CGAP were the main data source for the overview of MFIs within the Sub region.

2.2 Overview of the activities of Microfinance in Africa

In the 1970s, microfinance was well noted in assisting the poor with the establishment of the Grameen bank by Muhammad Yunus (Grameen bank 2004; Campbell, 2010). Muhammad Yunus had the belief that ‘capital is a friend of the poor and that its accumulation by the poor represents their best means of escaping the abject poverty that the welfare state and wasteful, corrupt and incompetent international aid organizations have failed to combat’ Grameen Bank (2004). Over the years microfinance has serve as a market mechanism to assist the poor in the world economy. That is to specifically address economic issues among the rural folks. In addressing these economic challenges faced by the less privileged, banking facilities were extended to the core poor in order to eliminate the exploitation of the poor by money lenders (Grameen Bank, 2004; BoG, 2007). The introduction of microfinance has helped in the provision of self-employment opportunities for the unemployed. In addition to that, it has brought banking

servicing to the door step of the less privileged, most especially to women from poor households (Grameen Bank, 2004; BoG, 2007). Thus microfinance has led to an increase in investment and saving by poor entrepreneurs since they do not have the opportunity to access regular banking services.

The inclusion of the poor in the formal financial system was not common, (Brau & Woller, 2004). Their inclusion was either in the form of partial inclusion in the developed countries or through full exclusion in the lesser developed countries (Brau & Woller, 2004). The inability of the formal financial system to tackle the financial constraints of the poor, resulted in informal and community based financial services to address the financial desires of the poor (Rosenberg, 2005). However the introduction of microcredit to tackle the financial needs of the poor entrepreneur has led to an increasing number of formal financial sector organizations being committed to the financial handicap of the poor entrepreneur (Grameen Bank, 2004; Brau & Woller, 2004).

Rosenberg, (2005) refers to microfinance as ‘a full range of financial services that low-income people use, including not only credit but also savings, insurance, and money transfers’. Furthermore, Sinha (1998) as cited in Eoin (2005) differentiated microcredit from microfinance; he stated ‘microcredit refers to small loans, whereas microfinance is appropriate where NGOs and MFI supplement the loans with other financial services (savings, insurance and money transfers)’. This means that microloan is a subset of microfinance in that it provides credit facilities to the poor, while non-credit financial services such as savings, insurance, pensions and payment services are associated with microfinance. Microfinance has become a critical financial instrument for the survival of the poor. Furthermore it is more reliable than the informal financial

sector, like saving and loan clubs, community based financial service and others (Rosenberg, 2005).

The microfinance (MF) industry in Sub Saharan Africa (SSA) has taken advantage of the accelerated development in the sub region. This has positively impacted the development of the microfinance sector, more especially in the year 2007 when MFIs attain operational self-sufficiency through an increase in outreach drives. However, during the global financial crises, gross domestic product growth dropped from 7 percent in 2007 to 5.5 percent in 2008, while inflation rose from 6.8 to 11.9 percent. The 2008 global financial crises led to a 6 percent dip in the MF sector. The MF industry within the SSA is still faced with threats. These challenges range from an increase in operating expenses, a fall in rate of returns. Weak supervision and portfolio quality been poor and have worsened over the years. Moreover, the overall penetration rate is very slow, due to the fact that much concentration is on specific institutions. With the diversity of experience in the MF industry within the SSA region, the overview of the studies will be a review of the development of the industry, by concentrating on growth trends in SSA, funding flow and structure of MFIs in the region.

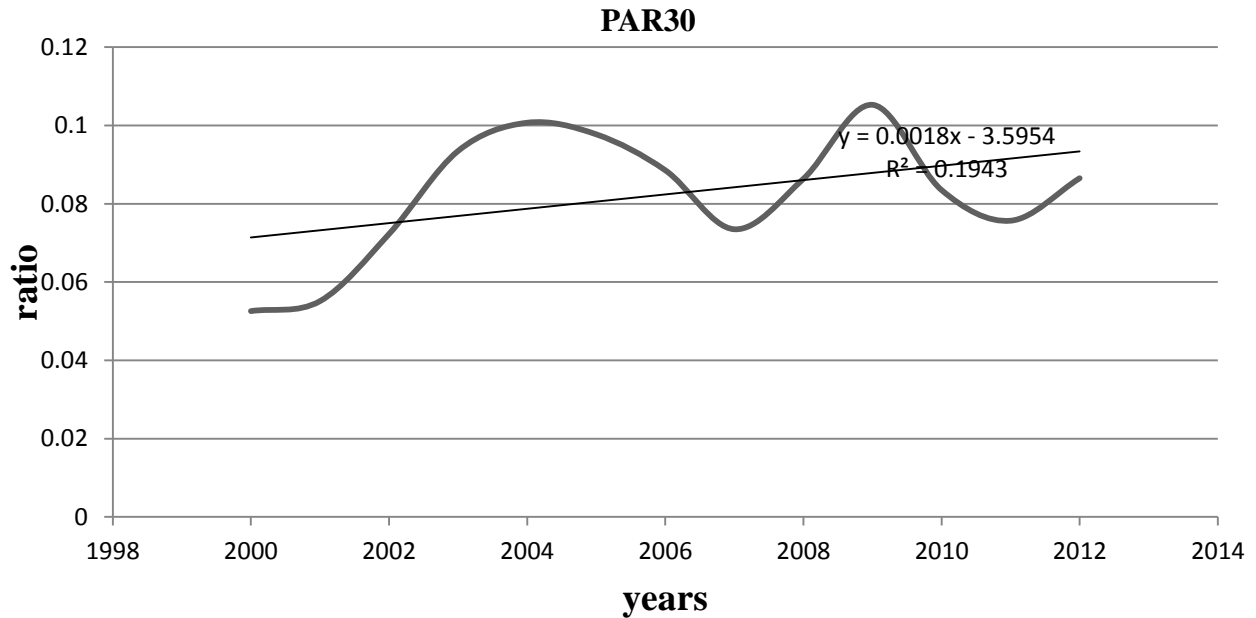
2.3 Growth Trends and Loan Portfolio at Risk of MFIs in SSA

The MF industry in SSA is facing challenges with profitable service delivery. Despite these operational challenges, the industry attained operational self-sufficiency in 2007 for the first time, (MIX and CGAP, 2008). West Africa has very poor portfolio quality. Twenty two percent of MFIs in West Africa accounted for over 10 percent portfolio being at risk within 30 days. Likewise three of the institutions have over 20 percent of portfolio at risk, while other MFIs had

over 50 percent of portfolio at risk (MIX and CGAP, 2008). During the period of 2008, rural banks within the region were, however, able to manage their loan portfolio risk. They had profit of 46 percent and a return on asset of 2 percent with a profit margin of one percent. This helped in minimizing their loan portfolio risk.

Southern Africa MFIs had a decrease in loan portfolio at risk within 30 days from 5.6 to 3 percent (MIX and CGAP, 2010). The Southern Africa region recorded nearly 78 percent of its borrowers being less delinquent (MIX and CGAP, 2011). Furthermore the region enjoyed a profit margin of 8 percent resulting in a decrease of operating expenses from 22 percent to 17 percent. This shows a significant impact on the financial performance of the region, also there was an appreciation of return on assets and return on equity from zero percent in 2006 to 3 percent in 2007 and 14 percent respectively, (MIX and CGAP, 2008).

The Eastern Africa region is considered one of the regions with strongest portfolio quality. The region recorded a portfolio at risk within the 90 days decline from 1.9 percent to 1.7 percent (MIX and CGAP, 2010). However portfolio at risk within 30 days increased from 3.5 percent to 3.7 percent. Furthermore, the eastern Africa region witnessed a decline in financial self-sufficiency. The region had total operational expenses increased from 24 percent to 20 percent, this resulted in a decrease of their profit margin by 2 percent, nearly negative to 15 percent (MIX and CGAP, 2008). The central Africa region had challenges with their portfolio quality. They had a portfolio at risk within 30 days to be stable at seven percent and that of 90 days was slightly above 4 percent. Furthermore the region accounted for 31 percent of MFIs recording 10 percent improvement in portfolio at risk within days.

Figure 2.1 Growth Trends Portfolio at Risk of MFIs in SSA

Source: Microfinance Information Exchange

Figure 2.1 shows the growth trend of portfolio at risk of 30 days within the SSA region. From the graph there was a sharp increase of portfolio at risk from 0.053 in 2000 to 0.093 in 2005. However from 2006 to 2007 the MF industry in the sub region attained financial self-sufficiency. There was a reduction in portfolio at risk from 0.089 to 0.073 during that period.

Despite the attainment of financial self-sufficiency in the year 2007, the industry once again experienced an increase in the loan portfolio risk in 2008 and 2009. This could be an effect of the financial crisis that hit the global economy during the period. Furthermore there was a decrease in 2011, nonetheless the portfolio at risk raised steadily in 2012.

2.4 Growth trends of borrowers and depositor of MFIs in SSA

The growth trends focus mainly on the growth in the number of borrowers, savers, loan portfolio and saving. In the year 2007, about 160 MFIs in Africa had 5.2 million borrowers and 9 million savers (MIX and CGAP, 2008; 2010; 2011). They also had a total outstanding loan portfolio of 2.5 billion USD, while their deposit increased by 2.1 billion USD (MIX and CGAP, 2008; 2010; 2011). The table below provides detail information on growth and productivity trends of MFIs in Sub Saharan Africa from 2006 to 2008. There was a growth in borrower of 25 percent (4.7 million borrowers) in 2007. Furthermore savers increased by 31 percent (7.2 million savers) in 2007. There was 69 percent of loan portfolio growth, indicating an increase of about 916 million USD. In addition there was a significant change of 60 percent in saving.

Despite a strong holistic growth in Sub Saharan Africa, there were differences in the growth rate of both lending and deposit among the sub regions (Central, East, Southern and West). There was also a more rapid growth in loan portfolio than in saving, although there was a larger growth in savers (MIX and CGAP, 2010). The eastern and southern region experienced tremendous growth in both borrowers and savers, while the growth rate in West Africa was on a smaller scale, this could be as a result of much penetration in this region. However the Central Africa region experienced a decrease in the progress of number of borrowers.

Table 2.1: Growth Trend Borrowers and Loan Portfolio in the Sub Region

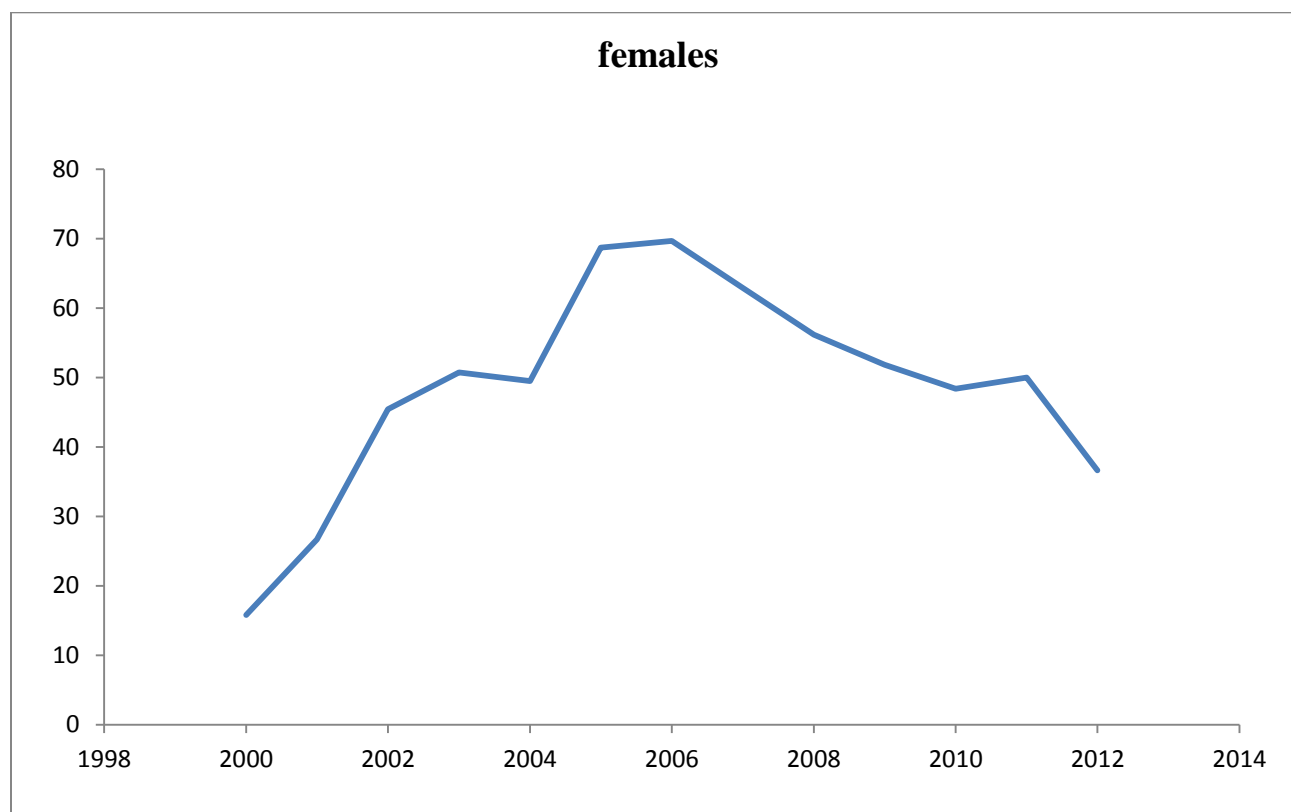
		Borrowers (Thousands)	Growth rate	Loan Portfolio (USD Mil)	Growth rate
SSA	2006	3785		1320	
	2007	4731	25%	2236	69%
	2008	6,484	12%	3089	26%
Central	2006	219		97	
	2007	213	-3%	142	46%
	2008	269	21%	214	20%
Eastern	2006	2061		554	
	2007	2628	28%	1025	85%
	2008	3,521	12%	1481	35%
Southern	2006	519		188	
	2007	767	48%	417	121%
	2008	1,006	14%	486	21%
Western	2006	986		481	
	2007	1123	14%	652	36%
	2008	1,688	11%	908	17%

Source: MIX Market; Results based on totals

In 2008 MFIs in SSA had slow growth in borrowers. The growth rate of borrowers dropped from 25 percent in 2007 to 12 percent in 2008. This was as an effect of the global economy crises. The financial crises hindered the expansion of the client base of MFIs in SSA. This financial challenge affected Eastern Africa when the borrower growth rate dropped from 28 percent to 12 percent in 2008. Nonetheless the Eastern region had a reasonable size of loan portfolio increase

from 1025 to 1481. Likewise Central Africa was not affected by the major economic shocks in 2008. Instead the region experienced a positive borrower growth of 21 percent as compared to -3 percent in 2007. In addition, Southern and Western had their borrowers' size falling to 14% and 11% respectively.

Figure 2.2 Growth Trends of Female Borrowers in SSA



Source: Microfinance Information Exchange

year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
females (%)	15.8	26.7	45.46	50.74	49.48	68.74	69.7	62.93	56.18	51.83	48.38	50	36.63

Source: Microfinance Information Exchange

The borrower growth rate of female borrowers is depicted in the figure and table above. The growth rate of female borrowers was close to 16% in the year 2000 and increased to 26.7% and 45.46% in the year 2001 and 2002 respectively. The growth rate of female borrowers was more than half of the total borrowers in the 2003. However, it dropped to 49.48% in the 2004. There was a stable growth in 2005 and 2006 at respective growth rate of 68.74% and 69.7%. Nonetheless there was a gradual decline in the 2007 to 2010 from 62.93% to 48.38% as shown in the table and figure above.

Table 2.2: Growth Trend Depositors and Deposits in the Sub Region

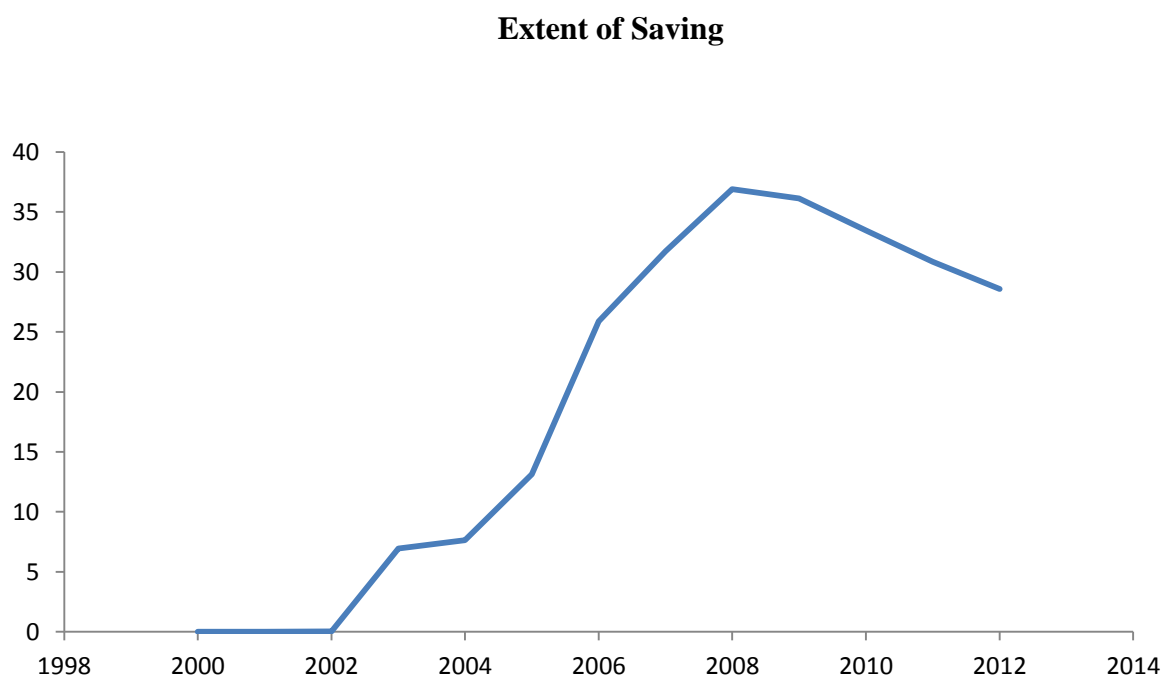
		Depositors	Growth rate	Deposits	Growth rate
		(Thousands)		(USD Mil)	
SSA	2006	5473		1148	
	2007	7177	31%	1839	60%
	2008	16,573	40%	2798	10%
Central	2006	350		135	
	2007	455	12%	232	72%
	2008	719	30%	354	25%
Eastern	2006	2241		472	
	2007	3172	42%	799	69%
	2008	8501	33%	1308	12%
Southern	2006	694		144	
	2007	993	43%	254	76%
	2008	1857	45%	236	-5%
Western	2006	2189		396	

2007	2557	17%	553	40%
2008	5497	56%	905	8%

Source: MIX Market; Results based on totals

Depositors in SSA are three times greater than borrowers, with close to 17 million depositors to nearly 7 million borrowers. SSA is considered as one of the regions where depositors outnumber borrowers in the world, (MIX, 2011). This could be as a result of cooperative societies assisting with financial services in the region. Table 2.2 shows an increase in the number of depositors from 455 in 2007 to 719 in 2008 in the Central Africa region. This represents a growth rate of 12% to 30%. Furthermore, the region experienced an increase in deposit size of 2790 million from 1839 million. This indicates a 10% increment in deposit size in Central Africa.

Likewise the Eastern Africa region had the number of depositors moving from 3172 to 8501; this show an appreciation of 33%. Furthermore, the deposit size was 1308, implying a growth rate of 12% in 2008. Southern Africa experienced a shift of depositors from 993 to 1857, showing a slight increment of 2%. However the deposit size fell by 5% from 254 to 236 in 2007 and 2008. The Western Africa region had 8% increases in deposit size. This means, the region experienced a shift in deposit size from \$553 million to \$905million within the period of 200 to 2008. In addition, the Western Africa region had its deposit size increased by 2940 to 5497 from 2007 to 2008.

Figure 2.3 Growth Trend of Deposits to loans in SSA

Source: Microfinance Information Exchange

Growth Trend of Deposits to loans in SSA

year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
extent of saving	0	0	0.0309	6.9518	7.6437	13.1475	25.8944	31.7292	36.9062	36.1214	33.4644	30.8416	28.5777

Source: Microfinance Information Exchange

The figure also depicts deposits made in relation to loans during the period under study within the SSA region. From the year 2000 to 2002, the SSA region experienced no deposits in relation to loan granted by MFIs. However, there was a gradual effort to increase the degree of saving with respect to loans during the period of 2003, 2004, 2005, with a slight increase of 6.9518%, 7.6437% and 13.1475% respectively. In addition, the percentage increase in extent of saving in

the year 2006 and 2007 was 25.8944% and 31.7292% respectively. Furthermore, 2008 and 2009 experienced the highest period of deposits in relation to loans granted. As indicated, the period recorded an increment of 36.9062% and 36.1214% respectively. Nonetheless, there was a drop from the year 2010 to 2012. The respective percentages to indicate the value of saving received with respect to loan are as follows 33.4644%, 30.8416% and 28.5777%.

2.5 Capital Structure (Leverage) of MFIs

Deposits constituting 57 percent of MFIs capital structure is the largest source of funds for MFIs in SSA, (MIX and CGAP, 2010). Donor's investment formed 13 percent of funding for MFIs (MIX and CGAP, 2011). Local funding, (deposits) constituting a majority share of the funding structure in the sub region, is a relevant source of funding for the growth of MFIs in SSA. Furthermore, MFIs with strong deposit base, performed better than those depending on donors' investment (MIX and CGAP, 2008). The review will look at funding from the demand side and then review international donor's funds to microfinance.

2.5.1 Borrowing

Borrowing is one of the significant sources of funding for MFIs in SSA. It comprises both foreign and local sources of funding. Local borrowing constitutes three quarters of the financial structure. Two thirds of the source of funding is from foreign sources, while public borrowing accounts for a quarter of the total borrowing (MIX and CGAP, 2008; 2010). East and West Africa have the highest concentration of foreign funding in their operations, (MIX and CGAP,

2010). 40 percent of this foreign funding is invested in the Kenyan MF market, while Uganda, Tanzania, and Niger accounted for a disproportionately larger amount of the foreign funds than the rest of East and West Africa (MIX and CGAP, 2008).

Table 2.3: Capital Structure (Leverage) Trend Data by Sub Region (USD Mil.)

		Savings	Commercial Borrowings	Other Debt	Equity
Africa	2006	1148	243	376	557
	2007	1839	343	680	912
	% Increase	60%	41%	81%	64%
Central	2006	135	5	21	19
	2007	232	9	23	38
	% Increase	72%	81%	12%	103%
East	2006	472	116	196	183
	2007	799	183	413	436
	% Increase	69%	58%	111%	138%
Southern	2006	144	30	35	198
	2007	254	36	54	228
	% Increase	76%	20%	54%	15%
West	2006	196	93	124	557
	2007	553	114	190	912
	% Increase	40%	24%	53%	64%

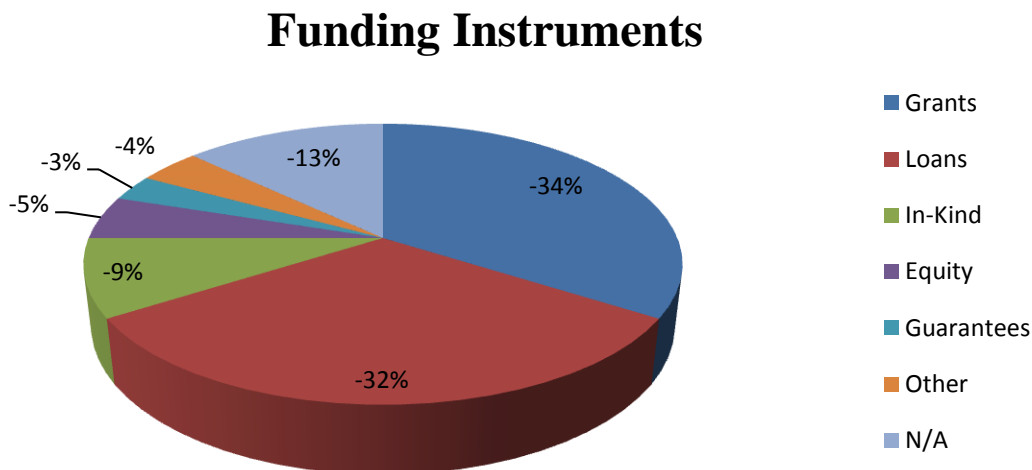
During the period under review, East Africa had debt to equity ratio moving from 2.3 to 2.6; also commercial debt increased by 57 percent while saving was 69 percent. The Southern Africa region is the least leveraged region within the African continent. Southern Africa had forty

percent of its funding being sourced from equity. Furthermore, debt to equity ratio decreased from 3.8 to 3.2 in 2006. West Africa had an increase in leverage, with its debt to equity ratio growing from 3.8 to 4.3; also commercial borrowing within the region has increased by 41 percent since 2006.

2.5.2 International Donors' and Investors' Funds into MFIs

International donors comprise bilateral and multilateral development assistance and non-governmental organization, which provides funding to microfinance in SSA. International donors most at times use various financial instruments in the distribution of funds. These financial instruments are normally adopted depending on the objective of the project and the countries where the project will be undertaken. The chart below explains the various proportions of instruments used in the year 2007 by these donors.

Figure 2.4 Funding Instruments

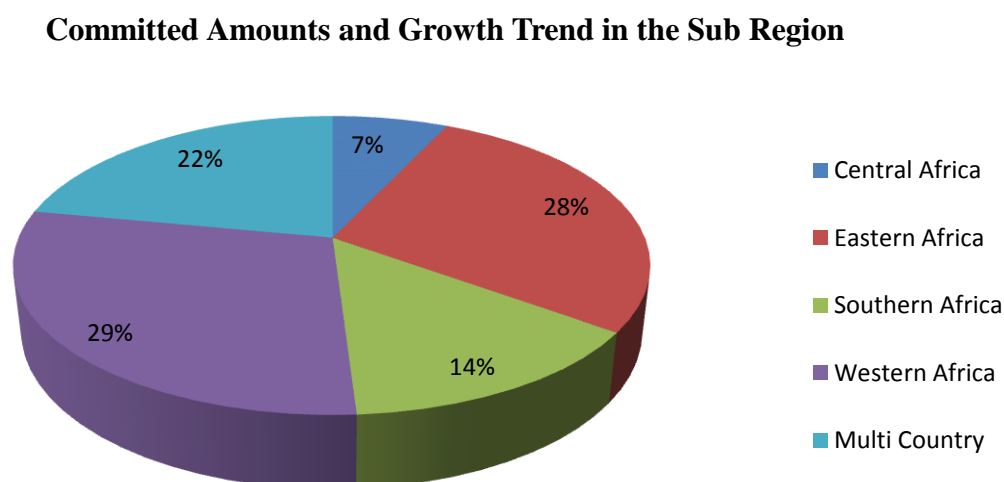


Source: 2009 Microfinance Funder Survey, MIX and CGAP

The chart above shows that grants from 34 percent of the funding instruments. This was the proportion of funding from bilateral donors and international NGOs, while loans are 32 percent and was from Development Finance Institution (DFIs), private foundations multilateral funders and international NGOs. In-kind funding was 9 percent, while equity and guarantee were 5 and 3 percent respectively.

Western and Eastern Africa had the highest injection of donor investment in MFIs, with one third of these commitments going to Ethiopia, Ghana, Kenya Mozambique and Uganda (MIX and CGAP, 2008; 2011). Commitments in the Central Africa sub region grew by 27% between 2007 and 2008, mostly in Cameroon and DRC (MIX and CGAP, 2008; 2011). However, a decline by 4 percent is noted in the Southern Africa region. Donors withdrew their activities from the microfinance market of Angola, Namibia and South Africa; however Madagascar still received funds from donor agencies (MIX and CGAP, 2011).

Figure 2.5 Committed Amounts and Growth Trend in the Sub Region



Source: 2009 Microfinance Funder Survey, MIX and CGAP

MFIs in SSA are heavily funded by deposit and borrowing. Although donated equity accounts for a small proportion of the fund structure, it is still a significant source of funding in the SSA MF industry. Deposits and borrowing constitute 80 percent of the operational funds of MFIs in SSA (MIX and CGAP, 2008; 2011). It has been the major source of funding compared to external sources. Nonetheless, the deposit to asset ratio of MFIs in the year 2008 declined, as borrowing was employed in addition to other funding sources of MFIs.

2.6 Chapter Summary

The chapter reviewed Growth trends of borrowers, female borrowers and depositors of MFIs in SSA. Furthermore, the capital structure of MFIs within the sub region was discussed, showing that deposits and borrowing were the major sources of funding for the sub region. In addition, the overview indicated that the Southern Africa region is the least leveraged within the sub region. The data source of the overview was based on a survey of the MIX and CGAP.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

The literature overview seeks to survey scholarly articles and books, published by accredited researchers, and relevant to the study and also to provide a detailed summary and acute examination of each work with the aim of achieving the research objectives. Both theoretical and empirical reviews are considered.

3.2 Theory

Performance measurement is at the core of every investor who employs resources in an investment fund. These investors develop assessment schemes that provide them with the feedback as to whether they are making the desirable return. In a likewise event the investor will consider appraising the fund manager. The fund manager will be subjected to the investment contract and regular evaluation of his/her accomplishments. The maximization of the shareholders' wealth is the focus and achievement of the fund manager. The achievement of the desired return can be assessed based on the good or the poor and it is out of experience and not just quagmire luck that success attained. 'Return can be defined as the rate of change in the value of an asset in a defined time interval while Risk is the uncertainty in what a security price in consequence with the return will be at a certain point in the future' Zechner and Aldrian, (2000). Against this background, the study is conducted on the following theories on risk: Hamada's

(1972) theory on risk and leverage, Sharpe's (1963) Capital Asset Pricing Theory (CAPM) and Markowitz's (1959) Portfolio Theory. Hence,

$$E(R_j) = R_f + \beta_j[E(R_m - R_f)]$$

Where,

$E(R_j)$: the expected return on the asset $j = 1 \dots N$,

R_f : the risk-free rate of return measured as treasury bill/bond yield,

R_m : the expected return for the risky market portfolio,

β_j : the individual asset's systematic risk relative to the risky market's portfolio, and

$E(R_m - R_f)$: the expected risk-premium of risky market portfolio.

Relating this to MFIs' loans portfolio, a duo of loans at varying levels is kept by the management of MFIs. The diversification of the overall risk of this loan portfolio should be such that the change of returns from each duo of loans is probably to be such that the corresponding coefficient is closer to 0 rather than exactly equal to + 1.00 as Markowitz alluded to for diversification of assets' risk. The equation above indicates the compensation MFIs managers make for adding on more risky loans. That is, management of MFIs charges a premium equivalent to the variance between the overall risk premiums appropriate in the 'market' for all the credit facilities in the market ($R_t - R_{mt}$). In principle, the CAPM explains that the desired rate of return required by MFIs is the same as the risk free rate plus a premium, as persists in the market for the total credit facilities.

MFIs price their loans accordingly, most especially base on the range of risk associated with each loan. Highly (lower) perceived risky loans will attract a higher (lower) lending price. Loan diversification help reduce the risky nature of individual loans, as stated by Markowitz. MFIs are mostly concerned with market risk and the price of the risk when it comes to loan pricing decision.

$$\text{Price of risk} = \text{unit of risk} \times \text{risk-premium} = \beta_j [E(R_m) - R_f]$$

Tax, bankruptcy cost and other risk related cost are factored into the loan pricing of MFIs, especially when they are highly leveraged institutions. Excessive risk-taking activities like trading and lending by MFIs may lead to bankruptcy cost. Therefore, increase in the leverage of MFIs leads to increase in the risk of the bank. The beta of individual MFIs with loan capital can be express as:

$$\beta_{jL} = \beta_{ju} [1 + D/E_j (1 - tc)]$$

When leverage effect is introduced into the above equation.

Where,

β_{jL} = beta of levered firm, β_{jU} = beta of unlevered firm, D/E = debt-equity ratio, tc =tax rate relevant to a pool of income of a MFIs. Capital structure has the possibility of affecting the credit risk of MFIs. Meaning, the risk of MFIs increases as they add on more leverage.

3.3 Review of Empirical Literature

3.3.1 Empirical Evidence of Factor that Influence Loan Portfolio at Risk in the Banking Industry

Microfinance is one of the fundamental development tools aimed at alleviating poverty by extending microcredit to the poor entrepreneurs (Van, Stewart & De Wet, 2012). This paper focuses on the determinants of loan portfolios at risk in the microfinance industry within the Sub Saharan Africa region, as well as recent evidence on factor that influence the loan portfolio quality. The empirical literature on the determinants of loan portfolio risk can be viewed from the banking sector as well as from the non-banking financial institutions.

Chaibi and Ftiti (2015) investigated the determinants of credit risk in the German and French markets and banking economies. Their studies found that bad management (inefficiency), leverage and return on equity influence credit risk significantly. Their empirical result also indicate that the economic health of the countries they studied have a significant influence on credit risk when they proxied it with GDP growth and inflation.

Castro (2013) explored the banking industry of Greece, Ireland, Portugal, Spain, and Italy by examining the relationship between macroeconomic factors and the bank credit risk. His study found that credit risk in the banking sector is generally affected by macroeconomic factors. Castro's empirical results indicate that GDP growth, unemployment rate, interest rate, likewise exchange rate also significantly impact credit risk. Furthermore, his findings revealed that policy measures that can help the countries he studied to attain economic stability is through the promotion of growth in employment, productivity and enhancing competition in the industry. In

addition, Castro stated that a reduction in the external and public debt could also result in economic stability.

Louzis et al (2012) explored the bank and the macro economy and specific elements that affect non-performing loans in the Greece economic. They regressed key economic and bank specific factors that influence non-performing loans using the data set of the 9 largest banks in green, between the period of 2003 and 2009. Some of their main conclusions were that the Greek banking industry is significantly influenced by macroeconomic indicators (GDP, unemployment, interest rates and public debt). They also found that bank specific variables, like firm size and management performance are other variables that significantly impact non-performing loan.

In view of the fluctuation effect of the financial crisis, Wagner and Winkler (2013) examined the vulnerability of credit quality in the financial industry. Their study suggests that microfinance is vulnerable to financial turmoil. Furthermore they reveal that credit growth within the microfinance industry could result in financial instability. Breuer (2006) also examined the relationship between conflict of interest and problem loans. Using a dataset spanning from 1999 to 2000, he found that conflict of interest could possibly lead to mismanagement, which could also result in problem loans. Breuer further suggests that the extent of ethnic heterogeneity ameliorates the potential conflict of interest that exists between borrowers, depositors and the bank, and that this could lead to a decline in problem loans and the opposite could happen too.

Behr and Simon (2012) examined the effect of information sharing among lenders. Their study focussed on how sharing of information could significantly influence access to credit, cost of credit and loan performance. One of their major conclusions is that information sharing helps to improve loan payment performance. Thus it serves as an incentive measure against loan

delinquencies, since the borrower will easily be tracked and records are shared among the lenders. Furthermore, they found that the quality of loan has improved after the introduction of information sharing among lenders. Alhassan, Kyereboah-Colemanb & Andohaa (2012) used the system- generalized method of moments to estimate and ascertain the asset quality of Ghanaian banks during the financial crisis. Their span was from 2005 to 2010, furthermore they used a dataset of 25 banks and their conclusions were that bank size, inflation and real exchange rate significantly influence loan portfolio quality. Moreover bank market structure, loan growth and non-performing loans were also found to be significant.

3.3.2 Empirical Evidence of Factor that Influence Loan Portfolio at Risk in the Microfinance Industry

Crabb and Keller (2006) studied the microfinance market between the period (of) 2001 to 2003, using data from Opportunity International, Crabb and Keller regressed key variables that influence loan portfolio risk. This was a means to mitigate default in loan portfolio quality. They examined loan portfolio quality by looking at how females can help mitigate credit risk under the group and individual lending methodology. Their results show that females are highly significant (under) in group lending methodology when it comes to loan repayment compared to individual lending methodology. Furthermore, GDP growth, inflation, loan size and number of client outstanding were found to have a negative significant relation with portfolio risk.

Likewise, Nawai and Shariff, (2010) explored the microfinance sector of Malaysia by examining the factors that influence the performance of repayment. Their study used the multinomial logit regression model to regress fundamental key variables and found that a visit to the business

premise by loan supervisors helped reduce loan default. Also Nawai and Shariff found that improvement in the income of clients and increase in client's total sales help mitigate their loan default rate. Furthermore, the study of Nawai and Shariff revealed that age, gender, business experience, religious education and total household income have a significant influence on credit risk management. Likewise, distance to lender's office, formality of business, period of loan approval and loan monitoring impact credit risk significantly.

D' Espalier et al., (2010) did a global study of repayment performance of women. Variables such as loan size, operational self-sufficiency, loan officer efficiency were modelled. One of their objectives was to ascertain whether females were better credit clients than males. Nonetheless one of their challenges was the time invariant covariates nature of variables. To address this limitation in their study, they used Random effect and fixed effect vector decomposition (FEVD) models to account for the time- invariant covariates nature of the variables. They found that females, firm size and portfolio growth have a strong influence on loan portfolio quality.

Weber and Musshoff (2012) explored the risky nature of microcredit in the agricultural industry of Tanzania. They reveal that agricultural firms face challenges in acquiring credit, however, they are able to make better repayment on time than non-agricultural firms. Furthermore, they found that seventy percent of their respondents were women, explaining that inclusion of female entrepreneurs will help in mitigating credit default. Collier, Ani & Skees (2011) assessed how natural disaster affects loan portfolio quality. The objective of their study was to examine the implication of correlated risk on business strategies and what measures could be put in place to mitigate its effect on the loan portfolio quality. They found that correlated risk could result in rationalization of credit, more especially within the agriculture sector, since that is highly

exposed to natural disasters. Furthermore, Moodie (2013) found that loan portfolio quality could be influenced at the borrower's level as at the institutional and country level. Moodie explained that the impact on loan portfolio quality at the borrowers' level could result from business risk, such as failure of crops or pest infestation, among other factors. In addition, the study revealed that the health issue of the borrower could pose challenges on loan portfolio quality. Health risk like HIV/ AIDS are some of the health related issues that affect loan portfolio quality. Moreover, payment of school fees, over-indebtedness and civil disturbances, all have a significant impact on the quality of loan portfolio.

In addition, Moodie states that fraud on behalf of the field officers could result in an increase in credit risk, especially when field officers embezzle funds. Likewise, the inability of field workers to mobilise funds could lead to bankruptcy, thereby impacting on loan portfolio quality. Moodie further identifies devaluation of local currency, political instability and natural disaster like floods, tsunami and drought, all influence the loan quality.

Using the probit model Godquin (2004) found that loan size can negatively impact credit risk. His study also found that, loan duration, age, productive assets of the household, as well as self-employment in agriculture, number of landed properties, were highly significant on the loan portfolio quality. Godquin also found that women were not significant on loan portfolio quality when he explored the microfinance market of Bangladesh.

Papias and Ganesem (2009) examined the repayment behaviour of clients of cooperative societies in Rwanda. Although they had a challenge with the scope and sample size, as well as their inability to include income variables that has a significant influence on repayment, they had the following variables to significantly influence loan portfolio quality: age, gender, size of the

household, interest rate charges, number of official visits and the purpose for the credit. It has been hypothesized that regular visits by loan officers helped improved repayment performance among borrowers. That is, as loan officers pay frequent visits to the work place of their clients, the officers are able to help their clients resolve technical issues which can lead to commitment in repayment of loan by the borrowers. Furthermore, the empirical result of Papias and Ganesem, found interest rate charges to significantly influence loan portfolio quality. Thus, when interest charges are higher, there is high possibility that borrowers will default, since the price for servicing the loan could also increase.

Al-Azzam, Hill & Sarangi (2012) used fourteen variables to investigate repayment performance through a group lending methodology, in Jordan's microfinance industry. Their study was the first to examine how technology influences repayment performance in the microfinance market. They found that religion has significant effect on loan payment performance in the microfinance economy of Jordan. Inferring, that women who pray five times daily have less likelihood of default repayment of loans, therefore, making religion an important factor in reducing the default rate of loans in the microfinance market of Jordan. Their study also found that peer monitoring, group pressure and social ties to significantly impact on loan payment performance in microfinance institutions in Jordan. They also suggest that when there is high cooperation among members in a group, the number of days in delay of repayment reduces, leading to high portfolio quality.

3.3.3 Empirical Evidence of Factors Accounting for Loan Portfolio at Risk Used in the Study

3.3.1 Female and Loan Portfolio at Risk

The debate of inclusion of minority women in economic activities has led to several studies into gender economic issues. Most of these studies investigate which gender is more credit worthy when it comes to loan repayment. However, the observed evidence in connection with this issue produced mixed results. Investigating the performance of gender loan repayment, Boehe and Cruz, (2013) found that having many female clients have a positive impact on reducing loan portfolio risk of MFIs. Boehe and Cruz used a mixed technique for the analysis of data from 26 microfinance institutions in 22 countries; they came to the conclusion that the engagement of females in socioeconomic activities gives them the opportunity to build upon their managerial roles thereby helping them to set aside an amount to meet the future loans obligations better than males. Papias and Ganesan, (2008), in order to understand the repayment behaviour of rural clients in the MF industry, looked at the socio economic factors influencing repayment culture of MF clients in rural Rwanda. They used a binary logistic regression empirical model to establish that female borrowers are more trustworthy than male borrowers. Their studies draw attention to the fact that females are more trustworthy when it comes to payment of loans than men, since they budget well and also engage in farming activities which enable them to pay their loan back quicker than men, through the earnings they make from these farming activities. Additionally, they found 80% percent of female in rural Rwanda make prompt payment, when compared to 20% among males. This was evident as a result of good record keeping practices on the part of women. Sharma and Zeller, (1997) employed information on 128 credit groups in Bangladesh and indicate that women have a lower credit risk rate than men. Sharma and Zeller demonstrated

that extending credit facilities to females is less risky than to males. Due to the prevalence of gender inequality, females take on less risky project in order to avoid being reprimanded in the household for project failure. Furthermore, their studies showed that there is high insurance in female clients, owing to the fact that they are inexperienced in the market economy and will often opt for assets they can manage and which are less risky.

D'espallier, Gue´Rin and Mersland, (2010), had a global analysis of 350 microfinance institutions (MFIs) from 70 countries. Their study investigated credit risk among the genders. D'espallier et al. focussed on which gender is a better credit risk client. Their results confirmed that, in credit risk management, females are better clients than males in the MF industry since they are associated with lower portfolio risk. Using an alternative dependent variable of loan loss provisions, they arrived at the same result. Their study also indicated that MFIs that target women clients have lower risk and performed better. Crabb and Keller, (2006), in a study to support Christian organizations seeking to promote development through microfinance, came to the conclusion that women, though they are marginalized in the society, are more trustworthy with credit payment when given the start-up capital to engage in micro businesses than men. These studies concluded that women become less risky when group lending methodology was used to mitigate the credit risk effect.

Weber and Musshoff, (2012), based their study on microcredit given to farmers in Tanzania by Access Bank Tanzania Ltd. Their findings led to the evidence that a high proportion of farmers were women and were often less delinquent when it comes to meeting the loan obligations. Their study also revealed that women groups are faced with the obstacle of assessing credit. Nonetheless, they are trustworthy when it comes to repayment. As females are exposed to numerous risks and keep on adding risk upon risk, they improve their managerial capability and

are capable of managing their assets to bring the best of yields, thereby making quick payment of the loan they contract. This managerial capability is acquired through periodic visits and meetings by loan officers, organization of workshops and training programmes for the female borrowers. In so doing they are able to increase yields which in turn enhance their loan repayment performance.

However, recent works indicate that there is no significant relationship among repayment and gender when other factors are controlled. That is, the improvement in female lower delinquent rate is motivated by other non-financial services (Godquin, 2004). Furthermore, Godquin, (2004) in assessing how MFIs can improve upon their loans allocation in Bangladesh, found no justification for the primacy given to female borrowers in micro financing. The result of the study they conducted proved that female borrowers have an insignificant impact on loan settlement contrary to what other studies have proven. He argues that better repayment performance by females could be as result of the small amount of the loan given them. Hence the enhance repayment rate by female borrowers is motivated by other non-financial services. Amare and Bekabil, (2008) examined group lending methodology and livelihoods of small scale farmers in Ethiopia in relation to the loan repayment rate among these farmers. Their investigation found that females are not significant in loan repayment, and they being members of microfinance have no positive impact on the management of the loan portfolio. In the case of the United States (Bhatt & Tang, 2002) found no significant result with respect to gender repayment, when they examined the lending methodologies. Armendariz and Morduch, (2005) also argued that MFIs in Indonesia's scope of operation was not focussed on gender, female borrowers nevertheless attain a perfect repayment rate.

On the other hand, Nawai and Shariff (2012) studied the determinants of loan settlement performance of microfinance institutions in Malaysia. They used the multinomial logic regression model to analysis 309 respondents and found contradicting results in previous studies which confirm that female borrowers are less delinquent in paying back loan than male borrowers. Nevertheless, they explain that their outcome could be as a result of correlated risk such as the death of a husband, disruption of business activities through child birth or they became risk seekers and ended up in engaging high in risky businesses. Possibly the debates of women being better credit clients are not that definite. The fact that earlier studies are limited to certain geographical areas and institutional focus requires a relook at the gender and repayment issue at a region level (Sub Saharan Africa). Though other studies have examined the issue at the global level, the sample sizes of these studies were small and repayment may stem from compulsory practices that are more dreaded by women than men. Therefore, there is the need to re-examine the fact in a different context.

3.3.2 Capital Structure (leverage) as a Determinant of Loan Portfolio at Risk

The microfinance (MF) industry from its inception has depended on grants and subsidies to provide financial support to the minority group within the society, Yaron and Manos, (2007). This is intended to improve upon capacity building of the less developed countries by using funding from donor agencies. However, for sustainable service provision to the poor minority by MFIs, they themselves should be sustainable since MFIs that can't support themselves are bound to fail Tehulu, (2013). Thus, subsidization of MFIs will not help them meet their obligation of poverty alleviation in the future, if they do not attain self-sufficiency. In that regard, MFIs have shifted towards diversified ownership of the institutions rather than being State-owned

Development Finance Institutions, in order to attain its objectives of serving the poor Yaron and Manos, (2007). Therefore operational self-sufficiency (OSS) and financial self-sufficiency (FSS) have been the focus of most MFIs. 'Financial Self-Sufficiency indicates whether or not enough revenue has been mobilized to cover both, direct costs - including financing costs, provisions for loan losses, and operating expenses - and indirect costs, including the adjusted cost of capital while operating self-sufficiency is a percentage (%), which indicates whether or not enough revenue has been mobilized to cover the Microfinance Institution's (MFI's) total costs – operational expenses, loan loss provisions and financial costs' as defined by Arunachalam, (2006). With this in mind, evolving MFIs have embraced a more economically-oriented approach in their operations. This comprises sourcing finance by making and retaining earnings, setting up mechanism to minimize loan loss, increasing the outreach drive and increasingly borrowing from commercial sources at market rates.

Kyereboah-Coleman, (2007), in his analysis of capital structure on the performance of microfinance firms, came to the conclusion that MFIs, which enjoy economies of scale minimize moral hazards and adverse selection as a risk through managing ability and also perform better in their outreach drive, are highly leveraged institutions. Thus enhancement of the operations of an MFI in attainment of sustainability is the combination of debt and equity deemed fit by the institution. Nawaz (2010) studied the role subsidy plays in the performance of microfinance from an audited report of 204 MFIs from 54 countries. His study reveals that some of the MFIs depended on subsidy. In the year 2005, 153 MFIs out of 204 depended on subsidy and 122 out of 179 MFIs in 2006 were also subsidy dependents. The study also proved that MFIs which are not subsidy dependent have a decline in performance. The later finding contradicts the former which confirmed better performance of MFIs via self-sufficiency. Adding to our understanding,

Hermes and Lensink, (2011) mention that most MFIs are using a poverty lending approach which focuses on alleviating poverty through the provision of credit with subsidized interest rates rather than the financial system's approach which stresses financial sustainability, where MFIs are able to cover the lending money cost out of income yield from loan outstanding portfolio minimize operational cost. Hermes and Lensink alluded to the fact that although 70% of the world's MFIs are subsidy driven, the promoters of financial self-sufficiency are seemingly winning the debate of MFIs attaining financial sustainability. This means that while the majority of MFIs are subsidy dependent, the objective of moving from a subsidising financial institution to a self-supporting finance firm have been the core focus of MFIs. Capital structure influences the credit risk administration of banks and other financial institutions, as proven by numerous studies. Nonetheless studies in the microfinance industry on these issues are scarce.

Cebenoyan and Strahan, (2004) in their study of active credit risk management by banks through the loan sales market found that banks who have improved their capacity and credit risk management's ability are highly leveraged and take the risk of lending to risky borrowers. That is banks with thin capital end up taking more loans which will probably lead to problems loans. Louzis et al. (2012), also conditioning leverage on size, found a positive effect of leverage on credit risk. Their study reveals that, as banks add up to their capital structure through leverage, they end up putting their loan portfolio at high risk. However, their study made it clear that at certain limit leverage provision on size does not have any effect on credit risk. That is, larger firms are able to diversify their investment, hence are able to manage economic crises.

In continuation, Chaibi and Ftiti, (2015), though they expected a positive impact from leverage on loan quality, and their result proved positive in the Germany economy, when they compared the market based economy of France with the bank based economy of Germany. This reflects the

firm's ability to maintain a level of financial discipline. Chaibi and Ftiti also confirmed that leverage has no significant effect on credit risk in the economy of France. Their finding on the Germany economy confirm the capital structure agency cost theory which depicts that management is likely to undertake risky projects when they are highly leveraged, since it will allude to the benefit of shareholders when the project is successful as against debt holders when the project fails. Consistent with this view, Ahmad and Ariff, (2007) saw that leverage has no correlation with credit risk. Gallo, Apilado, and Kolari, (1996) studied the mutual fund activities of commercial banks and its effects for bank risk and profitability over a period of 1987 to 1994. Though they found out that mutual fund provides a productive avenue for expansion for banks, their work was also consistent with Chaibi and Ftiti and also with Ahmad and Ariff who found no significance between credit risk and leverage. That is banks operating with high leverage are not affected with credit risk as other factors affect the loan portfolio.

Most studies in the banking sector have found mixed results between leverage and credit risk without a conclusive effect. Furthermore, little or no work has been done to look at the effect of leverage on the loan portfolio in the microfinance industry. Our study seeks to assess the effect of leverage on loan portfolio as the industry moves from a subsidy based microfinance institution to a self-sufficiency microfinance institution. The study therefore assessed leverage as a determinant of loan portfolio at risk of 162 MFIs from 28 countries within the Sub-Saharan Africa Microfinance Information Exchange (MIX) database.

3.3.3 Management efficiency and Loan Portfolio Quality

Economic resources are scarce by nature, as stated by the founding fathers of economics. Therefore the management of these scarce resources to attain a higher yield is the concern of most investors. As a result, efficiency has become an important element in the operational activities of businesses due to economic inputs being scarce. Efficiency is the ability for one to lessen the volume of waste during production or service rendering. This helps in creating value from scarce economic resources. Since efficiency is about the output to input ratio, its assessment and measurement leads to the improvement in services rendered and productive. Efficiency strategy can be alternated through various means, such as same for less, i.e. same outcome for less effort, more for same, i.e. more result for same effort, and much more for more, i.e. much more end result for more effort. Efficiency improvement does not only deal with cost cut as the 'same for less' alternative has alluded to, but efficiency can be increasing cost for a corresponding increase in output, which is the objective of the latter two alternatives (investopedia.com).

Labour and management efficiency in credit risk administration has been the focal point of most researchers. These studies looked at the management and labour ability to manage and control cost when handling loan portfolio. In line with this, Berger and DeYoung (1997) found that banks with bad management of cost are likely to face high problem of loans in the future. Berger and DeYoung state that banks that skimp in order not to ensure higher loan quality tend to look efficient. However they end up in facing a high level of loan problems in the future. Their study discloses a negative influence between cost efficiency and credit risk. They specify their reasons for this result as those inefficient banks have problems controlling the internal costs and are not able to appraise their bad loans well. Berger and De Young further detail that problem loans

occur as a result of uncertainty beyond the control of these banks, which lead to cost efficiency as they have to devote much input to make up for the problem loans.

Chaibi and Ftiti, (2015) in their cross-country analysis compared commercial banks in the market based economy of France with Germany's bank-based economy, their study supports the bad management hypothesis and confirms the outcome of Berger and DeYoung, (1997); Podpiera and Weill, (2008); Louzis et al., (2012) when the coefficient of efficiency proves to be positive and statistically significant for the French market based economy. This indicates that low cost efficiency leads to a rise in loan portfolio at risk. Nonetheless, the result from the Germany bank based economy suggests otherwise; Chaibi and Ftiti found that in the Germany economy, inefficiency does not lead to a higher rate of loan problems, they show that there is insignificant influence between credit risk and efficiency, and the coefficient indicates negativity. They went ahead and confirmed that though there is a negative relationship, the possibility of problem loans increasing with short-term efficiency is high.

Louzis et al, (2012) studied factors that influence non-performing loans in the Greek economy by having a comparative analysis of mortgage business and consumer loan portfolios. Their study is also in line with Berger and DeYoung, (1997; Podpiera and Weill, (2008) when they buttress the 'bad management' hypothesis by finding a positive coefficient index of efficiency and a statistically significant relationship for all the groups of problem loans they studied. Poor skills of management are evidence via the ability in assessing collateral pledged by borrowers, credit scoring and monitoring debtors.

Skills of management have an influence on loan repayment. The ability for MFIs to institute firmer or more forcible enforcement methods can lead to high repayment. Furthermore, MFIs operating on trust and responsibility reposes confidence in their customers, leading to a low default rate. D'Espallier et al., (2011) found an insignificant relationship between credit risk and management efficiency after analysing 350 MFIs from 70 countries at the global level. Meaning the experience of management in credit risk administration is not significant when it comes to loan repayment. Ntow-Gyamfi and Boateng (2013) found that better credit risk management by management has a negative link with the loan default rate. That is when there is an improvement in credit risk management it result in a low loan default rate.

Education of MFIs managers leads to enhancement in their managerial performance. However studies done on management and staff efficiency focussed much on the banking sector, leaving the microfinance industry. Furthermore, these studies were done in developed economies (Berger & DeYoung, 1997; Podpiera & Weill, 2008; Louzis et al., 2012). A study that looked at the less developed economies was D'Espallier et al., (2011). Even their study examined a combination of developed and developing countries when they assessed management quality as a determinant of loan portfolio risk in the MF industry. With an expectation of a positive effect of efficiency on credit risk in the MF industry, we focussed our analysis on a regional base as we determine efficiency as a factor that influences loan portfolio quality.

3.4 Macroeconomic Variables that Influence Loans Portfolio at Risk Used in the Study

3.4.1 Economic Growth and Its Impact on Loan Portfolio at Risk

The economic health of a country, in addition to the wellbeing of the citizens, is estimated using the gross domestic product (GDP) indicator. The GDP indicator helps assess the standard of living of a country, since it represents the size of the economy. Specifically GDP represents the production and growth of an economy which has an effect on the citizenry of a country. Meaning, a significant change in the GDP, whether an upward or downward trend, have a significant effect on the profitability of companies and citizens of a country. A bad economy usually means lower profits for companies, which subsequently affect the performance of these companies. In view of this, a lot of studies in the banking literature have examined the connection between the macroeconomic environment and credit risk. The hypothesis of this has showed that during periods of economic expansion it results in a decline of problem loans, since both consumers and corporate institutions are able to service their debt via income and revenues generating activity. Nevertheless, credits are extended to less viable credit clients as the economy keeps on growing, making the loan portfolio highly risky during economic recession. Furthermore, Carey 1998 argues that diversification of debt portfolio losses is sometimes induced by the state of the economy.

Chaibi and Ftiti, (2015), control for the macroeconomic cycle using GDP growth. Their study proves a highly significant and negatively correlated result for both GDP growth and problem loans in both France and Germany. Their study also indicates that banks that are more vulnerable by adverse macroeconomic shocks have smaller non-interest income, as evident in the French banking economy. There have been other experimental studies which endorse the aforementioned association among the economic cycle and credit defaults. Louzis et al., (2015)

found that the real GDP growth has a high effect on business NPLs in the Greek banking system. Castro, (2013), using a large panel of banks in Greece, Ireland, Portugal, Spain and Italy (GIPSI) concludes that the macroeconomic environment affects bank credit risk significantly. Louzis et al., explain that when there is a decrease in the growth rate of the economy (GDP growth) it in turn increases the credit risk. Alhassana, Kyereboah-Coleman, and Andoh, (2014), in their examination of asset quality of banks in Ghana during crisis period, had a consistent result when they found a negative influence between non-performing loans and gross domestic product growth rate (GDP rate). This implies that the quality of a bank's assets is not likely to devalue during periods of high economic growth.

Badar and Javid, (2013), also assessed the long and short run dynamics between non-performing loans and macroeconomic variables of commercial banks in Pakistan for the period of 2002 to 2011. Their study found that no bivariate co-integration exists between *NPL* and Gross domestic product (GDP). That is, there is no stationary relationship among GDP and credit risk, an upwards or downwards movement of one will have a significant effect on the other. The Jamaican economy was not left out, when Marlon Tracey in her draft article found the relevance of economic growth in determining credit quality. Her study proved that economic upturns favour loan portfolios quality for commercial banks in Jamaica. Ganbaatar and Selenge, (2012) argue that GDP growth is stronger explained of NPL growth. Their work found a positive connection between GDP and non-performing loans for small and middle banking institutions, whereas their estimation had a negative relationship between larger banks and credit risk.

The above literature has indicated that the progress of a country is measured by the growth in GDP. Therefore, in improving the economic growth of developing countries the microfinance scheme has been introduced to help shape the economy. However all the studies cited above,

assessed the impact of GDP on credit risk in the banking sector, more especially these studies were done in developed economies. Little work has been done in the microfinance (MF) industry. Within the MF sector Crabb and Keller, (2006) control for a macroeconomic variable by using GDP growth and found a negative but significant influence between credit risk and economic growth (GDP growth). Our study therefore controlled for GDP growth within the MF industry by assessing the impact of GDP growth on credit quality in the microfinance industry within Sub Saharan Africa

3.4.2 Inflation as a Determinant of Loan Portfolio at Risk

In economics, inflation is the percentage variation in the value of the Wholesale Price Index (WPI) in an economy over a period of time ([www.investopedia](http://www.investopedia.com)). Inflation efficiently assesses the variation in the prices of a basket of goods and services in a year, when the price level increases with respect to a unit increase in the currency and purchases of a smaller amount of goods and services. Therefore, inflation shows a decrease in the purchasing ability per unit of money, a loss of real value in the standard of exchange and unit of account in the economy. There is a varied repercussion of inflation on credit risk. Debt servicing can be made easier for two main reasons, when inflation is higher. Castro, (2013) suggests that when inflation is higher it is connected with an increase in the employment rate. Also real value of outstanding loan is reduced. Higher inflation furthermore causes a decline in the debt servicing behaviour of borrowers as a result of a reduction in their real income. Nkusu, (2011) also found that inflation can unpleasantly affect debtors' credit servicing due to monetary policy to fight the inflation. Additionally, rates adjustments made by bankers to cushion their real returns also affect the

repayment capacity of borrowers. Subsequently, there is a mixed association between credit risk and inflation, which can either be positive or negative.

In general, evidence of either the positive or the negative impact of inflation on credit quality in the microfinance industry is weak at best. Chaibi and Ftiti, (2015) had a mixed result when they studied two economies, thus the German and French economies. Their study indicates a significantly negative coefficient of the inflation rate on credit risk in the German economy. Chaibi and Ftiti (2015) explain that the real incomes of borrowers are reduced in the German economy as a result of high inflation which in turn affects their credit servicing ability. Their study also proves that inflation is not significant to credit risk in the French economy. The finding of Chaibi and Ftiti (2015) on the French economy is consistent with that of Castro (2013) who had a null impact result of inflation on credit risk. That is, the inflation variable has no significant influence on credit risk. Castro was of the view that inflation does not only depreciate the real value of the unsettled loans, but additionally affect the real income of the credit clients.

Badar and Javid (2013) used a Granger causality test to evaluate the association between inflation and credit risk. There was Granger causality between inflation and non-performing loans as revealed by their work. However, they also had a mixed result when they explored the short run dynamics by using a vector error correction model. Their study proves that in the short run inflation has a weak relationship with non-performing loans. This helps to draw attention to the fact that the macroeconomic environment has an impact on the determination of credit quality. In the draft work Marlon Tracey, it was proved that inflation plays an important role in shaping loan quality in the banking sector. Her draft work showed that the adverse effect of inflation is prominent in the Finance Institution Acts loan portfolios. Alhassana, Kyereboah-Coleman, and Andohaa (2014) found a positive influence between inflation and non-performing

loans in the Ghanaian banking system. Their finding was in line with the studies of Fofack (2005), who examined the causes of credit risk that affected a number of countries in the Sub Saharan Africa during the banking and economic crises in the 1990s. The increasing level of inflation affected the ability of consumers to make purchases, as the amount of goods and services they consume have been restricted as a result of high inflation. This affected the capability of loan customers to service their debt, as they cannot easily turn their goods over to generate enough revenue. Crabb and Keller (2006) also found a negative significant result of inflation when they tested for portfolio risk in MFIs for a Christian organization seeking to assist the poor and empower women.

Unforeseen inflation leads to a decline in real rates of return for MFIs, which in turn hinder the MFI lending mission. Inflation causes MFIs to insulate their risk by building conventionally large inflation premiums into interest rates. Inflation also impacts the motivation for borrowers to make repayment, which results in a higher default rate. Likewise the cost of funding by MFIs is affected by inflation. Though a lot of studies have extensively looked at the effect of inflation on loan quality in the banking sector, little work has been done in the MF industry. Our studies therefore controlled for inflation as a determinant of portfolio at risk in the microfinance industry within the Sub Saharan Africa region.

3.5 Chapter Summary

In conclusion, the chapter noted that a portfolio at risk is based on (Sharpe, 1963; Markowitz, 1959 and Hamada's 1972) proposition that managers' compensations are made when they add on more risky loan. This also may lead to effective allocation and distribution of loan. Furthermore

adding more risky loans may result in a higher default rate of loans in the MF sector. There again, issues relating to loan portfolios at risk were discussed. In discussing loan portfolio at risk, the work of Zechner and Aldrian (2000) was reviewed. They indicate that there is a linear connection between risk and return. The linear connection between risk and return showed that investors' expected returns could be increased via increasing their risk following the CAPM securities, where higher risk are associated with a higher return, compensating the investors' risk taking ability. Empirically, the chapter reviewed works such as Godquin, (2004) and Crabb and Keller, (2006) and highlighted significant relationships between credit risk and its determinants. Hence, in this study, arguments laid out were structured in a manner that highlighted what is ideally expected in the course of this study.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter describes the research methodology. It identifies the type of study to be carried out, the research methodology and the reasons for such a methodology. Besides, this chapter unveils details and justifies the methods to be followed in achieving the set objectives of the study. The chapter begins with the specification of the model for the study, and then goes ahead on the definition of the variables specified in the model. Justification for the variables employed is therefore explained. The data analysis tools and techniques are detailed and the sample and sources of data for the study are explained finally.

4.2 Model Specification

The research seeks to empirically find out the determinants of loan portfolio at risk in microfinance institutions of countries in the Sub Saharan region of the Africa continent considering the period of 2000 to 2012. This study adopted the use of panel analytical tools to accomplish the set objectives. The significance of appreciating the reasons behind the time series variation in the finance industry, beside those that form the cross- country variation, cannot be over stressed. Knowing the significance of the time-series variation of credit risk in the financial sector in these modern times, an empirical research into its determinants must be able to justify variation across firms and over time. The study employed panel data techniques to give evidence of the effects or contributions of any of the determinants of loan portfolio risk in the microfinance institutions in Sub Saharan Africa region.

Panel data estimation tends to produce more conclusive results than cross section analysis and classical time series analysis, since it includes both the cross section and time dimensions of the data. It can also be used to address more multifaceted issues with panel data than would be possible with pure time-series or cross-sectional data alone. Also, it allows us to control unobserved country-specific effects and deal with the impact of omitted variables bias, and look at both long-term and short-term effects (Stock & Watson, 2001; Brooks, 2008). Following previous work the model is specified below;

$$PaR30_{it} = \alpha + \beta_1 fem_{it} + \beta_2 lev_{it} + \beta_3 lsty_{it} + \beta_4 Ineff_{it} + \beta_5 \log Clt_{it} + \beta_6 ExtSav_{it} + \beta_7 GDP_{it} + \beta_8 infl_{it} + \varepsilon_{it}$$

PaR30, Portfolio at risk, is the ratio of ‘unpaid principal balance of all loans with payments past due (1 to 30 days and more) to total gross outstanding loan portfolio (sum of principal outstanding of all loans)’, *fem*, female, is the percentage of female borrower to total borrowers of the institution under study. *lev*, represents leverage, which is estimated as total debt to total asset. *lsty*, loan intensity, measures the risk exposure of the MFIs which is proxied as gross loans to total asset. *Inef*, inefficiency (expense management) is operational expense to total asset. Furthermore, *LogClt*, monitoring and borrower growth by the MFIs is measured as the log of active numbers of borrowers. *ExtSav*, is proxied by deposit to loans, used as a measure of savings made in relation to loans by borrowers. The economic health was measured using gross domestic product (GDP) and inflation. *With* ε_{it} being the error term, which when decomposed will be $\varepsilon_{it} = \mu_i + v_{it}$, where μ_i is the individual specific effect and v_{it} is the disturbance term that varies over time and entities.

4.3 Definition and Justification of Variables

This research work undertook to classify key variables that influence loan portfolio quality in MFIs within the Sub-Saharan Africa region. Variables selection was guided by previous studies on credit default and loan repayment within the industry. These variables helped in determining the factors that influence or affect loan portfolio quality. They were classified as dependent variables, independent variables and independent controlled variables.

4.3.1 Dependent Variables.

4.3.1.1 Portfolio at Risk

Portfolio at risk (PaR) can be discussed as the delay in repayment or non-payment of loans when their obligation falls due. The default, which can be complete or partial, is primarily that of the borrower. This risk includes principal and interest lost, which leads to the disruption of cash flows and increased collection expenses. This affects the compensation of lenders, since they are rewarded for assuming credit risks by way of interest payments from the debtor. In view of previous literature, loan defaults have been measured either by forward looking or backward looking approaches by Bushman and Williams (2012) and Castro (2013) respectively. Chaibi and Ftiti, (2015), in their study, estimated loan default as impaired loans as a ratio to total asset.

However our estimation of credit default was proxied by portfolio at risk (PaR). Crabb and Keller (2006) and Boehe and Cruz (2013) used this estimation in their studies. (PaR) measures the ‘percent of the total loan portfolio that has at least one payment overdue by more than 30 days’ Crabb and Keller (2006). Again, this proxy is deemed suitable for this research since it is obtained right from the MIX market database. It was estimated as the ‘value of all loans

outstanding that have one or more instalments of principal past due more than (1 to 365) days'. Furthermore, it accounts for the total unpaid principal balance as well as both past due and future instalments, but excludes accrued interest. This measure also includes restructured loans. Moreover, (PaR) is a strict and corrective way of assessing MFI's risk performance. Also PaR is an accurate measure because it does not only estimate the volumes of payment at risk but the overall risk of the institution's loan portfolio. This measure is deemed efficient in this research since it is a robust credit risk estimator that provides a richer view of a firm's credit condition and financial strength in the microfinance industry. In our estimation we used unpaid loans which were 30 days old, over those which were 90 days old. This was to capture the impact of default, since the 90 days loan PaR will not give a fair view of the credit risk situation's due spread.

(total loan outstanding overdue within 30days / total outstanding loan)

4.3.2 Independent Variables.

4.3.2.1 Female

Differential treatment among genders in terms of lending has led to diverse views as to which gender is creditworthy or has a high loan default rate. Studies have found mixed results (Godquin, 2004; Bhatt & Tang, 2002; Nawai & Sheriff, 2012; Papias & Ganesan, 2008; Mohd Zaini & Roslan2009). Whilst some are of the opinions that women are higher credit risk clients compared to men, Crabb and Keller (2006); Papias and Ganesan, (2008), others found otherwise (Godquin, 2004; Bhatt & Tang, 2002). D'espallier et al, (2010) in their study found that females are better credit clients than males. Likewise, the empirical work of Crabb and Keller (2006) also

suggests that women have a lower delinquency rate when it comes to loan repayment. Papias and Ganesan, (2008), empirically found that 80% of females as compared to 20% of males in the Rwanda MF market are credit worthy. Nonetheless, Bhatt and Tang, (2002) found an insignificant effect of female on credit risk when they studied the American MF market. Moreover, Godquin, (2004) found an insignificant relationship between genders and repayment in the microfinance market of Bangladesh. Armendariz and Morduch, (2005) also argued that the MFIs in Indonesia's scope of operation did not especially target women, but that female borrowers nevertheless attained a perfect repayment rate, making the target of females insignificant in relation to credit risk management. Amidst all these reasons, most MFIs focussed on women rather than men in granting loans. We therefore wished to ascertain the extent to which credit is loaned to females in SSA and its effect on the loan portfolio quality.

The study expects a negative relation between female and loan portfolio risk. This negative relation is expected following the work of Crabb and Keller, (2006) and D'espallier et al, (2010), and is measured as percentage of female borrowers to a total number of borrowers.

$$\left(\frac{\textit{Female Borrowers}}{\textit{Total number of Borrowers}} * 100 \right).$$

4.3.2.2 Leverage (Asset Management)

Leverage gives an idea of how a firm finances its daily operational expenditure. This can be a mixture of long term debt and the equity that a business uses to finance its day to day operations. (www.investopedia.com). Furthermore, the financial health of a firm can be assessed by the type of financial mix the firm employs in its capital structure decision making. Leverage can possibly

increase a firm's gains and losses if the firm invests with borrowed money (Lousiz, ?et al., 2012). Thus both the risk and the value of a firm can be affected by leveraging. Chaibi and Ftiti (2015) state that, highly leveraged capital is associated with high risk since one has to gain high returns. Therefore, there is the need to assess the impact of leverage as a determinant of PaR in MFI. In the evaluation of financial health, Tehulu (2013) uses the debt to equity ratio in his studies.

To capture leverage in our estimation, we used data from the MIX market, where leverage is total debt to asset ratio. Following the work of Louzis et al. (2012) and Chaibi and Ftiti (2015), the study expected a positive relationship between leverage and loan portfolio risk, since debt ratio is the most commonly used leverage ratio in ascertaining the financial health of a firm. Furthermore it captures the total debt (short and long term debt) employed in funding a business. Moreover the debt ratio estimator helps in assessing the amount of debt used in financing a business as against the equity invested by shareholders and the total asset of the firm, is also simple to calculate; that is a proportion of total debt to total asset.

$$(\mathbf{Debt\ Ratio = Total\ liabilities\ to\ Total\ Asset}).$$

4.3.2.3 Extent of Saving

Like compensating the loan balance of banks, extent of saving serves as a surety from borrowers to lenders through the regular deposits made in relation to the loan acquired by the borrowers. The deposits made by borrowers in relation to their loans are used to offset their loans.

Intuitively, as borrowers make regular deposits in relation to their loans, it is expected that the loan default rate of loans reduces. As MFIs necessitate money to be deposited to offset their loans, they are able to undertake investment drives and also grant other loans, which are likely to

yield lower interest rate, thereby making repayment of loans easier for borrowers. However, if there is a drop in deposits to loans, the interest rate will be adjusted, leading to difficulties in repayment. This study therefore proxy for extent of saving by borrowers, using deposit to loans. Inferring from Crabb and Keller, (2006) this variable was included in our study

$$\textit{Extent of Saving} = \textit{Deposit to Loan}$$

The following control variables were included in the regression. These control variables are deemed to actually contribute to the determinants of portfolios at risk in microfinance institutions in most countries and especially those selected for the study in Sub-Saharan Africa.

4.3.2.4 Inefficiency (Expenses Management)

Quality of management is proxied by inefficiency. This measure is used as a meter in assessing the capability of management to control cost. Inefficiency is estimated as the operation expenses to total asset, following the work of Tehulu (2013) and Athanasoglou, Brissimis and Delis, (2008).

$$\textit{inefficiency} = \frac{\textit{operation expenses}}{\textit{total asset}}$$

Increase in credit default can be caused by a highly measured efficiency term as skimping by (Louzis et al; 2012). Also, Ntow-Gyamfi and Boateng (2013) suggest that best management practices could lead to a decline in loan default rates. Likewise, Athanasoglou et al. (2008) suggest that improvement in expenditure management leads to efficiency while inappropriate management of expenses results in inefficiency. D'Espallier et al., (2011) find an insignificant relationship between credit risk and management efficiency. The empirical result of Louzis et al;

(2012) is in line with Berger and DeYoung, (1997); Podpiera and Weill, (2008), when they found a positive coefficient and a statistically significant association between credit risk and efficiency. That is, low quality of skilled workers in the lending business can result in a high rate of loan PaR in the Micro finance industry. Likewise a qualified labour force will minimize the effect on PaR. Consequently, the relationship between inefficiency and PaR can be positive or negative.

4.3.2.5 Monitoring (Number of Outstanding Clients)

Deficiency of suitable information flow, as well as inadequate monitoring of clients and loan officers can have an adverse effect on the portfolio quality in the long term (Wright, Arunachalam, Sharma & Moulick, 2006). This insufficient information about clients is serious and could result in difficulties in identifying and tracking bad loans (Crabb & Keller, 2006). This issue creates a challenge in sustaining an operative credit administration systems and good portfolio statistics. The lack of appropriate information systems could mean that MFIs will not be able to recognize delinquency in their portfolio and consequently may not make any efforts to tackle it (Wright, et al., 2006).

In so doing, MFIs will have mounted strategies to address information difficulties from clients. This helps in effective and efficient monitoring of clients, which in turn leads to better repayment. In order to minimize the information deficit from clients, MFIs institute various lending methodologies to serve as control for information deficiency. Methods such as the village banking and group lending were introduced to curb information asymmetry (Crabb & Keller, 2006).

The group lending programmes have minimized cost of selection, monitoring and enforcement of loan repayment since all these functions have been transferred from the supply side to the demand side, Amare and Bekabil (2008). The introduction of the borrower group has served as a core value, guiding financial trades of MFIs because group liability and peer monitoring are all embedded in this system of monitoring.

Crabb and Keller (2006) state that MFIs that lack adequate monitoring will have higher risks. In measuring MFIs monitoring ability, Crabb and Keller (2006) proxied monitoring with number of outstanding clients. Their study proved significant and showed a negative relationship between monitoring and credit risk. Other studies have given evidence of a significant relationship between monitoring and credit risk using the lending methodology (Al-Azzam, Hill & Sarangi, 2012; Chatterjee & Sarangi, 2004; Wydick, 1999). Our study is therefore controlled for monitoring by proxy with the *logarithm number of outstanding clients* and also expected a negative relation between number of outstanding clients and loan portfolio risk.

4.3.2.6 Loan Intensity (Volume of Loan)

The loan amount is the maximum amount that a lender is willing to lend to a borrower. This gives a limit at which a borrower can secure loans. The maximum loan volume is based on a mixture of different factors, involving the specific loan scheme, the value of the property that serves as collateral for the loan and the borrower's qualifying ratios and credit records. Lenders naturally offer various loan programmes with maximum loan volume designs for different classes of borrowers (www.investopedia.com).

The amount of loan initially given to a borrower by MFIs is often small and far below what the client wants and can handle,(Rosenberg, 2010). However, the initial amount the MFIs lend to borrowers naturally reflect, not the client's ability to use and make repayment, but rather the MFI's risk management policy, (Rosenberg, 2010). This loan amount has led to multiple-indebtedness in the MF industry, which may or maybe be strongly correlated with repayment performance. MFIs extends loans which are too small for clients, compels them to go to multiple MFIs to apply for extra loans that suit their needs and repayment capacities. This leads to multiple indebtedness and makes repayment difficult for the borrowers.

Furthermore the loan size has been used as MFIs' risk management policy (Crabb & Keller, 2006). That is, MFIs give out little amounts of loans initially, and after they have succeeded with a better repayment performance they loosen their requirements for extending loans. This enables clients to choose the range of loan size that fits their needs and that they can repay with ease. Borrowers may go through a lot of hassle to meet their loan commitment, as the volume of loan is increased by the lenders. In addition, due to the incremental penalty rate of interest to be paid on the default loans after a definite period, borrowers with a large volume of debt will face a higher penalty cost associated with defaulting (Amare & Bekabil, 2008).

Likewise, Weele and Markowich, (2001) find that as countries experience high inflation, their currencies depreciate since loans extended to clients are indexed to U.S. dollars. This results in repayment problems by the client when the volume of loans increases. Papias and Ganesan (2009) prove a negative relationship between credit risk and loan size. Their study statistically supports the fact that credit risk decreases with a decrease in the magnitude of loan amount.

Making loan size an important determinant of loan portfolio at risk, Crabb and Keller (2006) found a negative connection between amount of loans and credit risk. Our study extended findings on the factors that determine loan portfolio at risk, since most studies have not given us the full story of the impact of loan amount on credit quality.

The loan intensity variable measures volume of loan obtained by borrowers. As the volume of loans increases, MFIs may lose track of their risk management strategy and this can lead to loan crises. Borrowers may also default as a result of hyperinflation, which hinders their ability to generate income to fund their loan obligation. In our estimation, volume of loan given to borrowers was proxied by loan intensity. This was to help us assess the impact of volume of loan on credit risk. Adopting the model from Tehulu, (2013), the proxy for amount of loan was estimated as follows:

Loan intensity = gross loan portfolio to total asset

Our expectation anticipated ambiguity, since the relationship between Amount of loan and NPLs can be positive or negative.

4.3.3 Macroeconomic Variables

Some of the critical reasons that affected our decision of including macroeconomic variables in our analysis comprised: the challenging economic situations that these countries are facing, the presence of increasing levels of public deficits and debts, but also the problems accumulated as a result of seeking external sources of funds to finance their economies. These hostile economic conditions may affect the loan quality negatively thereby causing an upsurge in the risk of credit

default in these countries. Hence, it becomes necessary to include macroeconomic variables in our study to assess how macroeconomic variables affect loan portfolio in MFIs.

4.3.3.1 Gross Domestic Product Growth

GDP growth was controlled in the model to represent the cycle of the macro economy within the country. Relative to GDP, defaults in loans are less when there is an increase in GDP growth, which leads to expansion in the economy. That is, expanding growth in business, in jobs and personal income lead to borrowers servicing their debts, however there is a decline in debt servicing if there is economic recession. This variable was included on the grounds that economic growth has that indirect potential to alleviate poverty, thereby reducing credit default. If there is economic growth, the portfolio at risk will decline (Crabb & Keller, 2006). We expected a negative association between defaults in loans and GDP growth.

4.3.3.2 Inflation

Inflation is estimated as the annual change in the gross domestic product (Aggarwal, 2006). The deleterious effects of inflation on loan portfolio quality have been supported by a reasonable amount of literature at the time when most of these studies were done. The focal association of the results is that poor macroeconomic performance has unfavourable effects on loan portfolio quality. Studies have shown that inflation has mixed repercussions on loan portfolio at risk (Crabb & Keller, 2006; Castro, 2013; Chaibi & Ftiti 2015). Outstanding loans' real values are reduced, whereas servicing of debts by borrowers is worsened, when inflation is high (Castro, 2013; Chaibi & Ftiti 2015). The capacity of borrowers' loan servicing deteriorates under high

inflation due to inflation combating mechanisms like monetary policy and lenders rate adjustments as a means of maintaining their real returns (Chaibi & Ftiti 2015). Following other similar studies on the effects of inflation on credit risk, we also hypothesized that the coefficient of inflation is to exhibit a positive or negative effect on the dependent variable.

Table 4.1 Expected Summary of Variables

Variable	Symbol	Definition of variable	Expected Sign	Source
1. Portfolio at Risk>30	<i>PaR30</i>	The level of credit risk		MIX Market
2. Leverage	<i>Lev</i>	Total debt to total asset ratio	+	MIX Market
3. Gender	<i>Fem</i>	Percent of female borrowers to total number of borrowers	-	MIX Market
4. Inefficiency	<i>Inef</i>	Operation expenses to total asset	+/-	MIX Market
5. Outstanding clients	<i>logCl</i>	Log of number of outstanding clients	-	MIX Market
6. Extend of Saving	<i>ExtSav</i>	Deposits to loan ratio	-	MIX Market
7. Loan intensity	<i>lsty</i>	Gross loans to total asset	+/-	MIX Market
8. GDP growth	<i>gdp</i>	Growth rate of real GDP, in percentage terms	-	WDI
9. Inflation	<i>Infl</i>	Inflation rate, in percentage	+/-	WDI

4.4 Data Source

The data source for our empirical analysis is adopted from two main sources. Our financial data was obtained from the Microfinance Information Exchange (MIX) database, while our economic data were extracted from the World Development Indicator (WDI) database. The Microfinance Information Exchange (MIX) was the principal source for financial and social performance data in the MF industry. MIX is the primary source for impartial, qualified and relevant information on microfinance data and analysis. Committed to the solidification of the financial inclusion and the microfinance sector by promoting transparency, MIX provides impartial, qualified and important information on microfinance institutions (MFIs) (www.mixmarket.org). MIX fulfils its aims through a variety of platforms. On MIX Market (www.mixmarket.org), they offer immediate opportunity to financial and social performance information covering more than 1,900 MFIs around the world. Data in relation to MFIs specified were sourced from the MIX market for our study.

In conducting our investigation, we concentrated solely on MFIs that had reported on their financial standing at the mix market for the period under study (2000 to 2013). The choice of MFIs data was driven by the quality of data reported by MFIs at the MIX market due to the fact that they have audited and certified financial statements. In all, a total of 614 MFIs data from 31 countries in Sub Saharan Africa were extracted from the MIX market. The studies focus primarily on MFIs with a dependable financial data for the period of consideration. Using filtering criteria of a minimum of 5 years and above for our sample selection, we allowed a final sample of 162 MFIs from 28 countries within the sub region (appendix 1). This was to reduce bias since the data set was made up of a lot of missing variables.

The World Development Indicators (WDI) was the prime source for macroeconomic data needed to undertake this study. This was deemed appropriate since most researches have used such sources and surveys to conduct to update these data. We used 2000-2012 in order to account for recent issues in portfolio at risk over the last decade since current data is likely to be more accurate in relation to statistical estimations.

4.5 Estimation Strategy

The study adopted the panel estimation model and the general form of the panel data model is specified below;

$$y_{it} = \alpha_i + \beta X_{it} + \varepsilon_{it} \quad (1)$$

Where:

Subscript i denotes the cross sectional dimension (institutions) $i = 1 \dots N$ and t denotes the time series dimension (time), $t = 1 \dots T$;

Y_{it} is the dependent variable.

α_i is scalar and constant for all periods (t) and specific to country fixed effect (i)

β is a $k \times 1$ vector of parameters to be measured on the explanatory variables or the factor loadings or parameter estimates for the explanatory variables.

X_{it} is a $1 \times k$ vector of observations on the explanatory variables comprises the explanatory variables in the model which may include controlled variables:

ε_{it} the error term.

The last but not least is that the use of panel estimator instead of time series and cross sectional regression for estimating separate object and time period respectively allowed for efficiency, since any bias which could arise in the estimation was thus minimized. The research sought to establish a connection between loan portfolio at risk in MFIs and factors that affect loan portfolio at risk, and how a mixture of borrower-level, lender-level, and macro factors affect loan portfolio quality (Schicks, 2013).

The estimation of the parameters in our panel regression model was not estimated with *seemingly unrelated regression* (SUR) framework by Zellner (1962). The SUR is not deemed fit for the study due to the following reasons: first and foremost there is a limitation to its application since it can only be used when the number of time series observation, T , per cross sectional unit i should be at best as large as the total number of such units, N . Furthermore the variance-covariance matrix of the errors ($NT \times NT$) needs to be estimated since the number of parameters in total is very large. Furthermore the pool OLS estimates the parameter (α and the β vector) consistently however due to inefficiency, the study employs other panel estimator technique (Fixed Effect (FE) and Random Effect (RE) models) for its analysis. The fixed effect model has gained prominence within the social sciences more specifically the economics and the political sciences (Schurer & Yong, 2012), likewise the random effect model which is also frequently used in the social sciences (Beak and Katz, 2007). These models have been used in other sectors like education, biomedicine, geography and other areas of studies (O'Connell & McCoach, 2008; Jones, 1991; Verbeke & Molenberghs, 2000, 2005). The two models (FE and RE) are applicable in resolving complex structures, such as the place based hierarchies and temporal hierarchies (Jones Ron, & Pattie 1992; Beck 2007, Beck &Katz, 2007).

The fixed effect, as compared to the SUR, allows the intercept in the regression model to vary cross-sectionally, however at constant over time. The FE model is widely used in many disciplines due to its ability to avoid heterogeneity bias (Bell and Jones, 2013). In continuation, the disturbance term ε_{it} is decomposed into $\varepsilon_{it} = \mu_i + v_{it}$ where μ_i is the individual specific effect and v_{it} is the disturbance term that varies over time and entities. This will capture unexplained variables about y_{it} that is left out.

Therefore Substitute equation (2) into (1) specify the fixed model (3)

$$\varepsilon_{it} = \mu_i + v_{it} \quad (2)$$

$$y_{it} = \alpha + \beta x_{it} + \mu_i + v_{it} \quad (3)$$

An alternative approach to the fixed effects model is the random effects model. With respect to the fixed effect model, the random effect technique postulates different intercept terms for each object and also the intercepts are time invariant, where the relationship between the dependent and the independent variables are considered to be the same cross-sectionally and temporally. On the other hand, the difference is that the intercepts for each cross sectional unit under the random effect arise from a common intercept α , in addition to a random variable ϵ_i that differs cross-sectionally but constant over time. The random deviation of each object's intercept term from the global intercept term α is estimated by ϵ_i . Below is the random effect specification model;

$$y_{it} = \alpha + \beta x_{it} + \omega_{it} \quad (4)$$

$$\omega_{it} = \epsilon_i + v_{it} \quad (5)$$

Where; x_{it} is still a $1 \times k$ vector of explanatory variables, and the following assumption are required, that the mean of cross-sectional error term ϵ_i is zero and is independent of the individual observation error term v_{it} , also has constant variance σ_{ϵ}^2 , furthermore is independent of the explanatory variable x_{it} .

The random effect, just as the fixed effect, makes it easier to allow for time variation (Brook, 2008). Therefore, in order to test which estimation model was appropriate for the study, the Hausman specification (1978) test was used. Hausman's specification test serves as a comparison among the parameter estimates of the FE and the RE model (Greene, 2012; Wooldridge, 2002) and the result helps employ the specific model appropriate for the study (Greene, 2012).

4.6 Diagnostic Test

The study first and foremost conducted various diagnostic tests on the data before estimating the FE and RE estimations.

4.6.1 Correlation Analysis

First correlation analysis was conducted to measure the relationship between the variables. The resulting value, 'correlation coefficient' points out the extent to which some variables of interest move together; whether directly or indirectly. Correlation makes no priori assumption as to whether or not one variable impacts the other(s), instead it determines the degree of association

between variables and the resulting sign indicates whether the associations between the variables are direct or indirect.

In this study, the Pearson correlation was used to test the correlation between the variables to determine the degree of association, as well as to determine if the generated correlation coefficients indicated high levels of multicollinearity. Correlation between two variables (X_1 , X_2) is measured as:

$$r_{X_1 X_2} = \frac{\sum_{i=1}^m Z_{1i} Z_{2i}}{m} = \frac{\sum_{i=1}^m (\chi_{1i} - \bar{\chi}_1)(\chi_{2i} - \bar{\chi}_2)}{m \sigma_1 \sigma_2} = \frac{\sum_{i=1}^m (\chi_{1i} - \bar{\chi}_1)(\chi_{2i} - \bar{\chi}_2)}{\sqrt{\sum_{i=1}^m (\chi_{1i} - \bar{\chi}_1)^2 (\chi_{2i} - \bar{\chi}_2)^2}}$$

Where σ denotes the standard deviation of the mean \bar{X} , m denotes the sample size; X denotes the series of the variable under consideration. In order to be sure which variable to include in the estimation, the Variance Inflation Factor (VIF) for the $\hat{\beta}_i$ was estimated $\left(VIF = \frac{1}{1 - R_i^2} \right)$ and variables with $VIF > 10$ were dropped which indicated high multicollinearity (Allison 1999; Studenmund, 2006).

4.6.2 Test for Heteroskedasticity

Heteroskedasticity is the situation in which the variance of a regression error term μt , conditional on the explanatory variables, is not constant (Stock & Watson, 2007). Simply put, for the regression analysis to make meaningful predictions, the variance of the error term must be constant, implying homoscedasticity (Brooks, 2008). To test for heteroskedasticity in the specification above, the Modified Wald test for groupwise heteroskedasticity was carried out.

The Modified Wald test for groupwise heteroskedasticity, in the view of Baum (2001), is one of the best approaches to detect heteroskedasticity, owing to the reasons that its computation is viable when the normality assumption is violated.

To test for heteroskedasticity in this study, the implied hypothesis was given as:

H0: Disturbancetermisconstant (homoskedastic)

H1: Disturbancetermisnotconstant (heteroskedastic)

In this hypothesis testing, if the probability value ($prob > chi^2$) is less than (0.05) then the null hypothesis was rejected and in the alternative accepted meaning there was heteroskedasticity in the model.

4.6.3 Test for Normality

The classical linear model assumes that the error (or dependent variable) has a normal distribution conditional on the explanatory variables (Wooldridge, 2002). Therefore Shapiro-Wilk W. normality test tends to be more appropriate due to its good power properties (Mendes & Pala, 2003), also due to its ability to detect abnormality due to skewness and kurtosis (Althouse Ware and Ferron 1998). To test for normality in the disturbance term for the specification above, the implied hypothesis is given as:

H0: DisturbancetermisNormallyDistributed

H1:DisturbancetermisnotNormallyDistributed

4.6.4 Test for Autocorrelation

For a classical linear regression model, it is assumed that there are no patterns in the errors. That is to say, $Cov(\mu_i, \mu_j) = 0$; for $i \neq j$. If there are patterns in the residuals from a model, then they are auto-correlated. To test for autocorrelation in this study, the Wooldridge test for autocorrelation in panel data was used. Its implied hypothesis was given as:

$$H_0: \hat{\rho} = 0$$

$$H_1: \hat{\rho} \neq 0$$

4.7 Chapter Summary

Chapter Four discussed the research methodology. Also, the model for the study was specified in this chapter. Furthermore details of the explained and the explanatory variables were described in addition to the justification for employing these variables. Likewise, the estimation techniques are detailed and sample and sources of data for the study are then explained (finally).

CHAPTER FIVE

ANALYSIS AND DISCUSSION OF RESULTS

5.1 Introduction

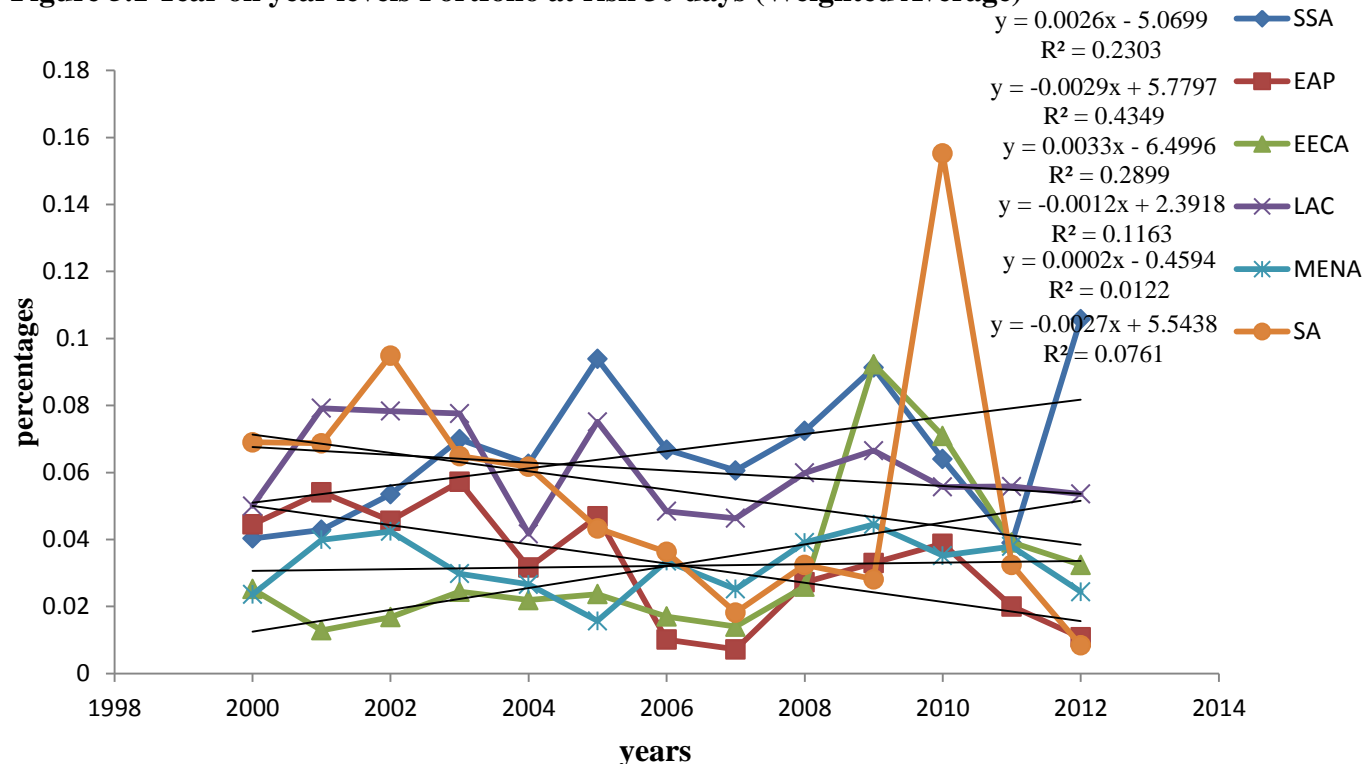
This chapter consists of the analysis and discussion of the data collected from 2000-2012 with respect to the variables that were included for the purposes of this study. As stated earlier, most of these variables were gathered from the databases of the Microfinance Information Exchange market (MIX market) and World Development Indicators (WDI) of the World Bank Group. This chapter ascertains the level of loan portfolio at risk and also considers the descriptive and inferential methods of statistical analysis in arriving at the conclusions drawn.

5.2 Ascertaining the Levels of Loan Portfolio at Risk in MFIs in SSA

This study attempted to achieve the objective of ascertaining the level of loan portfolio at risk in MFIs in SSA, by comparing SSA loan portfolio at risk to that of other sub-regions, over a period of 13 years (2000-2012).

5.2.1 Year on Year Level of Loan Portfolio at Risk

Figure 5.1 Year on year levels Portfolio at risk 30 days (Weighted Average)



Source: Computations from Data obtained from the various databases (2015). SSA is Sub Saharan Africa, EAP represent East Asia and The Pacific, EECA is Eastern Europe and Central Asia, LAC is Latin America and The Caribbean, MENA is Middle East and North Africa while SA is South Asia.

Figure 5.1 shows the year on year variation of loan portfolio at risk using the gradient of line. The limitation of this finding is that, year (time) is the only variable used in the trend and level analysis. From the trend analysis there was a positive relation between year and loan portfolio at risk in SSA region. Thus a unit increase in year will cause loan portfolio at risk to increase by 0.0026, other things being equal. Also time contributed 23.03% variation in the loan portfolio at risk in the SSA region. Moreover, during the period of study, time contributed 43.49% of the variation of loan portfolio at risk. Furthermore, holding all other factors constant, there was a

negative relationship between time and loan portfolio risk. Hence a unit increase in time will cause a 0.0029 decrease in loan portfolio risk. In addition, there was a positive association between loan portfolio risk and time in the EECA region. As indicated in figure 5.1 a unit increase in time will result in an upwards movement of loan portfolio at risk by 0.0033, other things being equal. In continuation, time accounted for 28.99% of the variation in loan portfolio at risk in the EECA region. Likewise, the LAC region also recorded 11.63% time variation in loan portfolio risk during the period of study. Similarly, a unit change in time will cause loan portfolio at risk to decrease by 0.0012 indicating a negative association between loan portfolio risks. The MENA region recorded an insignificant positive growth in the loan portfolio by 0.0002 with respect to time. Also, time accounted for 1.22% variation in loan portfolio at risk in the region. In South Asia, a unit change in time shows a 0.027 decrease in loan portfolio at risk, as a result, the negative relation between time and loan portfolio at risk as detailed in figure 5.1.

5.2.2 Region on Region Level of Loan Portfolio at Risk

The level of loan portfolio at risk of MFIs classified into regions (SSA, East Asia and The Pacific, Eastern Europe and Central Asia, Latin America and The Caribbean, Middle East and North Africa and South Asia) were analysed over the 13 year period of the research work. Table 5.6 and figure 5.1 show the trend of loan portfolio at risk in the six regional classification of loan portfolio risk in the industry.

Table 5.1 Region on Region Level of Loan Portfolio at Risk

Years	SSA	EAP	EECA	LAC	MENA	SA
2000	4.03%	4.45%	2.52%	5.00%	2.36%	6.90%
2001	4.29%	5.41%	1.29%	7.92%	3.99%	6.87%
2002	5.35%	4.56%	1.68%	7.83%	4.24%	9.49%
2003	6.99%	5.72%	2.44%	7.76%	2.98%	6.49%
2004	6.26%	3.16%	2.19%	4.17%	2.66%	6.17%
2005	9.39%	4.69%	2.37%	7.51%	1.57%	4.33%
2006	6.68%	1.01%	1.70%	4.84%	3.35%	3.63%
2007	6.06%	0.72%	1.40%	4.63%	2.52%	1.82%
2008	7.24%	2.72%	2.59%	5.99%	3.91%	3.24%
2009	9.13%	3.30%	9.23%	6.65%	4.45%	2.81%
2010	6.40%	3.87%	7.09%	5.57%	3.52%	15.52%
2011	3.90%	2.00%	3.91%	5.58%	3.79%	3.24%
2012	10.58%	1.08%	3.24%	5.36%	2.44%	0.84%
Summation	86.30%	42.69%	41.65%	78.81%	41.78%	71.35%
Overall Weighted Average	7.19%	3.56%	3.47%	6.57%	3.48%	5.95%

Source: Computations from Data obtained from the various databases (2015). SSA is Sub Saharan Africa, EAP represent East Asia and The Pacific, EECA is Eastern Europe and Central Asia, LAC is Latin America and The Caribbean, MENA is Middle East and North Africa while SA is South Asia

Generally SSA has consistently accounted for a higher portion of loan portfolio at risk in the MF industry with a weighted average of 0.0719 as compared to the regional weighted average of 0.0504. This indicates that, 7.19% of loan portfolios were at risk over the period of the study. From the table 5.6, SSA was the region that suffered the highest loan portfolio at risk. In the year 2004 to 2007, MFIs in the region experienced the worst loan portfolio at risk, making SSA the region which was the most highly affected by loan portfolio risk problems. The PaR rate ranges from 6.26% in 2004, 9.39% in 2005 6.68% in 2006 and 6.06% in 2007. Although SSA experienced the highest loan portfolio risk problem within the period of 2004 to 2007, the region had a drop in their loan portfolio risk by 0.62% from 2006 to 2007. This could be inferred to the fact that in 2007, MFIs in SSA enjoyed financial self-sufficiency (MIX and CGAP, 2008, 2010).

Nonetheless, in 2008 and 2009 the region once again experienced a raise in their loan portfolio risk rate as detailed in table 5.6. This could be as a result of the global credit crisis that hit the world's economy. Furthermore, the region was more highly affected by the global economic credit crises than any other regions among the regions under study, with a rate of 7.24% and 9.13% in the year 2008 and 2009 respectively. This massive impact of the credit crises on the MF industry of SSA could result from the fact that the MF industry of SSA is highly leveraged as compared to other regions whose activities are funded by donor investment (MIX and CGAP, 2008, 2011).

East Asia and the Pacific (EAP) region was the third least region to be affected by loan portfolio at risk. The region recorded an overall loan portfolio at risk of 42.69% and a weighted average of 0.0357 over the 13 year period of the study. Although the loan portfolio was slightly affected by the global economic crisis by an increment of 2.00%, it did not exceed the regional weighted average rate of 5.04%, making EAP the second least region to be affected by the global economic crisis. The highest loan portfolio at risk recorded by the region was in the year 2003 (5.72%) and 2001 (5.41%).

Eastern Europe and Central Asia (EECA) region was the region to be least affected by loan portfolio at risk within the period of the study. The region enjoyed a minimum loan PaR rate ranging from 1.25% to 3.00% from 2000 to 2008 as shown in figure 5.1 and detailed in appendix 4. This low loan portfolio risk enjoyed by EECA could be as a result of efficient and effective credit risk administration and management, such as: an appropriate investment mix, also the paying off and tracking of high interest credit. Furthermore, rebalancing of portfolio occasionally could partly contribute to the low rate of PaR in the EECA region. Since it helps maintain the portfolio at a comfortable risk level. This is to avoid overemphasizing one or more asset

categories. Moreover, the low level of loan portfolio at risk within the EECA region could also be attributed to the ability of MFIs within the region to detect and avoid scam and fraud perpetrators. This could suggest that EECA maintains high monitoring standards and also seeks adequate information on clients in order to avoid the negative implications of moral hazard and adverse selection.

However the EECA region was the worst affected region in 2009 with a loan portfolio risk rate of 9.23% passing SSA by 0.10% during the global economic crisis of 2008 and 2009. The possible reason could be that the MF industry of EECA advanced more loans to and also made credit easily available to potential home owners. This was due to the fact that there was a real estate boom within the period 1997 to 2006 (Wikipedia.org). Nonetheless, a decline in the housing prices led to significant losses in the housing business, thereby having a significant impact on the loan portfolio at risk of the EECA. This shifted the loan PaR rate from 2.59% in 2008 to 9.23% in 2009. This indicates a significant difference of 6.64%. Moreover, the high level of loan portfolio at risk of EECA in the year 2009 could also be as a result of the sharp increase in the London Interbank Offered Rate (LIBOR). This eroded investors' confidence and trust, since banks were unwilling to lend to each other.

In addition, the Latin America and the Caribbean (LAC), recorded the highest loan portfolio at risk in the industry for the years 2000 (5.00%) and 2001 (7.92%). Also, in the years 2003 and 2004, Latin America and the Caribbean experienced a steady decrease in their loan portfolio at risk at rate of 7.83% and 7.76% respectively, although they were the regions with the highest loan portfolio quality. However, in 2004, LAC was able to minimise their portfolio risk to a rate of 4.17% below the regional weighted average rate of 5.04% for the period of the study.

The Middle East and North Africa (MENA) regions were the second least affected regions by loan portfolio at risk during the period of the study. The MENA region had a loan portfolio risk below 5% over the 13 year period of the study. Furthermore the MENA region was not affected by the global economic crisis of 2008 - 2009 as compared to other regions under study. This could be as a result of the difference in the Islamic financial system and the financial system in the other regions. The possible differences that led to a low PaR rate by MENA during the period of the research work could be the prohibition of fixed or specific interest charges for loan advancement called 'Riba'. Furthermore, the low loan PaR rate recorded during the period could be attributed to the lack of additional penalties for delay in loan repayment.

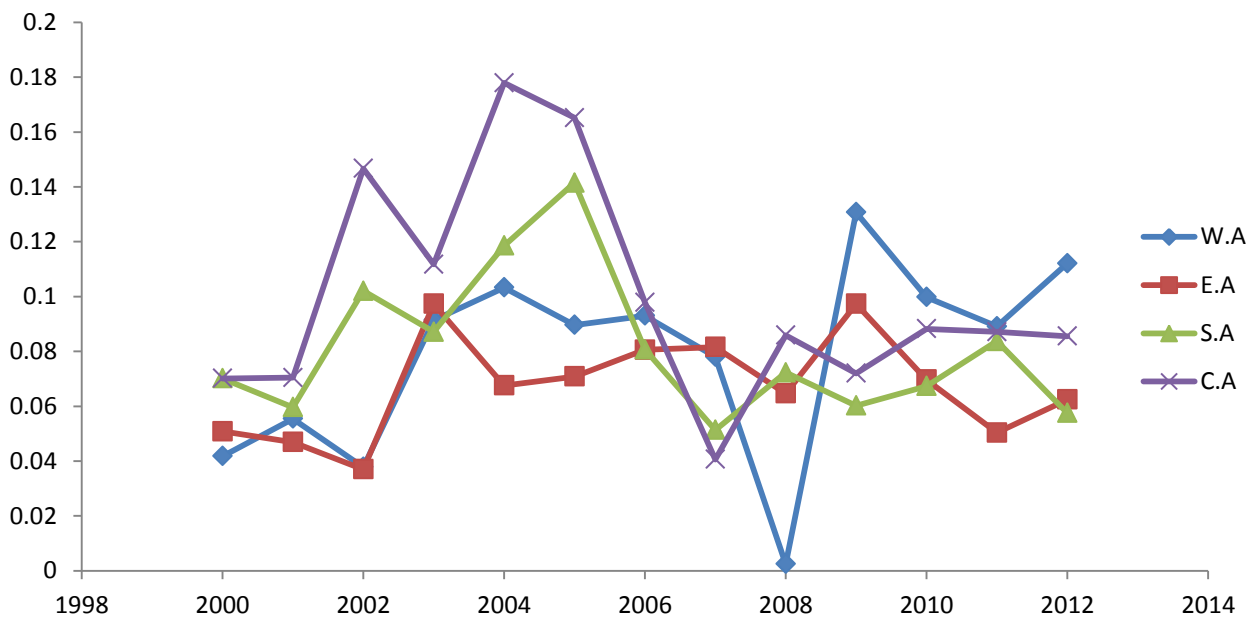
In addition, the request of strict collateral known as 'Murabahah' from the commencement of the loan application could be a contributing factor for the low loan portfolio risk experienced by the MENA region. Moreover, 'Musharaka al-Mutanaqisa' another principle of the Islamic financial system could also be a possible reason for the region's accounting for low loan portfolio at risk for the 13 year period. This principle allows the financial institution to enter into a partnership agreement with borrower, where both parties provide capital at an agreed rate and invest it into a business venture. The financial institution than share the profit accumulated from the business venture. These are some of the possible reasons why the MENA region recorded low portfolio at risk within the period of the study. The last but not the least was the South Asia (SA) region. The South Asia region had a consistent and continues decline in their loan portfolio risk from the year 2003 to 2007. The SA region showed a rate of 6.49% in 2003, 6.17% in 2004 and 4.33%, 3.63% and 1.82% for the 2005, 2006 and 2007 respectively. On the other hand, the SA region also saw a slight rise in their loan portfolio in 2008 and also recorded the highest loan portfolio risk

among the regions in 2010 (15.52%). This could be attributed to their inability to recover from the economic crisis that hit the global market.

5.2.3 Level of Loan Portfolio at Risk in Sub- region of Sub- Saharan Africa

The study also ascertained the level of loan portfolio at risk on sub regional bases within the SSA region. This was done by comparing the West Africa, East Africa, Southern and Central Africa regions.

Figure 5.2 Level of Loan Portfolio at Risk in Sub- region of Sub- Saharan Africa



Source: Computations from Data obtained from the various databases (2015). West Africa is W.A, East Africa is E.A, and Southern Africa is S.A and Central Africa C.A region.

On average the East Africa region with a rate of 0.073 was the region to be least affected by loan PaR, followed by West Africa and Southern Africa with a rate of 0.085 and 0.088 respectively

(see appendix 2). During the period of study, West Africa recorded the lowest loan PaR with a rate of 0.25%. This could be as a result of the SSA region attaining financial self-sufficiency in 2007. However, the rate shot up to 13.07%, showing a significant difference of 12.82%, furthermore this significant increment could be attributed to the global economic crisis. Central Africa recorded the highest loan portfolio at risk from 2001 to 2005 with a rate ranging between 7.00% and 17.00% (see appendix 2). However there was a sharp drop in the loan PaR rate from 2005 to 2007 (see appendix 2. likewise, there was a steady increase and drop from 2008 to 2012 as detailed in figure 5.2. From figure 5.2, the trend shows a slight up and down movement in the loan PaR in East Africa after a rise in 2003 over the period of study. Southern Africa was the second sub region to be affected by loan PaR after Central Africa, showing a steady rise in the loan PaR from 2003 to 2005. However there was a fall in 2007 which was the year SSA attained financial self-sufficiency.

In summary, SSA experienced the highest effect of loan portfolio risk over the period of study with the highest score of 0.863 as compared to the other regions, therefore the need to examine the determinants of loan portfolio at risk in SSA.

5.3 Descriptive Statistics of the Variables in the Study

The table below shows the descriptive statistics of the research variables. It highlights the minimum and the maximum values of the variables, and also the mean and standard deviations of the variables. This was done to give a fair idea about the data and to help spot outliers. Table 5.1 below summarizes statistics about the variables that affected loan portfolio at risk of

microfinance institutions within the Sub Saharan African region, as presented alongside the explained variable (Portfolio at Risk).

Table 5.2: Descriptive Statistics of the Variables in the Study

Variable	Obs	Mean	Std. Dev.	Min	Max
PaR30	1034	0.0866	0.1034	0.0002	0.9362
Leverage	1254	0.6117	0.2536	0.0009	0.998213
Percent of Loans to female	1067	0.5928	0.2497	0.0051	1
Extent of saving	586	0.4289	0.2459	0.0085	0.9947
Inefficiency	1038	0.2342	0.1734	0.0039	0.9839
Number of Outstanding Clients	1303	9.0240	1.8256	0.1484	13.56113
Loan Intensity	1267	0.6252	0.1871	0.0074	0.9898
GDP Growth (%)	2106	0.0546	0.0447	-.3283	.3363
Inflation (%)	2013	0.0939	0.0876	-0.0898	0.9822

*Source: Computations from Data obtained from the various databases (2015) Portfolio at risk is measures the 'percent of the total loan portfolio that has at least one payment overdue by more than 30 days (total loan outstanding overdue within 30days/ total outstanding loan) Leverage is a proportion of total debt to total asset (Debt Ratio = Total Liabilities/ Total Asset). Female is measured as percentage of female borrowers to total number of borrowers, (Female Borrowers/ Total number of Borrowers * 100). Extent of saving is estimated as deposit to loans, total deposit/total loan. Inefficiency is estimated as the operation expenses to total asset operation expenses/ total asset. Monitoring is proxied by logarithm number of outstanding clients. loan intensity is gross loan portfolio to total assets. GDP growth is growth rate real GDP in percentage terms. Inflation is real inflation rate in percentage terms.*

Table 5.2 reports on the mean standard deviation, minimum and maximum value of the various variables we studied. MFIs within the sub Saharan Africa region, as far as repayment is

concerned, have a PaR30 equals 8.66%, which implies that MFIs stand the chance of losing only 8.66% of the total loan portfolio. Moreover, it falls within a range of 0.02% (minimum) and 93.62% (maximum) and standard deviation of 10.34% indicating that overdue loans within 30days vary across MFIs by 10.34% during the period of study. Leverage also recorded a minimum and a maximum of 0.09% to 99.82% respectively. In addition, leverage recorded a mean value of 61.17% implying that MFIs in SSA employed 61.17% debt to finance their total assets. The variation in the usage of debt during the period of study is 25.36% showing that the usage of debt slightly varies across the MFIs. The variable of female borrowers to total borrowers indicated that 59.3% of all MFIs borrowers were averagely women. This implies that MFIs focussed (mainly) on women in SSA during the period of study. The dispersion of female borrowers is 24.97%. This indicates a variation of 24.97% across MFIs in SSA. Furthermore the female borrowers have a minimum value of 0.0051 and a maximum value of 1. On average, extent of saving is 42.89%. This denotes that MFIs in SSA are able to raise a deposit of 42.89% as a surety to loans granted. Furthermore, the deviation of extent of saving across MFIs is 24.59% in SSA. The study again shows a minimum and maximum of value of 0.0085 0.9947 respectively. On the average, the gross domestic product growth rate and the inflation rate are 5.46% and 9.39% respectively during the periods understudy. The maximum and the minimum values of the gross domestic product growth rate is 33.63% and -32.82% respectively. Also, the lowest and the highest values of inflation are -8.98% and 98.22%. This shows an improvement in economic growth of SSA, this is likewise characterized with a fair inflation rate.

5.4 Correlation Analysis

Table 5.3 shows the correlation matrix between the various variables under study. The table mainly exhibits the Pearson's correlation which serves as a check for the collinearity between variables employed to achieve the set objectives. The 'rule of thumb' considers the existence of collinearity between variables at a correlation value of 0.5 and above. However, the research study sets a collinearity threshold of 0.7, following Kennedy (2008). From Table 5.3, there existed no multicollinearity among the variables for the study. The correlation analysis reports the direction and degree of the relationship that exist between two variables; however it does not show the effects that exist among the variables. The sign shows the direction of the relationship while the degree of relationship is determined by the absolute value. Furthermore, the study conducted the variance inflation factor (see appendix 3) and none of the variables was above vif 10. Therefore no variable in the specified equation was dropped.

Table 5.3 Correlation Matrix: Test of Multicollinearity

	PaR30	Leverage	Female	Ext. of Sav	Inefficiency	LogClt	Lsty	GDP	Infl
PaR30	1								
Leverage	0.0529	1							
Female	-0.1094***	-0.3074***	1						
Extent of Saving	0.1355**	0.3803***	-0.3219**	1					
Ineff	-0.0318	-0.2615***	0.3505***	-0.2675***	1				
log client outstanding	-0.1233***	0.1544***	0.0706**	0.004	-0.1272***	1			
loan intensity	-0.1119***	0.03	0.1261***	-0.1085	-0.0228	0.2072***	1		

GDP	-0.1081***	-0.0071	0.0358	-0.1905***	0.0152	0.1514***	0.1175	1	
Inflation	0.034	-0.0612	0.1094***	-0.1646***	0.1943***	0.0855***	-0.0099	0.0573**	1

*Source: Computations from Data obtained from the various databases (2015) Portfolio at risk is measures the 'percent of the total loan portfolio that has at least one payment overdue by more than 30 days (total loan outstanding overdue within 30days/ total outstanding loan) Leverage is a proportion of total debt to total asset (Debt Ratio = Total Liabilities/ Total Asset).Female is measured as percentage of female borrowers to total number of borrowers, (Female Borrowers/ Total number of Borrowers * 100). Extent of saving is estimated as deposit to loans, total deposit/total loan.Inefficiency is estimated as the operation expenses to total asset operation expenses/ total asset. Monitoring is proxied by logarithm number of outstanding clients. loan intensity is gross loan portfolio to total assets. GDP growth is growth rate real GDP in percentage terms. Inflation is real inflation rate in percentage terms.*

5.5 Empirical Analysis

The study initially sought to use simple Ordinary Least of Squares (OLS) estimations in the regression process to estimate and ascertain the relation between loan portfolio at risk and other factors that were deemed to affect the level of loan portfolio quality. Prior to these OLS estimations, the basic assumptions of the OLS were tested to ascertain whether the OLS could provide the Best Linear Unbiased Estimator (BLUE) necessary, thus enough to meet the objectives of the study. According to the Gauss – Markov theorem, the OLS will be BLUE when there are no difficulties of autocorrelation and heteroskedasticity.

Preceding the decision on the usage of the Ordinary Least Squares (OLS) estimations (appendix 4), various tests were performed testing for the assumptions of OLS for its appropriateness. First of all, the study performs a normality test using Sharpiro-Wilk W normality test. Secondly, the Wooldridge's test for auto correlation in panel data was used to assess the no auto correlation assumption needed to embark on OLS estimation. Again, the Breusch-Pagan (appendix 3) and

Modified Wald test for groupwise heteroskedasticity was used to test for the homoskedasticity assumption of the Ordinary Least Squares. The test results are discussed below;

5.5.1 Normality Test of the Variables

The study used the Shapiro –Walk W normality test to test for normal distribution in the data. The implied null hypothesis was $H_0: \text{DisturbancetermisNormallyDistributed}$

Table 5.4 Normality Test of the Variables

Variable	Obs	W	V	Z	Prob>z
PaR30	1034	0.68452	205.122	13.201	0.000
Leverage	1254	0.93244	52.372	9.892	0.000
Female	1067	0.98588	9.445	5.575	0.000
Extent of saving	1267	0.97676	18.184	7.251	0.000
Inefficiency	1038	0.83768	105.908	11.564	0.000
Number of Outstanding Clients	1303	0.94869	41.191	9.306	0.000
Loan Intensity	586	0.96921	11.951	6.006	0.000
GDP Growth (%)	2106	0.88677	140.741	12.608	0.000
Inflation (%)	2013	0.85593	171.876	13.095	0.000

*The null hypothesis is (H_0 : Variable is not Normally Distributed) Source: Computations from Data obtained from the various databases (2015) Portfolio at risk is measures the 'percent of the total loan portfolio that has at least one payment overdue by more than 30 days'(total loan outstanding overdue within 30days/total outstanding loan)Leverage is a proportion of total debt to total asset (Debt Ratio = Total Liabilities/ Total Asset).Female is measured as percentage of female borrowers to total number of borrowers, (Female Borrowers/ Total number of Borrowers * 100). Extent of saving is estimated as deposit to loans, total deposit/total loan.Inefficiency is estimated as the operation expenses to total asset operation expenses/ total asset. Monitoring is proxied by logarithm number of outstanding clients. loan intensity is gross loan portfolio to total assets. GDP growth is growth rate real GDP in percentage terms. Inflation is real inflation rate in percentage terms.*

Table 5.4 shows the normality test of the variables that influence loan portfolio at risk to affect. The table also shows the results of the Shapiro-Wilk (S-W) normality test performed to test the normality of the variables. The Shapiro-Wilk (S-W) normality test at default bears the null hypothesis that the data is normally distributed. In consistent with the results, the table 5.4 shows a significant S-W values which indicate that the data is not normally distributed therefore we reject the null hypothesis. The table exhibits that the various variables have varying numbers of observations due to the unbalanced nature of the panel data that is used in the estimations. The reason is that the data spans across 28 countries and over 13 years; missing data points could be said to be inevitable.

5.4.2 Test for Autocorrelation

As indicated earlier, the autocorrelation test was done to investigate if there were patterns in the residuals from a model, in other words, if the error terms were auto-correlated. To carry out this test, the Wooldridge test for autocorrelation in panel data was carried out. Serial correlation caused the standard errors of the coefficients to be smaller than they actually are and the higher R-squared. Nonetheless, there was no serial correlation. From Table 5.5, the study failed to reject the null hypothesis that there was no first order autocorrelation and concluded that the data does not have first-order autocorrelation.

5.4.3 Test for Heteroskedasticity

Heteroskedasticity relates to the randomness of the disturbance term. To check for heteroskedasticity in the residuals of the estimated equation, this was done using the Modified

Wald test for group-wise heteroskedasticity and with a null hypothesis that H_0 : *Disturbancetermisconstant (homoskedastic)*. The summary output presented below was generated to test for Heteroskedasticity available in the fixed-effects model. The result in Table 5.5 shows a significant probability value given the indication that there is existence of heteroskedasticity.

Table 5.5 Pre Estimation Diagnostics (Autocorrelation and Heteroskedasticity)

Diagnostic test	Hypothesis test	F/Chi2	P value
Wooldridge test for autocorrelation in panel data	H_0 : no first order autocorrelation	$F(1, 47) = 2.416$	$\text{Prob} > F = 0.1268$
Modified Wald test for groupwise heteroskedasticity	H_0 : $\sigma(i)^2 = \sigma^2$ for all i	$\text{chi2}(90) = 3.5e+32$	$\text{Prob} > \text{chi2} = 0.0000$

5.4.4 Hausman's specification and Breusch-Pagans LM test

The Breusch-Pagans LM test for random effect was used to determine the appropriateness of the random effects over the ordinary least of square estimations. The test is appended; the random effect estimations are preferred over the OLS. Also, the Hausman's test was used to ascertain the appropriateness of the fixed effect or random effect estimations of the model. From the tests below, the use of the fixed effect estimations were apposite for the estimations of the model. The null hypothesis was that the random effect model is more appropriate

Table 5.6 Hausman's specification

Coefficients				
	(b)	(B)	(b-B)	$\sqrt{\text{diag}(V_b - V_B)}$
	fe	re	Difference	S.E.
Lev	-.0624417	-.0219601	-.0404816	.0194219
Fem	-.0578229	-.0147301	-.0430929	.0237474
Inef	.1297789	.0386246	.0911543	.0385916
logClt	.0184474	.0026939	.0157535	.0069616
Exts	.0850319	.0651977	.0198342	.0260118
Lsty	-.0129137	.0069251	-.0198389	.0217633
Gdp	-.0003921	-.000731	.0003389	.0003354

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\begin{aligned} \text{chi2 (7)} &= (b-B)'[(V_b - V_B)^{-1}] (b-B) \\ &= 14.67 \end{aligned}$$

$$\text{Prob} > \text{chi2} = 0.0405$$

5.5 Regression Output

The regression analysis measures the impact that the explanatory variables have on the explained variable; loan portfolio at risk in Sub Saharan Africa. The regression analysis helps to ascertain the extent to which changes in the independent variables influenced or influences the explained variable. Furthermore, the use of panel regression in our estimation made our parameter

estimates more efficient and statistically reliable. Additionally, the regression analysis was able to show the overall effect of all the independent variables on the explained variable in the model specification adopted for this study. Moreover the fixed and random effect estimator was used to carry out the analysis on the study. In addition to that, the Hausman specification test was used to test the appropriateness of the model between fixed and random effect and proved that the fixed effect model was more suitable for the study.

The fixed effect estimation model was deemed appropriate for our study due to the fact that it helps in the analysis of the impact of the explanatory variables on the explained variable that varies over time. Likewise the exploration of the relationship between the predictor and outcome of the variables is better explained with the fixed effect model. Furthermore, the use of the fixed effect estimation model helped in addressing the time invariant effect from the independent variables our work understudied. Also, the fixed effect model was more appropriate in addressing the correlation between the error term and the constant. However, due to the fact that the data was not normally distributed and to the presence of heteroscedasticity, the robust option to control for heteroskedasticity in fixed effect was adopted. Therefore the result from the fixed effect estimation model is presented below;

Table 5.7 Regression Result

PaR30	OLS	Fixed Effect	Random Effect	Robust Fixed Effect
Leverage	-0.00254 (0.021446)	-0.0617** (0.031385)	-0.02191 (0.024581)	-0.0617* (0.0337742)
Female	-0.00129 (0.017877)	-0.0571* (0.033776)	-0.01472 (0.023925)	-0.0571 (0.0481186)
Extent of saving	0.056152*** (0.018371)	0.0837** (0.035252)	0.06507*** (0.023665)	0.0837** (0.038214)
Inefficiency	-0.01827 (0.02529)	0.1312** (0.051716)	0.038705 (0.034222)	0.1312*** (0.0445676)
LogClt	-0.00184 (0.002555)	0.0188** (0.008099)	0.002714 (0.004054)	0.0188** (0.0082181)
Loan Intensity	0.024809 (0.030608)	-0.0131 (0.036547)	0.006958 (0.029333)	-0.0131 (0.0379932)
GDP growth	-0.00146 (0.001064)	-0.0004 (0.000994)	-0.00073 (0.000929)	-0.0004 (0.0008215)
Inflation	0.045531 (0.047296)	-0.0193 (0.045125)	-0.00224 (0.042474)	-0.0193 (0.0313641)
Constant	0.05798 (0.034508)	-0.0894 (0.067859)	0.033642 (0.042546)	-0.0894 (0.0709824)
No. of Observation	354	354	354	354
F statistic	2.57	2.36	10.24	2.72
P. value	0.0097	0.0181	0.2488	0.0098

*Source: Computations from Data obtained from the various databases (2015) Portfolio at risk is measures the 'percent of the total loan portfolio that has at least one payment overdue by more than 30 days'(total loan outstanding overdue within 30 days/ total outstanding loan)Leverage is a proportion of total debt to total asset (Debt Ratio = Total Liabilities/ Total Asset). Female is measured as percentage of female borrowers to total number of borrowers, (Female Borrowers/ Total number of Borrowers * 100)Extent of saving is estimated as deposit to loans, total deposit/total loan.Inefficiency is estimated as the operation expenses to total asset operation expenses/ total asset. Monitoring is proxied by logarithm number of outstanding clients. loan intensity is gross loan portfolio to total assets. GDP growth is growth rate real GDP in percentage terms. Inflation is real inflation rate in percentage terms.*

5.6 Discussion of Results

The study employed portfolio at risk within 30 measured as the 'percent of the total loan portfolio that has at least one payment overdue by more than 30 days' (total loan outstanding overdue within 30days / total outstanding loan) as the dependent variable explained by borrower

characteristic, microfinance institution specific variable and macroeconomic indicators. The borrower characteristic variable is the percentage of female borrowers, while that of the MFIs specific variables consists of leverage, extent of saving, inefficiency and loan intensity. Furthermore, gross domestic product growth rate and inflation rate were the proxies for the macroeconomic variable. From the table figures in parentheses represent the standard errors.*, ** and *** denote 10%, 5% and 1% significance levels respectively.

5.6.1 Leverage

The variable of interest, leverage estimated as total debt to total assets, is negatively significant at p value of 0.071 with loan portfolio at risk as indicated from the regression result. The results suggested that a unit increase in leverage leads to 0.0617 unit reduction in loan portfolio at risk. Moreover, though the study expected a positive association between leverage and loan portfolio at risk, the empirical result showed otherwise. This result contradicts the agency cost theory that states that managers are likely to embark on risky projects when they add on more leverage to their capital, since the failure of the project goes against the debt holder, rather than against shareholders. Furthermore, the result could imply that, MFIs in SSA are able to manage their credit default rate with the introduction of leverage in their operation. Also the result suggested that the introduction of more leverage in the operations of MFIs lead to high financial discipline on the part of MFIs in SSA. Thus, as microfinance institutions employ more debt in their operations, they exact control on their activities, thereby reducing their risk which results in high financial discipline on the part of MFIs in SSA. Furthermore, in order for MFIs to attain their objective of poverty alleviation, they intend to manage their asset effectively and efficiently.

Likewise the negative relation between leverage and loan portfolio at risk, could be as a result of MFIs avoiding reputation damage due to inability to make repayment of funds sourced externally from the money and capital market.

5.6.2 Extent of Saving

The next key variable of interest is extent of saving. This is measured as total deposit to loans. The regression results identified the extent of saving to be positively significant with loan portfolio at risk at significant level of 0.031. This result implies that a unit increase in extent of saving leads to 0.0837 unit increase in loan portfolio at risk. Extent of saving like the compensating loans balance serves as a guaranty for lender. Extent of saving is the periodic deposits a borrower in the MF industry makes to cover up their loans obligations. This is a surety from borrower that they will meet their loan obligation when it falls due. Although the study expected a negative association between loan portfolio risk and extent of saving, our evidence proved otherwise. Intuitively, it was expected that as borrowers make periodic deposits in relation to their loans, it leads to a decline in the default rate of loan portfolio risk. However our study found a positive relationship between loan portfolio risk and extent of saving. This result suggests that management in the MF industry tends to relax their monitoring activities with the notion that the deposit clients make with respect to their loans will cover their debt. Likewise management may adjust interest rate since borrowers are not making periodic deposits in relation to their loans. This could also increase the likelihood of default by borrowers, since there could be a high possibility of difficulties in repayment. Furthermore, the positive relation could also mean that borrowers tend to delay or default in deposit with respect to loans with the idea that

the deposits they have made in relation to their loans will be used to cover their debt thereby leading to a higher default on their part. Moreover, there could be the likelihood that borrowers are not able to make periodic deposits on time due to the economic hardship they are facing, such as increase in price of food items, fuel prices, and school fees among other factors.

5.6.3 Management Inefficiency

Following other literature on loan portfolio at risk, the study included a measure of the bad management hypothesis in portfolio at risk administration. Inefficiency is measured as a ratio of operational expense to total assets. The result in the regression estimation showed that management inefficiency was highly significant at 0.004 and influenced loan portfolio at risk positively. This result implies that an additional increase in unskilled labour and also misappropriation of fund (management inefficiency) leads to 0.1312 unit increase in loan portfolio at risk. This result appears to confirm the work of Berger and DeYoung, (1997), Podpiera and Weill, (2008), Chaibi and Ftiti (2015), and Louzis et al., (2012). This implies that poor skills of management are evidence via their inability to assess collateral pledged by borrowers, credit scoring and monitoring debtors which could result in an increase in loan portfolio at risk. Moreover, an increase in loan portfolio risk, as a result of inefficiency, could be attributed to difficulties in monitoring internal costs and in evaluation of bad loans. Furthermore unforeseen circumstances beyond the control of management could result in higher spending in retrieving problem of loans, resulting in high cost inefficiency, thereby having a positive impact on loan portfolio quality. The positive significant relationship between inefficiency and loan portfolio risk in the sub region could be as a result of cheap labour employed by these MFIs.

Most of the MFIs employ senior high school leavers and diploma holder as loan officers, without much expertise in financial management to man their operations.

5.6.4 Monitoring (number of client outstanding)

Monitoring as proxied by logarithm of number of client outstanding was positively related to loan portfolio at risk, in contrast to the expected sign. Furthermore, logarithm of number of client outstanding significantly influences loan portfolio at risk at 0.025 significant levels. This result indicates that as MFIs in SSA, increase the number of clients outstanding by a client, it results in an increase of 0.0188 unit in loan portfolio at risk. The empirical evidence of this study seems to be consistent with the findings of Crabb and Keller (2006). A possible explanation could be that as MFIs desire to increase borrower growth, they tend to lower their regulation and standards and as a result, basic information of loan applicants are overlooked making tracking of loan applicants difficult. Similarly, MFIs are unable to track borrowers as result of an improper street and housing naming system in SSA, thereby making monitoring difficult, leading to a default rate in loan portfolio. This can lead to a high default of loan portfolio at risk, since adverse selection cannot be reduced. Likewise, the findings suggest that the inability of MFIs to maintain proper information and monitoring system could result in a rise in loan default rate among clients. Furthermore, the significant positive relation between loan portfolios at risk and monitoring could be as a result of the lack of equipment for their financial operation, in that they are not able to network across branches.

5.6 Chapter Summary

The chapter analysed and interpreted data from the Microfinance Information Exchange market (MIX market) and World Development Indicators (WDI) of the World Bank Group within the period 2000-2012. The research used a panel regression analysis for the study. Out of eight variables, the study analysed, four were not significant. Also the study used a robust regression due heteroskedasticity and also as a result of the data not being normally distributed. Furthermore, out of the four significant variables, three strongly influenced loan portfolio at risk at significant value of 0.05 and the other one at 0.1 significant values. In addition, the various diagnostic tests were carried out under this chapter.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents a summary of the entire study and concludes on the effect of the determinants on loan portfolio at risk. The study also makes necessary recommendations for policy implementation and further research. Lastly, this chapter presents some limitations of the study.

6.2 Summary

The potential development of micro financing has increasing need of being recognized and appreciated in the field of economic development, poverty reduction and other fields of the economy. Regardless of this scenario, factors that affect loan portfolio quality in the MF industry have remained largely unexplored. In more precise and concise terms, it could be said that determinants of loan portfolio in the Sub Saharan Africa is very important in the development of the MF sector, given the evidence on growth enhancement and poverty reduction effect of the industry in the region.

This research work attempted to fill the gap in literature for Sub Saharan Africa as a whole. The study used a balance data on 162 MFIs out of 614 from 28 countries in the sub region for a thirteen year period from 2000 to 2012 to ascertain the relation between the determinants of

portfolio quality and loan portfolio at risk. Furthermore, the study focussed on the effect of leverage and gender in the MF industry under study.

The trend of borrower growth and deposit growth in the industry within the sub region was first and foremost discussed. The study found an increase in both growth of borrowers and deposit over the period under study with an obvious decline in 2007 and 2008 study period. This is evident in the financial statistics in the global economy. However Kenya and Ethiopia experienced the highest growth in borrowers in the year 2009.

Likewise, the fixed effect estimation model was used to ascertain the significant effect of the factors that determine loan portfolio risk. On the eight determinants of loan portfolio at risk, leverage was seen to have a significant influence on loan portfolio quality, while gender proved insignificant. Also the impact of efficiency on loan portfolio quality was greater, likewise monitoring and extent of saving in that order. Furthermore out of the eight variables included in the estimation model, four were found not to be significant. The least insignificant variable was loan intensity, the other were GDP growth, inflation and female inclusion respectively.

To examine the effect of loan portfolio quality on the economy, the study controlled for GDP growth and inflation. The study found a negative impact on loan portfolio quality. This implies that, as the economic conditions are favourable, borrowers are able to increase yield and are therefore able to make repayment on time. However, favourable economic conditions may lead to MFIs increasing borrower scope and lowering the standard and regulation for loan application, which could result in loan portfolio risk.

Furthermore the study found that an increment in leverage by microfinance firms leads to a decline in loan portfolio risk. This could be as a result of the fact that MFIs maintain a high level of financial discipline. On the other hand, lack of basic information on borrowers could result in an increase in loan default rate. Likewise the study found that low quality of staff leads to inefficiency, thereby causing an increase in loan portfolio risk. The study observed that deposits made in relation to loans granted which served as a guaranty for the loan had a positive impact on loan portfolio risk, meaning, management are unable to mobilize deposits in relation to loans granted: therefore a decline in deposits to loans causes a rise in loan default rate.

6.3 Conclusion

This essay attempted to empirically establish the determinants of loan portfolio at risk in MFIs within the Sub Saharan Africa region, more especially focussing on leverage, gender and extent of saving effect on loan portfolio risk. These are important since knowing the effect of these variables on the loan portfolio quality will help in policy formulation and implementation, as MFIs strive for financial self-sufficiency. It is clearly noted, that leverage mitigates default in loan portfolio. This is consistent with other literature to some extent (Cebenoyan & Strahan, 2004); Kyereboah-Coleman, 2007). The findings generally indicated that leverage negatively and significantly influences loan portfolio risk. This scenario is real since the employment of leverage by MFIs is basically to help MFIs attain financial sustainability. In line with some previous work, leverage purposed to meet the financial operation needs of the MFIs, since donors' investment is shrunk. The employment of leverage by MFIs is to promote financial self-sufficiency among the MFIs within the sub region.

Inferring from the work of Crabb and Keller, (2006), extent of saving was included in the studies to ascertain the significant influence of this variable on loan portfolio quality. The empirical evidence indicated that extent of saving is highly significant and positively related to loan portfolio at risk. Ideally, extent of saving serves as a guarantee for the MFIs. Thus as borrowers make deposits in relation to the loans acquired, it provides some surety to the lenders, that the loan will be repaid. However, the empirical evidence does not follow this trend. This positive and significant influence of the research result could result from both the supply (MFIs) and the demand (borrowers) side of the MF industry. With the supply side, management of the MFIs could psychologically turn to relax monitoring activities, with the surety that borrowers are making deposits to the loan acquired. Nonetheless, it could be that the proportion of deposits made cannot offset the loans, resulting in a high default of loan in the industry. On the demand side, the behaviour of borrowers could also cause the increase in the high default of loans. With the notion that their deposits will offset their loans, they may chose not to settle their loans, leading to an increase in the loan default level. The study found that priority given to female clientele is insignificant within the sub region. Hence, it is credible that MFIs would profit by diversifying their risk across both poor male and female entrepreneurs.

For this study the key contributors to loan portfolio risk, aside leverage and extent of saving, are efficiency and the unexpected positive sign of monitoring variable (number of client outstanding) in the regression. The significance of these variables suggest that a key aspect of the loan portfolio risk is uncontrolled. Therefore it could be of benefit that MFIs put possible structures in place to control this inefficiency in the industry within the sub region.

6.4 Recommendations

This study contributes insight into the determinants of loan portfolio at risk within the SSA region. Furthermore, the empirical evidence informs policymakers of the impact of some indicators of loan portfolio risk and the manner in which this policy should be managed in order to minimize the negative impact of loan portfolio risk within the microfinance sector in SSA. The study has provided insightful reasons on why these determinants of loan portfolio risk should be managed.

The empirical analysis of this study clearly shows that loan portfolio risk has a significant impact on the reputation of the MF industry. In the light of the major role MFIs play in poverty alleviation, extending financial support services to the poor entrepreneurs in the economy, it is relevant that sound and prudent systems are instituted to manage the reputational damage MFIs face as a result of the huge loan portfolio risk in their books.

In order to reduce the inefficiency in credit administration and also manage client delinquency, MFIs should seek a wider spread of their loans to their borrowers. Thus, MFIs should increase their loan outreach to other sectors of the economy. This will result in loan diversification thereby leading to cost and management efficiency. Likewise, the widespread of loans across all sectors of the economic by MFIs will minimize the concentration of risk they encounter as a result of MFIs focussing on a particular segment of the economy. Furthermore, management inefficiency can be managed when MFIs practise the convergence of interests between shareholders and managers, which will improve performance. Acceptable equity-based compensation for executives could improve the incentives of controlling and managing economic resources which will lead to high efficiency on part of management. In addition,

management should set up an effective crediting rating and scoring system to evaluate the various borrowers they serve. This is to effectively expose serial defaulters and also address information asymmetry. Similarly MFIs could also employ the service of credit reference bureaus to check and monitor borrowers.

6.5 Further Research

Further work could be undertaken to refine the analysis as new trends and improved data becomes available (with each passing day). Although micro financing fosters poverty reduction and economic development, there are still many areas unexplored. Therefore, further research could be conducted, considering the non-financial service that MFIs provide and how this impacts loan portfolio quality, since this paper could not assess its impact and influence on loan portfolio risk. Further studies could be conducted to ascertain the cost and benefit accrued to MFIs in the provision of such service and its impact on loan portfolio at risk. Also, studies could explore how correlated risk issues such as civil wars, disease, epidemics and energy crises affect the loan portfolio quality, as these are predominant issues within the sub region. In addition, empirical work could investigate information sharing and how it impacts portfolio at risk within the SSA microfinance industry, since it is one of the significant factors that affect portfolio at risk in the industry.

REFERENCES

- Abd. G. I & Tan Be Lay A. (2002). Bank loan portfolio composition and the disclosure of loan loss provisions: Empirical Evidence from Malaysian Banks. *Asian Review of Accounting*, vol 10(1), 147 - 162.
- Alhassana A. L, Kyereboah-Colemanb A, Andohaa C. (2014). Asset quality in a crisis period: An empirical examination of Ghanaian banks. *Review of Development Finance*, 4 , 50–62.
- Al-Azzam, M., Hill R. H., & Sarangi S. (2012). Repayment performance in group lending: Evidence from Jordan. *Journal of Development Economics*, 97 , 404–414.
- Althouse, L. A., Ware W. B and Ferron, J.M. (1998). *Detecting departures from normality: a monte carlo simulation of new omnibus test based on moments*. p. Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.
- Amare B and Bekabil F. (2008). Repayment rate of loans from semi-formal financial institutions among small-scale farmers in Ethiopia: Two-limit Tobit analysis. *The Journal of Socio-Economics*, 37 , 2221–2230.
- Arunachalam, R. S. (2006). What is operating self-sufficiency? How to use it in microfinance? *Sa-Dhan Microfinance Manager Series: Technical Note # 13*.
- Athanasoglou P.P., Brissimis S.N & Delis M.D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Int. Fin. Markets, Inst. and Money* , 18, 121–136.
- Badar M., & Javid A.Y. (2013). Impact of macroeconomic forces on nonperforming loans: An empirical study of commercial banks in Pakistan. *WSEAS Transactions on Business and Economics*, Vol 10 (1), 2224-2899.
- Baum, C. F. (2001). Residual diagnostics for cross-section time series regression models. *The Stata Journal*, 1(1), 101–104.
- Beck, N. (2007). From statistical nuisances to serious modeling: Changing how we think about the analysis of time-series-cross-section data . *Political Analysis*, 15 (2), 97-100.
- Beck, N, and Katz J N. (2007). Random coefficient models for time-series-cross-section data: Monte Carlo experiments. *Political Analysis*,. 15 (2), 182-95.
- Behr P., & Simon S. (2012). The effect of information sharing between lenders on access to credit, cost of credit, and loan performance – Evidence from a credit registry introduction. *Journal of Banking & Finance*, 36 , 3017–3032.

- Bhatt, N., & Tang, S. Y. (2002). Determinants of repayment in microcredit: Evidence from programs in the United States. *International Journal of Urban and Regional Research*, 26 (2), 360-376.
- Boehe D.M & Cruz L.B. (2013). Gender and microfinance performance: Why does the institutional context matter? *World Development*, Vol. 47, 121–135.
- Breuer, J. B. (2006). Problem bank loans, conflicts of interest, and institutions. *Journal of Financial Stability*, (2), 266–285.
- Bushman R.M., & Williams C.D (2012). Accounting discretion, loan loss provisioning, and discipline of Banks' risk-taking. *Journal of Accounting and Economics*, 54, 1–18.
- Calum G. T., Rong K. & Xuexi Huo, (2010) Borrowing amongst friends: the economics of informal credit in rural China, *China Agricultural Economic Review*, Vol. 2 Iss: 2, pp.133 – 147
- Castro, V. (2013). Macroeconomic determinants of the credit risk in the banking system: The case of the GIPSI. *Economic Modelling*, 31, 672–683.
- Chaibi, H. & Ftiti Z. (2015). Credit risk determinants: Evidence from a cross-country study. *Research in International Business and Finance*, 33, 1–16.
- Collier, B, Ani L. K & Skees R. J. (2011). Loan portfolio performance and El Nino, an intervention analysis. *Agricultural Finance Review*, Vol. 71 (1), 98-119.
- Crabb P., (2008) Economic freedom and the success of microfinance institutions” journal of developmental entrepreneurship (JDE); *World Scientific Publishing Co. Pte Ltd.*, vol. 13(02) pages 205- 219.
- Crabb, P.R., & Keller T. (2006). A test of portfolio risk in microfinance institutions. *Faith & Economics*, 47 (48), Pages 25–39.
- Cull, R., Demigüç-Kunt, A., & Morduch, J. (2007). Financial performance and outreach: A global analysis of leading microbanks. *Economic Journal*, 117 (517), 107-133.
- D'espallier, B. I, Gue'rin & Mersland R. (2011). Women and repayment in microfinance: A global analysis. *World Development*, Vol. 39 (5), 758–772.
- Eoin Wrenn Trócaire, (2005) MICRO-FINANCE Literature Review
- Gibbons, D., and Kasim, S. (1991). Banking on the rural poor. *Center for Policy Research*, University Sains, Malaysia.
- Godquin, M. (2004). Microfinance repayment performance in Bangladesh: How to improve the allocation of loans by MFIs. *World Development*, Vol. 32 (11), 1909–1926.
- Greene, W. H. (2012). *Econometric Analysis*. (7th ed.). Harlow: Pearson.
- Hulme, David, & Paul Mosley (1996). *Finance against poverty*. London: Routledge,

- Jones, K. (1991). Specifying and estimating multi-level models for geographical research. *Transactions of the Institute of British Geographers, NS 16* (2), 148-59.
- Jones, K., Ron J. J., & Pattie C.J. (1992). People, places and regions - exploring the use of multilevel modeling in the analysis of electoral data. *British Journal of Political Science, 22*, 343-80.
- Kennedy, P. (2008). *A guide to econometrics*. (6th ed), Oxford, UK: Blackwell Publishing.
- Kevane, M., & Wydick, B. (2001). Microenterprise lending to female entrepreneurs: Sacrificing economic growth for poverty alleviation? *World Development, 29* (7), 1225- 1236.
- Kyereboah-Coleman, A. (2007). The impact of capital structure on the performance of microfinance institutions. *The Journal of Risk Finance, Vol. 8* (1), 56-71.
- Louzis P.D, Angelos T. V & Vasilios L. M. (2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking & Finance 36* (2012) 1012–1027, 36 , 1012–1027.
- Mendes, M & Pala, A. (2003). Type 1 error rate and power of the three normality tests. *Pakistan Journal of Information and Technology, 2* (2), pp 135 - 139.
- MIX and CGAP. (2008). *Africa Microfinance Analysis and Benchmarking Report*.
- MIX and CGAP. (2010). *Sub-Saharan Africa: Microfinance Analysis And Benchmarking Report*.
- MIX and CGAP. (2011). *MIX Microfinance World: Sub-Saharan Africa Microfinance Analysis and Benchmarking Report*. Microfinance Information Exchange (MIX) and Consultative Group to Assist the Poor (CGAP).
- Moodie, M. (2013). Microfinance and the gender of risk: The Case of Kiva.org. *Journal of Women in Culture and Society, vol. 38* (2).
- Mohd Zaini A K., & Roslan. A. H. (2009). Determinants of microcredit repayment in Malaysia: The ???of agrobanks. *Humanity and Social Science, 4* (1), 45 -52.
- Nawai, N., & Shariff M.N.M. (2012). Factors affecting repayment performance in microfinance programs. *Procedia - Social and Behavioral Sciences, 62*, 806 – 811.
- Nawai, N., and Shariff M.N.M. (2010). Determinants of repayment performance in microcredit programs: A review of literature. *International Journal of Business and Social Science, Vol. 1* (2), 152 - 161.
- O'Connell, A.A., & McCoach D. B. (2008). *Multilevel modelling of educational data*. Charlotte NC: Information Age.
- Papias M. M., & Ganesan P. (2009). Repayment behaviour in credit and savings cooperative societies Empirical and theoretical evidence from rural Rwanda. *International Journal of Social Economics, Vol. 36* (5), 608-625.

- Ramesh S. A. (2006). What is financial self-sufficiency? How to use it in microfinance?]. *Sadhan Microfinance Manager Series: Technical Note # 14*.
- Sharma M., & Zeller M. (1997). Repayment performance in group-based credit programs in Bangladesh: An empirical analysis. *World Development*, Vol. 25 (10), 1731-1742.
- Schicks, J. (2014). Over-indebtedness in microfinance – An empirical analysis of related factors on the borrower level. *World Development*, Vol. 54, 301–324.
- Schurer, S, & Yong J. (2012). Personality, well-being and the marginal utility of income: what can we learn from random coefficient models? *Health, Economics and Data Group, Working Paper*: University of York.
- Studenmund, A. H. (2006). *Using econometrics a practical guide* (5th ed.). ????:Pearson International.
- Tehulu, T. A. (2013). Determinants of financial sustainability of microfinance institutions in East Africa. *European Journal of Business and Management*, Vol.5 (17), 2222-1905.
- Van R. C., Stewart R. & De Wet T. (2012). The impact of microfinance in Sub-Saharan Africa: A systematic review of the evidence. *World Development*, Vol. 40 (11), 2249–2262.
- Verbeke, G, & Molenberghs G. (2000). *Linear mixed models for longitudinal data*. New York: Springer.
- Wagner, C. & Winkler, A. (2013). The vulnerability of microfinance to financial turmoil – evidence from the global financial Crisis. *World Development*, Vol. 51, 71–90.
- Waweru N & Gary S (2012) The use of performance measures: the case studies form the microfinance sector in Kenya *Qualitative research in accounting and management* Vol. 9.2012, 1, p. 44-65
- Weber, R., & Musshoff O. (2012). Is agricultural microcredit really more risky? Evidence from Tanzania. *Agricultural Finance Review*, Vol. 72 (3), 416-435.
- Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. Cambridge MA: MIT Press.
- Yaron J., & Manos R. (2007). Determining the self sufficiency of microfinance institutions. *Savings & Development* (2), 131-160
- Zechner J. & Johann A., (2000) Portfolio performance evaluation; *Institute of business administration*, University of Vienna, Austria.

APPENDICES

Appendix 1

List of Countries used in study

	<i>COUNTRIES</i>	<i>UNFILTERED</i>		<i>FILTERED</i>	
		<i>OBS</i>	<i>%</i>	<i>OBS.</i>	<i>%</i>
1.	ANGOLA	2	0.33	1	0.6
2.	BENIN	36	5.86	6	3.7
3.	BURKINA FASO	26	4.23	8	4.9
4.	BURUNDI	19	3.09	6	3.7
5.	CENTRALAFRICAN REPUBLIC	2	0.33	0	0
6.	CHAD	4	0.65	2	1.2
7.	CAMEROON	31	5.05	9	5.6
8.	CONGO	1	0.16	0	0
9.	D.R. CONGO	27	4.40	9	5.6
10.	ETHIOPIA	24	3.91	10	6.2
11.	GAMBIA	2	0.33	2	1.2
12.	GHANA	83	13.52	10	6.2
13.	GUINEA	2	0.33	2	1.2
14.	GUINEA BISSAU	4	0.65	0	0
15.	KENYA	48	7.82	9	5.6
16.	LIBERIA	4	0.65	2	1.2
17.	MADAGACAR	16	2.61	9	5.6
18.	MALAWI	11	1.79	7	4.3
19.	MALI	14	2.28	6	3.7
20.	MOZAMBIQUE	11	1.79	7	4.3
21.	NAMIBIA	2	0.33	1	0.6
22.	NIGERIA	65	10.59	5	3.1
23.	RWANDA	31	5.05	9	5.6
24.	SENEGAL	46	7.49	7	4.3
25.	SIERRA LEONE	13	2.12	5	3.1
26.	SOUTH AFRICA	19	3.09	4	2.5
27.	SWAZILAND	1	0.16	1	0.6
28.	TANZANIA	23	3.75	9	5.6
29.	TOGO	30	4.89	8	4.9
30.	ZAMBIA	10	1.63	6	3.7
31.	ZIMBABWE	7	1.14	2	1.2
	TOTA	614	100.00	162	100

Appendix 2

Year	W.A	E.A	S.A	C.A
2000	4.18%	5.08%	7.01%	7.01%
2001	5.54%	4.69%	5.96%	7.04%
2002	3.78%	3.70%	10.20%	14.67%
2003	9.14%	9.73%	8.71%	11.18%
2004	10.33%	6.76%	11.86%	17.79%
2005	8.96%	7.09%	14.15%	16.52%
2006	9.30%	8.06%	8.07%	9.78%
2007	7.80%	8.16%	5.14%	4.06%
2008	0.25%	6.47%	7.23%	8.59%
2009	13.07%	9.73%	6.02%	7.20%
2010	9.98%	6.97%	6.74%	8.82%
2011	8.91%	5.04%	8.37%	8.71%
2012	11.21%	6.24%	5.75%	8.56%
Summation	102.44%	87.71%	105.21%	129.94%
Overall Weighted average	0.085365	0.073089	0.087677	0.108284

Appendix 3

Variance Inflation factor

Variable	VIF	1/VIF
Lev	1.58	0.632581
Exts	1.55	0.644227
Fem	1.35	0.738127
Lsty	1.31	0.762151
Inef	1.30	0.76655
logclt	1.19	0.839829
Gdp	1.09	0.919971
Mean	1.34	

Appendix 4

Breusch and Pagan Lagrangian multiplier test for random effects. The null hypothesis in the LM test states that, the variances across entities are zero.

		Var	sd = sqrt(Var)
par30	0.005073		0.071223
E	0.002466		0.049657
U	0.003371		0.058056
chibar2 (01)			774.03
Prob > chibar2			0.0000