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The profitability of microfinance institutions and the connection to the yield on the gross portfolio

- *An empirical analysis*

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Executive summary

Recent studies have shown that the microfinance industry is growing while undergoing a transformation from the donor-driven NGO framework towards a greater degree of capital market involvement. This change is due to many facts, e.g. that donations are getting harder to find, and businesses have started to see possibilities for profit in this industry. The main objectives of this paper is to find the factors that determine profitability, and to find out whether the high interest rates go hand in hand with high profits for the microfinance institutions as claimed by some critics. To attain the objectives, previous literature, studies and theory from the commercial banking industry have been formulated into a background study, identifying certain indicator groups with economical significance: outreach, financing structure, expenses, revenue, efficiency, quality of portfolio, and the peer group comparisons of deposit taking, age, legal status and profit status to be factors of profitability and thereby to be investigated further in an empirical analysis.

The data used in the empirical analysis was found though MIX market, and a sample of 879 MFI's was processed and analyzed to test two profitability models with return on assets and profit margin as the dependable variables. I found that large variances in the microfinance industry became a problem when trying to estimate models to explain patterns, since the OLS regression is much influenced by outliers. Still, certain statistical trends were found which also aligns with theory or previous studies; Factors that statistically influenced profitability positively was the capital asset ratio, age (new) and the gross loan portfolio. Factors with a statistical negative influence were legal status (credit union) and cost per borrower. Two other variables also showed a statistical significance, but with the opposite influences than expected, and these were the operating expense over loan portfolio which had a positive influence, and number of active borrowers, with a negative influence. The unexpected signs of the variables could be explained by other influencing variables, time or other relationships than linear. The yield on gross portfolio did not show as a significant explanatory variable for profitability, and different correlations and robustness tests showed that there is no general trend that MFI's are charging a higher yield in order to get high profits, though it does occur.

It is, therefore, clear that there is still much diversity in the industry, and no clear set of best practices for becoming profitable has been defined. However, as the industry is young and still changing, this is not a surprising result.

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1. Introduction

In 1962, Milton Friedman, an American economist, stated that the only social responsibility of businesses was to increase their profits as long as they stayed within the rules of the game. Friedman argued that in a free society only people have social responsibilities, whereas a corporation, being an artificial person, can not be said to have social responsibilities {{ 26 Friedman, Milton 1970;}}. However, opposed to this view was Muhammed Yunus, a professor of economics and an advocate of social businesses, who developed the concepts of microcredit and microfinance. In 1976, Yunus started granting small loans to villagers thereby giving them the chance of becoming entrepreneurs and to earn income, and thereby breaking the cycle of poverty. It was impossible for poor people to be granted loans by mainstream financial banks, due to lacking collateral, and the only alternative was therefore the unofficial moneylenders who could charge up to 1000% for a monthly loan {{ 2 Dieckmann, Raimar;}}. In comparison, microfinance institutions, MFI's, in 2010 charged interest rates in the range of 1% to 95%[1] . Due to the fixed cost of processing loans and a high default risk, interest rates at MFI's cannot be lower than the rates charged by conventional financial banks, though from an outside perspective they may seem high.

The Grameen Bank, founded by Yunus, has lead the way for many FMI's with the goal of eliminating poverty, and in 2006, they were awarded the Nobel Peace Prize for their efforts.

The lending innovation designed by the Grameen Bank is a form of group lending using a joint liability contract. Under this contract all group members have to help if one of the members cannot pay. '*The joint liability, along with a banking system based on trust and participation, has removed the need for collateral*', it says on the website of the bank {{15 Grameen Bank 2011; }}. Since the establishment of the Grameen Bank, many other MFI's have been founded all over the world. In 2009, the Microcredit Summit Campaign reports the existence of more than 3,500 MFI's all

[1] See sample analysis table 17

over the world, and the Microfinance Information exchange has individual financial reports from over 1,800 {{7 MIX 2011; }}.

The goal of social economic development is, however, not a requirement for MFI's, and therefore not all MFI's are good-hearted, 'non-profit' organizations just as Grameen Bank started out. The industry, along with all the players in it, is rapidly changing. Today, the microfinance industry has become both more crowded and more complex. First of all, the concept of microfinance no longer just covers microcredit, but also includes the possibilities of saving, insurance and money transfer. Although MFI's are characterized as one type when it comes to financial services, there is a great variety of MFI's in terms of type of institution, legal form, business approach, degree of sustainability and funding sources. Recent studies {{2 Dieckmann, Raimar; }} have shown that MFI's are undergoing an actual transformation from the traditional donor-driven NGO framework towards a greater degree of capital market involvement. There are many hypotheses as to why this transformation is happening; one of them being that it is difficult to count on donations, subsidies and grants by development agencies or private donors. MFI's have likewise started to become more formal financial institutions or even regulated banks in their own specialized form. Grameen Bank also underwent a transformation in 1983, when it was transformed into an independent bank by government legislation. Today, 90% of its shares is owned by the borrowers, and the remaining 10% is owned by the government. Since 1995, the bank has been self-reliant, and it has been profitable most of the years since {{15 Grameen Bank 2011; }}. Many other MFI's follow the same pattern. The infant industry argument is often used as a parallel to why institutions should be subsidized in the beginning. Start-up costs are significant and microfinance institutions often need help from 'non-profit' organizations to get started, but the long-term success of any microfinance institution lies in its ability to attain profitability, since no one knows when subsidies or donations stop. Profitability leads to greater access to capital, as investors in general, such as private or institutional investors, demand some kind of financial return {{2 Dieckmann, Raimar; }}.

Gibbons and Meehan also point out that the only way for MFI's to become financially sustainable is by adopting commercially motivated, 'for-profit' strategies and thereby be able to achieve the goal of reducing poverty among large numbers {{16 Gibbons, David S., Meehan, Jennifer W. 1999; }}. The financial sustainability of an MFI can be defined as its capacity to cover all of its expenses by its revenue and

to generate a margin to finance its growth, and this is the same as profitability in the long run. Being a sustainable, and thereby profitable MFI also brings discipline to the MFI, tightens up its own operations, and generally leads to better products.

In 2008, MFI benchmarks by Microbanking Bulletin show that out of 1,084 MFI's 414 had registered as a 'for-profit' institution, and a total of 557 were even financially sustainable.

Microfinance can be seen as either from a business view or as a tool for development. The objective of this paper is to investigate microfinance institutions from a business view since it's observed that an increasing number of institutions have become interested in becoming profitable. The industry is changing and profitability for the individual institution is vital for survival in the long run. Therefore, it's interesting to investigate what actually determines profitability.

Critics have been raised over the increasing focus on profitability and argue that the demand for profit causes higher interest rates, and this conflicts with the goal of poverty reduction. Muhammed Yunus declares that greedy 'for-profit' MFI's are exploiting the poor to make large profits and that poor people should be the only beneficiaries of microfinance {{ 35 MIX publications 2011;}}. The connection between the profitability of an MFI and the interest rate charged is therefore also interesting, since this can reveal whether an MFI can have the goal of both poverty reduction, i.e. of making cheap small loans, and profitability.

2. Research questions

As profitability is in focus in this paper, the microfinance industry will be characterized and possible factors of microfinance institutions profitability will be described. The relationship between the interest rate and profitability will also be analyzed in order to examine whether there is a truth behind the mentioned critics. Whether the profit status has an influence on this relationship will also be examined. Instead of using the interest rate itself, the yield on gross portfolio (real) is used, which is the average interest and fees on loans, since this creates a better picture of the total costs for a borrower.

The main objectives of this paper leads to the following key research questions:

- What factors determine the profitability of MFI's?
- What is the connection between profitability and yield on gross portfolio?

Other papers have examined and tried to measure the sustainability of microfinance, but this paper focuses on profitability, as this is the first step in becoming sustainable. The connection between profitability and the yield on the gross portfolio has not been examined in this manner before to my understanding.

3. Methodology

This section describes the systematic approach of the paper applied to make an explorative and diagnostic study of microfinance institutions, what factors determine their profitability and the connection to the yield charged.

There are three main problem-solving methods, the analytical, the system oriented and the hermeneutical. I have found the analytical and the system oriented problem-solving methods most suitable for this paper, since there is no need to make any interpretations as the background study is objective and the empirical analysis will give its own conclusions {{23 Andersen, Ib 2002; }}. The hermeneutical method could, however, have been useful had the paper included the ethical aspects of the industry as well as whether microfinance is in fact helping reducing poverty. However, these aspects have intentionally been left out to make the structure and goal of the paper more clear.

The analytical way of thinking is based on an objective point of view. That is, my personal opinion does not influence the deduction of the problem statement. I will use the analytical approach when I want to make an objective view, first in the background study consisting of both description, analysis, and some theory, and secondly in the empirical analysis based on data. The system-oriented method gives a more differentiated picture and compares analogue systems. This method of problem solving is relevant when the data of different microfinance institutions are compared with each other, which happens throughout the paper. This method is used in order to provide different perspectives into the analysis.

Theory on microfinance is not yet established, though the concept is becoming increasingly accepted. Since the industry is changing, so do the aspects of this concept, and this is why an explorative and diagnostic study will bring new knowledge to the field. This is also the reason why there is no basic theoretical hypothesis that should be tested as a motivation for this paper. However, in order to find out what makes MFI's profitable, attention is paid to testable hypotheses, based on previous research, theory of banking practices and reasoning. Likewise, the connection between profitability and the yield will be examined to learn if there is a true correlation between them, as a strong correlation is the point of critics in this field. The hypothesis proposed is therefore that there is a direct relationship between the yield and profitability.

Theories from the field of finance are used in general to show the similarities and differences between the concepts, e.g. general concepts of interest rates in commercial financial institutions vs. MFI's, to further understand the behaviour of the microfinance institutions.

3.1 Data gathering

To get the best and the most reliable empirical analysis of the MFI's, it is important to stay critical and make the right choices when gathering and selecting data. This is important since the aim of the paper is to objectively understand the factors determining the profitability of microfinance institutions and the connection between the profitability of the individual institution and the yield it charges.

Most of the data used in this paper originates from MIX (Microfinance Information exchange) Market, www.mixmarket.org, which is a global, web-based microfinance information platform that compiles financial and social performance information on more than 1900 MFI's. MIX is also behind publications from MicroBanking Bulletin and MIX Microfinance World, which are also used as references through the paper. The organisation, along with its database, was created in 2002 as a private 'non-profit' organization promoting the exchange of information within the microfinance sector. The mission of the organization is to help create a transparent microfinance market.

Though the actual number of microfinance institutions in the world is much higher than the organizations database reports, new institutions are added every year. Data from this database is used as a reliable source of data to many researchers and analysts worldwide{{ 6 Armend≒riz, Beatriz and Morduch, Jonathan 2010;}}.

The main data set for this paper was downloaded with indicators for 1140 observations (MFI's) for 2009. This sample was screened and downsized to 879 observations. The raw data sample for the empirical analysis will be attended to in section 5.1 where the data processing is described.

Other data, such as macroeconomic variables or poverty levels have also been used in this paper and originates from websites such as the International Monetary Fund (IMF), the World Bank and The Microcredit Summit Campaign.

A descriptive examination of the data is used in the background study where e.g. characteristics of microfinance and the institutions have been made. This will lead to the next step, which is the analytical path, which I carried out through the software program SAS Enterprise Guide 4.2, a powerful framework for statistical analysis. Through the analysis, the data sample will be examined in different ways and multiple steps in testing assumptions will be taken. This quantitative data provides the opportunity of making an analysis from an explorative and diagnostic view.

Qualitative data, in the form if research articles, reports from organisations and critical pieces provides information for the background study as well, and offers suggestions as to what might be interesting factors when looking at profitability of microfinance institutions and the level of interest rates when diving into the data analysis.

This paper is based on secondary data sources through desk research. No primary data is used as the point of the paper is to make an empirical analysis leading to general conclusions. Therefore it was not relevant to this paper to make any interviews or observations.

3.2 Validity and reliability

It is important to be critical when gathering data, no matter whether it is quantitative or qualitative. There are two significant variables, validity and reliability, that need to be taken into account when gathering the data.

Validity is when the research has relevance to the problem statement {{23 Andersen, Ib 2002; }}. It is defined as the degree of agreement between the theoretical and the empirical conceptual framework

The validity of the data from MIX market is considered high since this is the most comprehensive and in-depth database in the microfinance industry on MFI performance, and it is therefore the database most used by researchers and analysts. The articles and reports are considered as valid as well, as these are dealing with aspects that the data cannot always provide and therefore also offer aspects in the analysis of the problem statement. The aspect of validity can, however, be discussed due to the fact that as the industry examined in this paper is new and changing, consequently there is not as much information about this field as can be found on many established industries.

Reliability is equal to the trustworthiness of the research. That is to say, will another analysis turn out with the same results as mine (with the same assumptions)?

It is very important to estimate the reliability of the compiled data and to remain critical. The paper can be considered reliable since the analytical and system oriented methods are being used. Also, the fact that the empirical analysis is based on a large data sample increases this reliability. MIX market is, as mentioned, a 'non-profit' organization promoting access to information exchange and transparency within the industry and is therefore also considered a reliable source. The financial statements on the website are audited, and the MIX reviews the data and follows up if there are any discrepancies or inconsistencies. Data reviewing includes checking MFI-submitted data against audit and trends, along with standardizing it according to industry reporting norms. The diamond raking system of MIX signals the level of transparency for the MFI and is likewise public. The higher the number of diamonds (1 to 5) the higher level of transparency. Despite all these efforts in making the data reliable, there are aspects that make the paper less reliable. It is up to the individual

institutions to submit their data to the organization, and this creates a skewed sample. Also, the presence of outliers could be influencing the results of the analysis in ways that they are not meant to, thereby also skewing the results.

Overall, it is concluded that from an outside point of view the data has a good combination of validity and reliability and thus forming a good foundation for the paper. The reliability of the data used in the empirical analysis will be tested even further in section 5.1 and 5.1.3.

4. Background study

This section serves as a characterization of the industry and the factors that might influence the profitability of microfinance institutions. Likewise, theory behind profitability and interest rates of retail banks and their connections to the microfinance industry will be described and analyzed. Last, two cases from the industry will be analyzed to see different types of profitability and their connection to the interest rates charged.

4.1 The Industry

A mapping of the different definitions, characteristics and actors in the industry is important in order to get an understanding of the following empirical analysis and the variables included.

4.1.1 Definitions

Many terms of both finance and microfinance will be used throughout the paper. This section defines the three most important and basic ones. Others will be either defined when it fits the structure of the paper, or they are considered general knowledge.

4.1.1.1 Microfinance and microcredit

Since the terms of microfinance and microcredit are often used interchangeably, it is important to define each term separately and thereby see what they cover.

Microfinance is the practice of providing a variety of financial services that target low-income and poor clients. The diversity of services offered reflects the fact that the financial needs of low-income individuals or households and small enterprises can change significantly over time. These services include loans, savings, insurance, and remittances. Because of these varied needs, and because of the industry's focus on the poor, microfinance institutions often use non-traditional methodologies that are not used by the formal financial sector.

MIX uses a functional definition: ”*Microfinance services – as opposed to financial services in general – are retail financial services that are relatively small in relation to the income of a typical individual. Specifically, the average outstanding balance of microfinance products is no greater than 250% of the average income per person (GNI per capita)”* {{ 7 MIX 2011;}}**.**

Microcredit is one of the financial services mentioned, namely the loans which include the act of providing loans of small amounts to the poor and other borrowers that have been ignored by commercial banks. Micro-loan is, therefore, a synonym for microcredit, and this financial service is in focus since it’s the main service of the MFI’s. Under this definition, microcredit encompasses all lenders, including the formal participants (such as specialized credit cooperatives set up by governments to encourage economic development) and those of a more informal variety (such as the village moneylenders or even loan sharks).

The different loan sizes of microloans cover a large scale but often start from USD 100 and can reach several hundred dollars, depending on the debtor’s repayment history etc. The average loan size of an MFI is an interesting factor since that the smaller the loans are the more expensive to disburse than larger loans.

In short, microfinance is the field of the industry and microcredit is the core service out of all the financial services.

4.1.1.2 MFI’s

A microfinance institution (MFI) is an organization that provides the microfinance services to low-income clients. An MFI can operate as a ‘non-profit’ institution such

as a non-government organization (NGO), credit cooperative, non-bank financial institution (NBFI), or even as a formal, regulated and 'for-profit' bank. The variety of institutions mentioned will be described more deeply later on.

MFI's differ in many ways. Most traditionally, differences are measured in size and reach; some serve a few thousand clients in their immediate geographical area, while others serve hundreds of thousands, even millions, in a large geographical region, through numerous branches {{ 7 MIX 2011;}}. Other differences can be found in their goals, funding structure, MFI model, age, services, financial reporting, transparency[2], interest rates, profitability and so on.

4.1.1.3 Sustainability vs. self-sufficiency vs. profitability

When comparing or analyzing individual MFI's, the matter of whether an institution needs, or gets, outside subsidies and donations, often comes up. The following terms are used when discussing this issue.

Sustainability is probably one of the most discussed terms concerning microfinance institutions since many consider this a deciding factor for the future of the institutions. Sustainability is generally seen as being essential for MFI's to reach and benefit a significant number of poor clients {{16 Gibbons, David S., Meehan, Jennifer W. 1999; }}. In definition, it is an organization's ability to cover costs. There are varying degrees of sustainability, ranging from not sustainable to financially sustainable.

Self-sufficiency is another word for sustainability. Operational self-sufficiency (OSS) is a term describing that the MFI raises enough revenue to cover the cost of operating the business - paying loan supervisors, opening branch offices, etc. Subsidies might still be used to issue loans or cover defaulted loans. An institution is financially self-sufficient (FSS) when it has enough revenue to pay for all administrative costs, loan losses, potential losses and funds. This means, that when an institution is financially sustainable, it does not require any subsidized inputs or outside funds to operate. Instead, it raises money through its lending operations. Achieving OSS is therefore the primary goal, and the goal after that is FSS.

[2] a transparent MFI gathers and reports accurate financial information on its own which is then verified and analyzed by external parties. These external authorities ensure that the MFI's performance complies with appropriate industry standards

As mentioned in the introduction of this paper, FSS of an MFI is the same as profitability in the long run. Also, since it is important to get to the core of any diagnostic study, the main focus is on profitability. Profitability can be measured in different ways, which will be examined further in section 4.2.

4.1.2 Characteristics

Poor people in developing countries usually do not qualify for any type of services from the formal and commercial banking sector. The term, 'unbanked', is used to describe the world's working poor who are excluded from the formal banking sectors. Lack of credit histories and documented records on small entrepreneurs or farmers make it difficult for a commercial bank to assess the creditworthiness of the borrower. Furthermore, they are excluded from the formal banking system since they are most of the time unable to provide collateral {{ 7 MIX 2011;}}. Yet, people living in poverty, like everyone else, need access to a diverse range of financial services to help run a small business, manage risks, and plan for a more stable future. Small-scale enterprises, microenterprises, which employ fewer than five people, are often the first step. Microenterprise is often the sole source of family income but can also act as a supplement to other forms of income. Examples of microenterprises are e.g. small retail kiosks, sewing workshops, carpentry shops and market stalls. Microfinance institutions exploit new contractual structures and organizational forms that reduce the riskiness and costs of making these small and uncollateralized loans are needed for either micro entrepreneurs, building a house for a family etc, and in that way they serve the people living in poverty.

Much of the interest rests on an attractive 'win-win' argument: microfinance institutions that follow the principles of good banking will also be those that alleviate the most poverty. By eventually eschewing subsidies and achieving financial sustainability, microfinance institutions will be able to grow without the constraints imposed by donor budgets. In the process, according to the argument, these institutions will be able to serve more poor people than can be served by institutions fuelled by subsidies. A key principle of this argument is that poor households demand access to credit, not "cheap" credit, meaning that institutions can charge high interest rates without compromising outreach. If the argument is right, much poverty

alleviation can be achieved at no cost to governments and donors – or perhaps even at a small profit. The vision has been translated into a series of "best practices" circulated widely by the Consultative Group to Assist the Poorest (CGAP; a donor consortium housed within the World Bank), the US Agency for International Development, the United Nations Development Program, and other key donors.
The most basic best practices are {{ 29 CGAP (Consultative Group to Assist the Poor) 2011;}}:

1. Where possible, look to INSOL Principles[3] to guide the structure by which the debt negotiation will be organized.

2. Adhere to a transparent process that includes all interested stakeholders.

3. Demand fair and good faith dealings by the MFI with its creditors, and among creditors.

4. Encourage speedy and simple solutions.

5. Favor "new" money over old such that creditors that provide new financing to the distressed MFI enjoy a priority over other existing creditors.

6. In the absence of fraud or bad faith conduct by the MFI, favor long-term, out of court resolutions.

The conflicting argument against the 'win-win' argument is that the high interest rates conflict with the original social economic development goals of the MFI's. Another point of this conflicting argument is that there has never been evidence that the most affective poverty alleviation programs can be – or should be – self-financing through MFI's. There is, likewise, no evidence showing whether a customer is better off after being served by an MFI than before (20 Morduch, Jonathan 2000).

No matter what argument turns out to be right, there is a number of MFI's in the world reaching out to poor people, and by new methods trying to overcome the increasing risk of providing financial services to the poor.

[3] Principles for a global approach to multi-creditor workouts by the International Federation of Insolvency Professionals

4.1.2.1 Innovative methods and organizational model

As mentioned, mainstream banks have for the most part denied the poor access to credit, because they are believed to be uncreditworthy. Many ask why the microfinance organisation, Grameen Bank, as the pioneer in the industry, has succeeded where others have failed. The answer of many economists lies in its unique group lending contracts. There are many variations of the group lending contract, but the first one, was the one designed by Grameen Bank where the borrowers organize themselves into a group of five and present themselves to the bank. After agreeing to the bank rules, the first two members of the group receive a loan. If the first two successfully repay their loans, then four to six weeks later, the next two are offered loans, and after another four to six weeks, the last person is finally offered a loan. As long as all the members in the group repay their loans, the promise of future credit is extended. If a member of the group defaults on a loan, then all the members are denied access to future credit if they don't pay for the defaulting member {{ 17 Sengupta, Rajdeep and Aubuchon, Craig P. 2008;}}.

The Grameen model configured into a highly standardized loan product, or model, that allowed serving cost-efficient poor people with small loan needs. The customers are often entrepreneurial poor who invest ever growing loans into their small-scale businesses such as petty trade, poultry, milking cows and so on {{ 5 Barman,Deepak 2009;}}. Group lending, or the joint liability contract, is the most celebrated lending innovation in the industry. Village banking is an extended version of the original group lending methodology. The clients here, typically women, form groups in the region of 10-30 individuals that are autonomously responsible for leadership, bylaws, bookkeeping, fund management and loan supervision. The group pools funds to use for business loans, savings, and mutual support, and members cross-guarantee individual loans. This methodology is simply an extended version of the joint liability model.

The first motivation of the different group lending contracts were economies of scale, but other benefits showed quickly: the members within the group can help mitigate the problems that an outside lender would face – agency costs. But the most difficult agency problem faced by lenders is that of adverse selection – ascertaining the possible credit risk of borrowers. Economic theory helps show how joint liability contracts mitigate adverse selection. The lender can mitigate the adverse selection

problem when customers, who do not directly inform the bank of the reliability of other customers, form themselves into a group (peer selection). That is, giving a joint liability contract, safe customers will more likely group together with other safe customers, leaving the risky types to form groups by themselves. This "assorting matching" mitigates the adverse selection problem because now the risky borrowers are the ones who must bail out on other risky borrowers, while the safe borrowers form a safe group together. As a result, all borrowers can be charged a lower rate (17 Sengupta, Rajdeep and Aubuchon, Craig P. 2008).

Joint liability contacts were seen as the breakthrough to the poor market. And since then, other innovative methods, such as dynamic and progressive loans (a type of dynamic incentive in which access to larger amount of credit becomes available after each successfully repaid loan), frequent repayment schedules, and non-traditional collateral has also been used. In many cases, they operate alongside group contracts.

Not all MFI's apply the group lending principle; instead, some MFI's prefer to lend to individuals without any shared liability aspect. This reflects that group lending also has some shortcomings, e.g. that it only fully works in rural settings where social control is higher {{ 2 Dieckmann, Raimar;}}. The sequential loan is an innovative method used by some MFI's that offer individual lending. Micro-enterprises do not generally supply material guarantees or reliable financial and accounting information when they seek microcredit. Thus, discriminating between micro-entrepreneurs without resorting to adverse selection and group lending is a crucial problem that MFI's must face. To identify micro entrepreneurs with higher potential, MFI's can apply these sequential loans. In practice, this means that the MFI start off by giving one loan to the borrower, and if this is repaid, they will provide another, and so on. Stepped lending is another term for the same process in which the borrowers who repay loans on time are eligible for increasingly larger loans. This innovation keeps initial risk low, allowing micro entrepreneurs to grow their businesses and increase their incomes and improving the quality of the portfolio at risk {{ 4 Ayayi,Ayi Gavriel 2010;}}.

Another initiative taken by Grameen Bank was how the institution chose to have women as the vast majority of their borrowers. This method has thereafter been

shared by many other MFI's. The high proportion of women reflects the fact that women are seen as more reliable debtors due to stronger social and family ties. Furthermore, they often follow a more conservative investment strategy, which in turn results in lower default rates for MFI's. This lower credit risk is further supported by a relatively low degree of labour mobility of female clients (due to the strong family ties) which decreases the cost of monitoring debtors for an MFI {{ 2 Dieckmann, Raimar;}}.

The different innovative methods have also made it possible to achieve relatively high repayment rates for the MFI's. The global level of repayment is about 97 percent {{ 7 MIX 2011;}}, which seems almost unrealistically high. Although the theories behind the different innovative methods adequately explain the high rates of repayment, validation concerning the reporting is an issue, and sometimes even offensive measures in collection repayments have been observed. Therefore it is difficult to know what are the true repayment rates (17 Sengupta, Rajdeep and Aubuchon, Craig P. 2008).

Many MFI's include a compulsory savings component that limits the borrower's access to deposited funds, from which the MFI can withdraw money from if the borrower can't make payments in some periods. This creates the possibility of a flexible loan where the savings serve as insurance. Though the poor people have little income, they are not too poor to save, as some already did before the institutions provided the opportunity. The poor often already save in ways that may not be considered 'normal' savings. Investing in assets, for example, that can be easily exchanged for cash in the future, e.g. domestic animals {{7 MIX 2011;}}. Most MFI's have recognised the importance of savings for the institution and its business. More important than reducing the risk, savings can be a relatively cheap source of funds for MFI's, because interest rates that have to be paid to attract savings are usually less than those that have to be paid to borrow funds commercially. MFI's, however, have major differences in priority of saving and credits between them {{16 Gibbons, David S., Meehan, Jennifer W. 1999; }}.

In the recent years, the range of microfinance services has widened considerably. Remittance services have been recognised as a critical service for the poor, many of

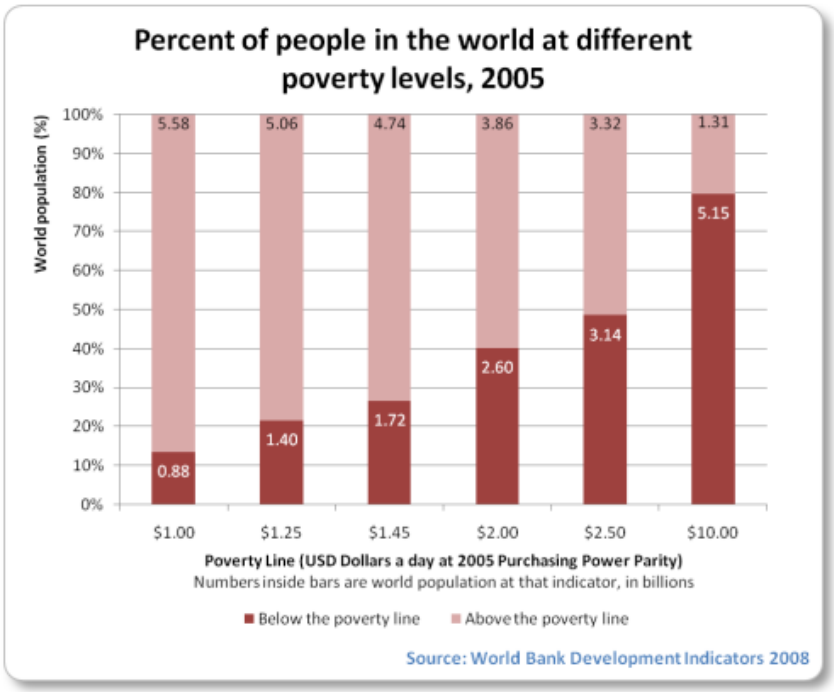
which migrate temporarily and support their families from far. The methodology, the services and the organizational models, like the industry, will evolve over time.

4.1.2.2 The market

MFI's focus on the part of the population that is not being served by mainstream financial service providers, especially poor people because of the original goal of poverty alleviation.

The World Bank renounced a new poverty line of 1.25 dollars a day in 2008, where for many years until then it had been 1 dollar a day. Among more developing countries, 2.50 dollars a day represents a typical poverty level. The 10-dollar-a-day figure is close to poverty levels in the US.

Table 1: People in the world at different poverty lines



Source: World Bank

The above table provides a global perspective to poverty in the world, and in the perspective of this paper, it shows the percentage of the world population that constitute possible markets for MFI's. Around 1.4 billion people live below the new poverty line and around 3.14 billion live on less than 2.5 dollars a day. It is obvious

that there is a big market, which is not being served by commercial banks and therefore possible customers to MFI's.

4.1.2.3 Coverage

It is difficult to know exactly how many MFI's there are currently since some are very informal, rural and aren't registered anywhere. Also, major international organisations have different estimates on the number of existing MFI's.

The Microfinance summit campaign is a project of the RESULT Educational Fund – a U.S. based grassroots advocacy organization, committed to ending hunger and poverty, that gathers microcredit practitioners, advocates, donor agencies, international financial institutions and NGO's from all over the world, to stimulate interchanging of knowledge and to work towards their own goals of poverty reduction, women empowerment etc. The Microcredit Summit Campaign reports the existence of over 3,500 institutions in 2009, where more than 190 million people had a microloan, and 128 million of these where the world's poorest, i.e. the people living below the 1.25 dollars a day poverty line.

Table 2: Progress in the existence of MFI's and client outreach from 1997 to 2009

Date	Number of Programs Reporting	Total Number of Clients Reached	Number of Poorest Clients Reported
12/31/97	618 institutions	13,478,797	7,600,000
12/31/98	925 institutions	20,938,899	12,221,918
12/31/99	1,065 institutions	23,555,689	13,779,872
12/31/00	1,567 institutions	30,681,107	19,327,451
12/31/01	2,186 institutions	54,932,235	26,878,332
12/31/02	2,572 institutions	67,606,080	41,594,778
12/31/03	2,931 institutions	80,868,343	54,785,433
12/31/04	3,164 institutions	92,270,289	66,614,871
12/31/05	3,133 institutions	113,261,390	81,949,036
12/31/06	3,316 institutions	133,030,913	92,922,574
12/31/07	3,552 institutions	154,825,825	106,584,679
12/31/09	**3,589[29] institutions**	**190,135,080**	**128,220,051**

Source: Microcredit Summit Campaign 2011

The above table shows that from 1997 to 2009 the total number of clients reached by MFI's worldwide has gone from 13 million to 190 million people, which is an impressive increase. Yet there is a big market, which has not been reached. It has also been found that only a small number of these institutions (including umbrella organisations) that serve the majority of the clients, especially the poor ones. Networks, which include umbrella organisations providing financial support, technical support, promotion and development support and large sponsored programs, serve around 50% of the poorest clients in only 7 networks {{ 24 Reed, Larry R. 2011;}}. In my sample analysis, section 5.1.3, whether this also holds for my sample, will be detected.

Of the 3,589 MFI's, 891 are based in Sub-Saharan Africa, 1723 in Asia and the Pacific and 639 in Latin America and the Caribbean as seen from the table below.

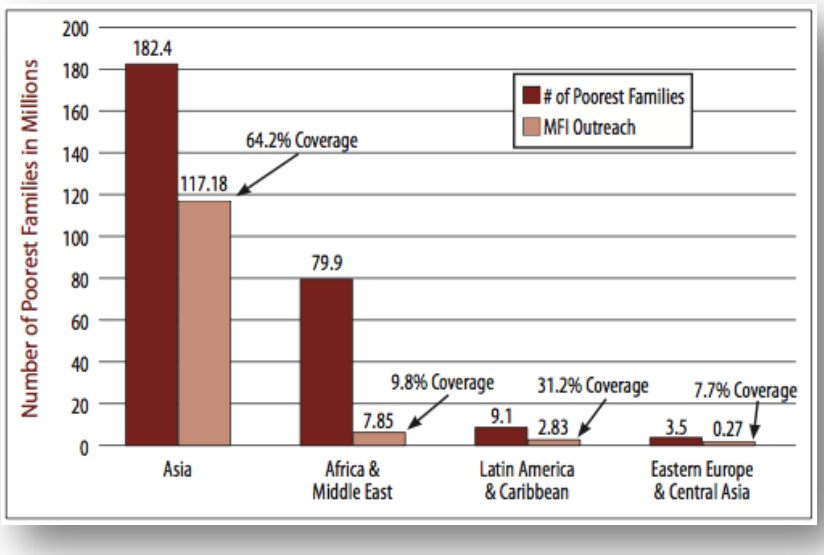
Table 3: Regional Breakdown of Microfinance Data

Region	Number of Programs Reporting	Number of Total Clients in 2007	Number of Total Clients in 2009	Number of Poorest Clients in 2007	Number of Poorest Clients in 2009	Number of Poorest Women Clients in 2007	Number of Poorest Women Clients in 2009
Sub-Saharan Africa	981	9,189,825	10,776,726	6,379,707	6,360,861	3,992,752	3,935,808
Asia and the Pacific	1,723	129,438,919	156,403,658	96,514,127	117,178,142	82,186,663	97,385,541
Latin America & Caribbean	639	7,772,769	12,257,181	2,206,718	2,834,742	1,450,669	1,935,685
Middle East & North Africa	87	3,310,477	4,552,387	1,140,999	1,492,322	890,418	1,217,113
Developing World Totals	**3,430**	**149,711,990**	**183,989,952**	**106,241,551**	**127,866,067**	**88,520,502**	**104,474,146**
North America & Western	91	176,958	148,628	109,318	85,750	72,576	56,651
Eastern Europe & Central Asia	68	4,936,877	5,996,500	233,810	268,234	133,815	163,318
Industrialized World Totals	**159**	**5,113,835**	**6,145,128**	**343,128**	**353,984**	**206,391**	**219,969**
Global Totals	**3,589**	**154,825,825**	**190,135,080**	**106,584,679**	**128,220,051**	**88,726,893**	**104,694,115**

Source: Microcredit Summit Campaign 2011

The table below shows the relationship between the numbers of families living below the poverty line a day (adjusted for the purchasing power index) in each region. Likewise, the number of poorest families that were reached with a microloan in each region in 2009 is shown. Approximately 91.4 percent of the poorest clients reported are in Asia, a continent that is home to just over 66 percent of the world's people living on less than 1.25 dollars a day (24 Reed, Larry R. 2011).

Table 4: Regional breakdown of Access to Microfinance



Source: Microcredit Summit Campaign 2011/World Bank

The Microcredit Summit Campaign holds reports from a broad range of MFI's, but the reports are not public, and don't hold the same amount of details from each report as MIX. Therefore, MIX, which currently holds reporting data from a total of 1,936 MFI's with 91.7 million borrowers, will be used as the main source of data in my empirical analysis.

While all MFI's currently serve an estimate of 190 million clients, the total potential demand is roughly estimated at 1 billion by CGAP, Mehan, Gonzalez and Rosenburg {{ 2 Dieckmann, Raimar;}}.

4.1.2.1 The transformation of the industry

In a microfinance context, and in this paper, transformation refers to the process by which a 'non-profit' organization or an NGO becomes a regulated financial institution. Another term used for the same process is commercialization, which in definition refers to the move by MFI's to provide services on a financially self-sufficient basis and under prevailing commercial principle and regulations.

This section describes how the nature of the industry is changing and discusses

benefits and disadvantages of the characteristics that have evolved significantly over the relatively short life of the industry.

The enthusiasm for microfinance, with its 'win-win' argument, has produced a dramatic increase in the number of microfinance institutions all over the world. Originally, the industry primarily consisted of 'non-profit', socially motivated organisations seeking to reach as many poor clients with microcredit as they were able to, given their limited budgets. Most of the MFI's operated on the basis of grants from donors to support their operations both in the early years and as they scaled up. There has been no in-depth empirical research on the best practice on the life cycle of an MFI, and it is therefore difficult for donors to decide at what point an MFI should go without its dependence on outside funds. Donations were, and still are seen as important in the start-up phase since microfinance is a new industry, and small institutions need help in the early stage (the infant industry argument) as there are large start-up costs for salaries of staff and capital expenditure to equip the institution. Operating expenses are simply increasing faster than interest income {{16 Gibbons, David S., Meehan, Jennifer W. 1999; }}. Donations, however, already limited in size and availability, became harder to come by as the pool of MFI's started to grow.

During the process of growth[4], MFI's demonstrated that through the use of the above-described innovative methods, a substantial portion of this new market could in fact be lent to profitably. This realization has drawn attention to the industry from public institutions, commercial banks, private investors and profit-motivated MFI's. The presence of competition from profit-driven lenders has forced MFI's in competitive regions to re-think their financing strategies. In the early 1990's, a small part of the institutions in the industry began to increasingly transform themselves from a donor-oriented model into formally regulated financial institutions with capital market involvement (commercial banks also started to offer microfinance services at this time). From the donor-funded projects of the early years, there are now all types of investors and funds providing equity and debt, some with more of a social orientation and others more commercially focused. Moreover, donors have questioned the need for continued subsidies, resulting in the recent focus on sustainability in the industry {{ 1 Craig McIntosha, and Bruce Wydick December 2005;}}. Profitability

[4] see table 2

has therefore become the heart of the promise that microfinance institutions can deliver poverty reduction while not relying on ongoing subsidy. Some also argue that for microfinance to be a development tool it must not be dependant on aid, because most aid policies around the world have failed {{ 4 Ayayi,Ayi Gavriel 2010;}}. This is also connected to the proverb that states that it is better to teach a man how to fish (and borrow him the money for the fishing pole), than to give him a fish. The 'bottom-up approach' in the microfinance revolution is what made the United Nations proclaim 2005 the year of the microcredit in an attempt to globally promote the benefits and potential of the industry.

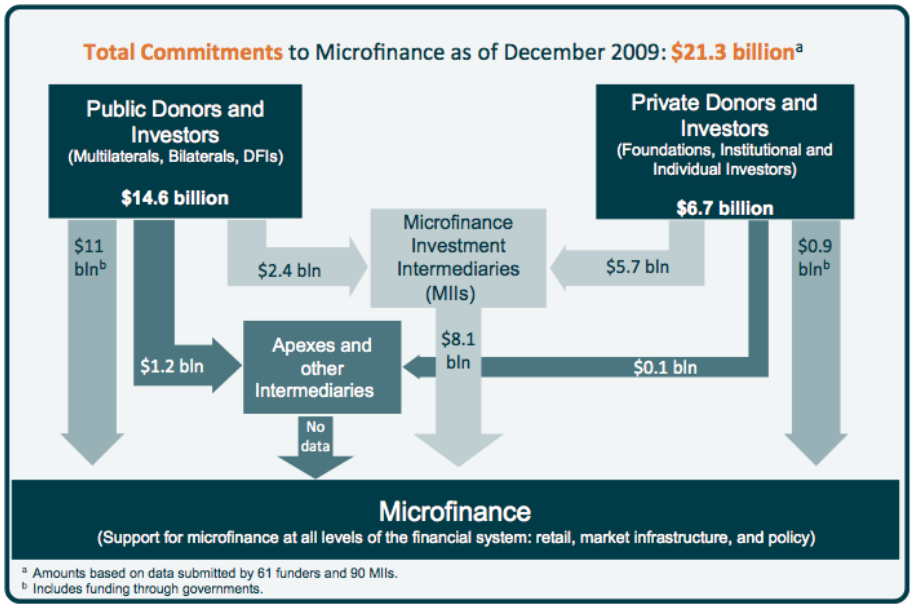
An increasing involvement of capital markets has been observed as an alternative source for financing. Socially responsible investments (SRI's) rank high on investors' agendas. In the US, nearly a tenth of professionally managed assets are already related to socially responsible investment by now. These impressive growth rates demonstrate the growing weight investors attach to the social and environmental consequences of their investments. Amongst the great variety of SRI's, investments in microfinance have recently started to increasingly attract institutional and individual investors. Therefore, benefits are seen from both sides; MFI's need a new financing strategy, and investors are attracted to investments in the industry because of the double bottom-line {{ 2 Dieckmann, Raimar;}}. Especially private-sector investors increasingly appreciate microfinance investments for their dual nature. First, the dual nature investments allow investors to adopt a social investment strategy aiming for poverty alleviation and social development. Second, they simultaneously offer an appealing profile that is marked by largely stable financial returns, low credit default rates and low correlation to the mainstream financial assets as well as the general domestic economy. Some evidence even indicates that microfinance investments might be conducive to the efficient portfolio diversification {{ 2 Dieckmann, Raimar;}}. One of the important developments for the MFI's was the 2007 release for Standard & Poor's (S&P) report in the rating methodology for MFI's. By applying a common methodology, S&P sends a strong signal to possible investors about the quality of MFI investments (17 Sengupta, Rajdeep and Aubuchon, Craig P. 2008).

Public donors and investors currently dominate the funding, and is comprised of both subsidised and commercial borrowing from a large variety of both domestic and foreign sources. A few large, profitable and formal MFI's, even access the capital market by issuing bonds, going public or securitizing their loan portfolios. Foreign

investors are either public, like international financial institutions, such as the World Bank, or private investors, in the form of NGO's, foundations, and institutional or individual investors. The range of investors and promoters is wide; Governments invest tax revenue and provide tax incentives, hoping to promote development, and individuals can even make a direct investment to an individual client through online brokers like MyC4 {{25 MYC4 A/S}}.

Although the number of private funders has expanded over the past 20 years, and has a larger growth rate, the bulk of funding today still comes from public donors and investors.

Figure 1: Funding landscape



Source: CGAP

Cross-border funding, which simply means financing arrangement that crosses national borders, reported a commitment to microfinance of 21.3 billion dollars in 2009 (It is more challenging to find global data on national and local funding). The commitment has increased by 17% since 2008, where the growth rate from 2007 to 2008 was 30%. Almost half of the total cross border funding is going through special entities called Microfinance Investment Intermediaries (MII), hereunder Microfinance Investment Vehicles (MIV's), and local wholesale facilities, called apexes. The other half is provided directly to the retail providers: MFI's and commercial banks. From the funders' reporting to CGAP, it has been observed that there is a high

concentration of funding in a few markets. Ten countries (India, Russia, Peru, Bulgaria, Bangladesh, Mexico, Morocco, China, Pakistan, and Afghanistan) represent close to 50 percent of total cross-border commitments {{ 30 El-Zoghbi, Mayada, G-chwiler, Barabera and Lauer, Kate (CGAP) 2011;}}. CGAP also states that transparency is the most important element in the continuing understanding of the growth of the industry.

One problem with investors in the industry is that while donors played a critical role in building the microfinance industry by providing early support to pioneers, investors seem unenthusiastic to accommodate the industry as a whole. Big investors would fund the well-known, established 'winners' rather than take the risk of funding and helping to build new institutions from among the hundreds of smaller MFI's looking for funding. The venture capital role of the grant funding donors should instead be directed at potential. As the CGAP Viewpoint states *"...the principal task of donors should be to identify and bet on promising MFI's and leave the known winners to commercial investors*"{{ 18 Gibbons, David S. and Meehan, Jennifer W. 2002;}}.

Though investors are attracted to the industry, they still expect high growth rates, profits (return) and the potential for scale. MFI's will have to convince the investors of the strength of their operations and their financial management. Maybe the MFI's even have to show the investors that they also operate 'for-profit' with a commercial mind, just like the investors themselves. Off course it all depends on the individual MFI and investor. {{16 Gibbons, David S., Meehan, Jennifer W. 1999; }}.

Though debt financing dominates, there is no single optimal capital structure for an MFI, since this decision depends on the individual institution based on a variety of determinants. Both internal factors such as growth of loan portfolio and savings mobilisation and external factors such as the regulatory framework, the availability of donors and commercial lenders are very important factors. Other important factors are the openness and development of the financial system in the country in which the MFI is situated. Other than the indirect access to capital markets through the MIV's, MFI's have rarely gained direct access to capital markets by issuing shares or debt instruments. One of the few examples is the Mexican MFI Banco Compartamos that went public in April 2007, which will be described more deeply later on. For MFI's, issuing equity is the most costly source of financing (except for donations), followed by unsecured and subordinated debt, whereas deposits (savings accounts) are reported

as the cheapest financing. However, a potential currency risk for foreign funding must be considered. When MFI's take decisions on capital structure they must also consider the maturity each type of funding, where equity primarily serves as a long-term, debt as a medium-term and deposits as a short-term founding source {{ 2 Dieckmann, Raimar;}}.

The funding structure of the MFI's is closely linked to whether the MFI is regulated or not. The advantages of becoming a regulated MFI are manifold. First, the size of the microfinance industry has reached a point where subsidized loans are no longer sufficient to cover the funding needs. It is only by becoming regulated that MFI's are allowed to take deposits, which expands their possible funding sources and, if they constitute additional funding, ultimately allows them to expand their business. Second, commercial funding can be obtained more easy as commercial lenders primarily target more formal and profitable institutions. Third, the financial viability of an MFI might be improved significantly, over the medium to long-term, since research shows that donations has become a disincentive to the efficient management. The more independent an MFI is, the better positioned it is for further business expansion and the achievement of its goals, whether they are the original development goals, or more commercial goals {{ 2 Dieckmann, Raimar;}}.

Another characteristic of the industry is the transformation of the MFI's as being classified as 'non-profit' to a 'for-profit' institution {{ 7 MIX 2011;}}. Traditionally, the funding structure of an MFI has followed a certain pattern over its life cycle. Start-up MFI's depended on donations and operated as NGO's, whereas the more advanced MFI's had a higher debt leverage where some evolved into more formalised institutions or even regulated MFI's. However, an increasing number of institutions don't follow this pattern any more. Some start-ups set up as profit-minded and regulated, where others still follow the social 'non-profit' status but choose to be regulated in order to take deposits {{ 2 Dieckmann, Raimar;}}. The profit status is closely connected to the current legal status of the MFI and its regulation and will therefore be described further in section 4.1.3.

The growth of the industry has also, though only in some areas, increased competition between MFI's. Institutions tend to operate in easier-to-reach areas in order to

minimize costs and thereby maximize profits. This dynamic leads to many organizations working in the same area, all with incentives for their loan officers that are tied to disbursements and collections. At first glance, standard economic theories suggest that competition should improve the performance of MFI's and lead to better service and lower interest rates. Yet, as systems don't always keep up with the growth pace, as in this case, the lack of a credit registry for microfinance means that clients can obtain loans from several providers at the same time or take out one loan to pay off another {{24 Reed, Larry R. 2011}}. This kind of competition is therefore not fulfilling the intention of bringing down the interest rates. The attitude to competition also differs from one institution to another. Some institutions have made profitability and financial sustainability their chief goals and would therefore prefer a monopoly in the area of operations. Other MFI's still focus on economic and social impacts and believe that the more MFI's there are, the wider the outreach, and therefore supports their goal of poverty alleviation.

4.1.3 Types of institutions

There are five main types of MFI's, and they all have distinct characteristics when it comes to profit status and regulation. The five types are Banks, Credit Unions / Cooperatives, NGO's, NBFI's and Rural Banks are pictured in the table below.

Table 5: The different types of MFI's

MFI type	Comment	Regulation	Possibility of deposit taking	Profit status
Bank	A bank may provide any number of financial services. Conventional banks have become increasingly involved in the industry.	Yes (by the state banking supervisory agency)	Yes	For profit
Credit Union / Cooperative	A Credit Union is a member-based financial intermediary.	Yes/No (Possible supervision by a regional or national cooperative council)	Yes	Non profit

NGO	A non-government organization which is registered as non-profit for tax purposes. Its financial services are usually more restricted.	No (with exceptions)	Yes/No (possible by a banking supervisory agency)	Non profit
NBFI	A non-bank financial institution providing similar services as those of a Bank, but is licensed under a separate category, which might be due to lower capital requirements, limitations on financial service offerings, or to supervision under a different state agency.	Yes (supervision by a different state agency)	Yes (unless this is one of the limitations that makes it different from a Bank)	For profit
Rural Bank	A banking institution aiming at clients who live and work in non-urban areas. These clients are generally involved in agriculture-related activities.	Yes	Yes	For profit (mostly)

Source: Own table based on definitions from MIX

4.2 Theory of profitability

Not all MFI's are sustainable, able to return a profit, or even to break even and therefore still depend on help from donors and subsidies. The rapid growth in the industry is not due to a golden 'one-way-road' to profitability since there are still big diversity between the MFI's and their operations. This section describes the theory of banking practices that lead to profitability for commercial retail banks, and then looks into what could be the similarities and differences compared to MFI's. Next the different profitability measures will be examined to get an idea of which ones suit the empirical analysis in the section 5.

4.2.1 Profitability and theory of retail banks

There are large differences between banks, financial institutions or intermediaries. Retail banking is, however, the banking practice closest to microfinance institutions and is therefore interesting to look into when it comes to profitability.

Conventional retail banks borrow from people in surplus of money and lend to those in deficit. The bank thereby makes money on the interest spread between the two, called the net interest income. Around half to three-quarters of the income comes from this intermediation role. The rest of the revenue comes from a number of other services such as insurance, money transmission, advisory services, investment and taxation services, card and factoring services etc. These service fees together represent the non-interest income for the retail banks. One of the key factors of success for conventional retail banks is getting enough customers. This is likewise considered a key factor for MFI's, but for different reasons, which depend on the goals of the individual MFI's, whether they are social or economical goals.

Conventional retail banks are in business to make a profit. A bank twice as big as a competitor will expect to make around twice as much profit. Profits are therefore in proportion to their size, though with some advantages from scale economies. Retail banks make about 1% profit on their assets, more or less {{ 28 Croxford, Hugh, Abramson, Frank and Jablonowski, Alex. 2005;}}. Since the microfinance industry is not as developed as the conventional banking industry, it is not expected that profit is in proportion to size, and also because the institutions and their products vary much more from each other than those of retail banks.

Retail banks use investors to provide capital to get started and to keep running, and in return the investors receive equity in the business, thus owning a part of the company. The company's profit and the investors' return on equity (ROE) are closely correlated. ROE will be discussed more when comparing different profitability measures. Retail bank investors would like the highest possible ROE, 10% being below average, 15% the standard, and 20% excellent. Only some MFI's have investors, yet this could be an interesting benchmark when looking at ROE for MFI's.

A minimum capital level of the retail banks are required by international regulators, in order for them to operate, and the purpose is mainly to protect the deposits of the bank's customers. The minimum capital that the retail banks need to hold, depends on the types and amounts of loans and varies from 2% to 8 % of the total value of the assets {{ 28 Croxford, Hugh, Abramson, Frank and Jablonowski, Alex. 2005;}}. Regulations for MFI's, however, depend on the individual country. A survey by practitioners, analysts, investors and observers (commissioned by Citigroup and CGAP) puts inappropriate regulation as the 3rd biggest risk facing the industry. In

many countries, regulation of MFI's is not keeping up the fast growth of the industry, and in some countries regulation is even non-existent {{ 31 Lascelles, David 2008;}}.

The core profit made by the bank is the net interest income, minus operating costs. The interest spread is related particularly to the risk of the loan. The greater the risk of the loan not being repaid, the higher the loan rate, and therefore the spread, and the larger amount of capital required for the bank by regulators. Operation costs are therefore an important factor. The largest expense is the administrative costs of running the entire banking operation. This is mainly centered on the bank's staff and their associated costs. The profit of a retail bank is simply its operational profit. The risk a bank assumes reflects management's appetite for its ability to manage it {{ 28 Croxford, Hugh, Abramson, Frank and Jablonowski, Alex. 2005;}}. Therefore, the management and credit management of retail banks are critical factors, as they are for MFI's. The survey mentioned above stated management quality as the biggest risk of all in the industry {{ 31 Lascelles, David 2008;}}.

There are many types of risks, besides credit risk, when observing retail banks. Interest rate risks, country risks, systematic risks and operational risks etc are all different risks. The same different risks apply for MFI's. Yet, the most obvious risk in banking is credit risk, which is the risk of the borrower not being able to repay a loan and thereby leaving the bank with the loss. This risk gets bigger when there is no collateral behind the loan, e.g. a mortgage loan. However, only practitioners in the survey acknowledge credit risk in their top 10 of biggest risks {{ 31 Lascelles, David 2008;}}.

Retail banks do however has to take on some risk, with the consequence of loosing some money. If they loose to little they will have no customers because they will be excluding a major part of the population which they could lend to, but loose to much, and the bank will go bankrupt under this model. MFI's operate under a very different approach, where they take bigger risks, but find ways to compensate for this risk, e.g. larger interest rates charged to the borrower and with the innovative methods such as joint liability. This new approach opens up a much larger market segment than seem before seen in banking.

4.2.2 Profitability measures

Any ordinary business is most concerned with its profitability, since if there is no basis for profit, or break even, the business will seize to exist. MFI's differ a bit, since subsidies and donations work as a kind of safety net for some institutions, so that other priorities come first. However, due to the rapid growth of the industry, profitability has become an important priority and a step in becoming sustainable, and it is therefore important to know different ways to measure profitability.

Profitability ratios are used to determine the company's bottom line and are important to company managers and owners alike. If a small business has outside investors who have put their own money into the company, the primary owner or manager has to show profitability to the equity investors. The ratios show a company's overall efficiency and performance and are in general divided into margin ratios and return ratios. Margin ratios represent the firm's ability to translate sales dollars into profits at various stages of measurement. Ratios that show returns represent the firm's ability to measure the overall efficiency of the firm in generating returns for its investors.

The most important and general margin ratios are the operating profit margin and the net profit margin. MIX also uses its own profit margin, which will be examined.

Operating profit is also known as EBIT and is found on the income statement of the business. EBIT is earnings before interest and taxes. The operating profit margin looks at EBIT as a percentage of sales. The operating profit margin ratio is a measure of overall operating efficiency, incorporating all of the expenses of ordinary, daily business activity. The calculation is: EBIT/Net Sales {{ 27 Brealey, Richard A., Myers, Steward C. and Allan, Franklin 2008;}}.

Net profit margin is the ratio most used when doing a simple profitability ratio analysis. The net profit margin shows how much of each sales dollar shows up as net income after all expenses are paid. For example, a net profit margin of 5% means that 5 cents of every dollar is profit. The net profit margin measures profitability after consideration of all expenses including taxes, interest, and depreciation, which in this case means after taxes and donations. The calculation is: Net Income/Net Sales.

The profit margin used by MIX is a bit different because the business is different. The calculation of the profit margin is here: Net Operating Income /Financial Revenue.

Net Operating Income is: Financial Revenue – (Financial Expenses + Impairment Loss + Operating Expenses). The financial expense and revenue is the interest, fees and commissions incurred on all liabilities respectively (including deposits accounts of clients held by the MFI, borrowings, subordinated debt and other liabilities) and loan portfolio (and other financial assets). This amount also includes other revenues related to financial service provision, when it comes to the revenue. The impairment loss is the non-cash expenses calculated as a percentage of the value of the loan portfolio that is at risk of default. This value is used to create or increase the impairment loss allowance on the balance sheet. At last, the operating expenses are related to operations, including all personnel expense, depreciation and amortization, and other administrative expenses.

Return ratios are becoming increasingly important for MFI's due to their increasing use of investors. Return on assets and return on equity are the most important ratios.

The Return on Assets ratio (ROA), also called return on investment, is an important profitability ratio because it measures the efficiency with which the company is managing its investment in assets and using them to generate profit. It measures the amount of profit earned relative to the firm's level of investment in total assets. The return on assets ratio is related to the asset management category of financial ratios. The calculation for the return on assets ratio is: Net Income/Total Assets {{ 27 Brealey, Richard A., Myers, Steward C. and Allan, Franklin 2008;}}. In MIX definition the return on asset ratio is: (Net Operating Income – Taxes) / Average Assets. The higher the percentage, the better, as a high percentage means that the company is succeeding in using its assets to generate sales.

The Return on Equity ratio is perhaps the most important of all the financial ratios to investors in a company. This ratio measures the return on the money the investors have put into a company. This is the most important ratio that potential investors look at when deciding whether or not to invest in the company {{ 27 Brealey, Richard A., Myers, Steward C. and Allan, Franklin 2008;}}. The calculation is: Net Income/Stockholder's Equity. In MIX definition the return on equity is: (Net Operating Income – Taxes) / Average Equity. In general, the higher the percentage, the better, as it shows that the company is doing a good job using the investors' money.

Financial ratio analysis is only a useful method of analyzing performance if comparative data are available. The ratios should optimally be compared to both historical data for the company and industry data. With the sample chosen, it will only be possible to compare ratios between the MFI's in the sample and not historically. The MFI's can, however, be compared in different peer groups which brings other interesting aspects to light.

4.3 Interest rates

Other things being equal, there are two ways in which a business can increase profit: by raising prices, or by lowering costs. As prices in the lending business are the interests rates and fees charged to the borrowers, the level of interest rates are of course an important issue.

There are three conflicting schools regarding interest rate levels in the microfinance industry. The first school, endorsed in particular by western NGO's and their partners in developing countries, maintains that the poor cannot pay interest rates at market prices, and consequently they must be loaned funds at very low interest rates (between 1% and 3% regardless of inflation). Such a model can function only with large subsidies all over the industry. The second school supported by mutual societies and savings and credit unions, recommends interest rates slightly below those of commercial banks. This approach is feasible because these institutions pay out little or none of the funds collected, or benefit from subsidized lines of credit or international aid. The third school is encouraged by organizations that want to manage microcredit by covering the effective rates to attain financial sustainability and to ensure the continuity of their actions. This school is rising and is in focus in this paper since profitability and thereby financial sustainability is the main element of the transformation of the industry. Higher interests rates are justified because the institutions are trying to eliminate the bank exclusion of the poor. Morduch also notes that the high interest rate results from the fact that the demand for credit is not very elastic among populations for whom credit were previously rationed {{ 4 Ayayi,Ayi Gavriel 2010;}}.

To follow the point of Milton Friedman's on the social responsibility of businesses, one must follow a financial logic when making credit accessible to a large number of clients. It is important to avoid confusing moral and economic judgments. The financial logic includes covering one's costs and setting rates accordingly. According to CGAP these points justify interest rates that are generally higher than those of the banking sector, but below those of informal borrowers such as loan sharks. An MFI must set sufficiently high interest rates to cover its expenses because a rate set too low would cause financial distress that may lead to bankruptcy. On the other hand, a needlessly high interest rate would penalize the clients, and the MFI could therefore lose them, which would then undermine its possible social mission. To attain profitability and financial sustainability, MFI's therefore must apply high but not exorbitant interest rates according to CGAP {{ 4 Ayayi,Ayi Gavriel 2010;}}.

All financial institutions charge an interest rate for the loans they grant their clients. Commercial banks adjust for the risk caused by the individual borrower. If a borrower approaches a bank for a loan, the bank's lending officer will require information about the borrower's financial position and plans for the future. Also, the bank will want to monitor the borrower's progress once the loan has been granted. In general for commercial banks, the interest rate is usually linked to the general level of interest rates. The most common benchmark is the London Interbank Offered Rate (LIBOR){{ 27 Brealey, Richard A., Myers, Steward C. and Allan, Franklin 2008;}}. MFI's, however, differ from the average financial institution, mainly in the sense that their products are 'micro', as the name signals. The operation of managing many small loans costs more money for any institution than managing one large loan which is the theoretical logic behind the fact that an MFI typically needs to charge higher interest rates to cover their costs despite their innovative methods. As the loans are small and administration costs should be minimized.

Financial revenue from the gross loan portfolio is the most important source of revenue for MFI's, and it has two components: 1) interest charges and 2) fees and commissions. From the point of view of transparency to the client, the higher the percentage of revenue that an MFI receives from interest on loan portfolio, the closer the average yield will be to the average interest rate paid by the borrowers. However, the share of fees and commissions as percentage of financial revenue from loan portfolio can be higher when some of the penalties associated with late repayment are

charged as fees and not as higher interest rates.

Because of unclear rules and regulation on these issues, it is obvious that there is a reporting issue to be considered. Many MFI's reported that 100 percent of their revenue from loan portfolio came from interest charges and zero per cent from fees and commissions. Auditors may choose to report both types of revenue from loan portfolio as a single line item. As it is not possible to find out which MFI's are including fees and commissions into their interest rates, it is easier to analyse the variable 'yield on gross portfolio' which is both interests and fees on the loan portfolio, divided by the average loan portfolio.

Interest rates, or yield on gross portfolios, across institutions vary a lot, and so do the yields across countries and continents. Adjustment of the yields helps to ensure comparability and is therefore important. The most important factor for this variable is inflation, and the treatment of inflation therefore has to be consistent. Interest rates, and yields, are usually quoted in nominal terms rather than in real terms. Nominal value refers to a price expressed in money of the day, as opposed to real value, which adjusts for the effect of inflation. E.g. The yield on gross portfolio for Grameen Bank in nominal value, in 2009, was 19.68%, whereas in real value it was 13.58%.

So, the simple answer to the frequently asked question; 'Why are microfinance interest rates so high?', is that 'the loans are so small!'. Some of the costs have diminished due to innovation and improved efficiency, but components like administrative and personnel expenses are still high {{ 22 Fish, Adam;}}. Next, different levels of interest rates in the lending business will be examined.

4.3.1 Interest rates in the lending business

As mentioned, the interest rates charged by different lenders vary considerably. Unofficial and local moneylenders are considered the group of lenders charge the highest interest rates, and are also referred to as loan sharks. For instance, in the Philippines loan sharks often charge an annualised interest rate of up to 1000% for a monthly loan {{ 2 Dieckmann, Raimar;}}. At the bottom of the interest rate scale lie the conventional banks, which however do not always serve the micro-entrepreneurs. In the middle, covering a large span, are all the different types of microfinance

institutions. In my sample, which is analyzed more deeply in section 5.1.3, the yield on gross portfolio in real terms varies from 1% to 95%.

The high interest rates charged by local moneylenders in the markets can be explained by the 'monopoly' that they enjoy, at least in the short run. Moneylenders have to compensate for the high transaction costs of issuing, servicing and monitoring each small loan. Secondly, some observers believe that these lenders have high 'opportunity costs' – that is, moneylenders can earn high return by investing in their own farms. At last, moneylenders face some of the same problems as commercial banks in identifying risky borrowers and securing collateral, particularly in the poor areas.

MFI's can often offer lower interest rates than local moneylenders because of their higher efficiency in screening and monitoring borrowers, which result from their economies of scale (serving more borrowers), and their use of joint liability lending mechanisms. This lowers the MFI's cost of lending relative to that of the local moneylender (17 Sengupta, Rajdeep and Aubuchon, Craig P. 2008).

CGAP has a set of guidelines when it comes to setting the appropriate interest rates. It is a matter of estimating unit costs of administration, loan loss, funds, and capital. CGAP Occasional Paper No. 1: "*the annualized effective interest rate (R) charged on loans will be a function of five elements, each expressed as a percentage of average outstanding loan portfolio: administrative expenses (AE), loan losses (LL), the cost of funds (CF), the desired capitalization rate (K), and investment income (II)*" :

$R = ((AE + LL + CF + K)/(1 – LL) – II$

This sounds reasonable, but can only be used as an understanding of composition of interest rates {{16 Gibbons, David S., Meehan, Jennifer W. 1999; }}.

Table 6: MFI benchmark on yields by current legal status

	Bank (84)	Credit Union/Cooperative (156)	NBFI (397)	NGO (420)	Other (5)	Rural Bank (67)
Yield on gross portfolio (nominal)	22.43%	20.38%	30.71%	29.48%	35.71%	27.15%
Yield on gross portfolio (real)	16.37%	14.92%	25.44%	22.66%	30.06%	22.91%

Note: Unadjusted data source from 2009, in USD, by current legal status. For adjusted data, all percentages are slightly increased.

Source: Own table based on benchmarks from MIX

Table 7: MFI benchmark on yields by profit status

	Non-profit (663)	Profit (468)
Yield on gross portfolio (nominal)	27.44%	28.93%
Yield on gross portfolio (real)	20.89%	22.05%
Note: Unadjusted data source from 2009, in USD, by profit status. For adjusted data, all percentages are slightly increased.		

Source: Own table based on benchmarks from MIX

From the first table, it can be seen that the cheapest credit on average can be loaned from credit unions, then banks and on the third place come the NGO's. At first sight, it seems a bit surprising that banks offer cheaper microcredit than NGO's since banks are 'for-profit' and typically have profit maximization as their primary goal, whereas NGO's are 'non-profit' and typically aims at social development. On the other hand, banks have more experience in the lending business, giving them the possibility of better management, lowering the cost and thereby giving them a better profitability at the same or lower interest rate. The second table shows that 'for-profit' institutions charge a higher interest rate, yet not much higher, which may imply that not all MFI's having the status 'for-profit' are profit maximizing, and that other reasons, e.g. tax benefits, could be the reason for the profit status.

As mentioned earlier, competition is an increasingly important factor in the industry. Many MFI's serve a market where the only competitors are the unofficial moneylenders, who charge significantly higher rates than the official lenders. The MFI's in those areas therefore have a lot of freedom in setting interest rates before they would be out-priced. The effective interest rates are therefore set not by the free market forces of supply and demand, but by monopolistic or oligopolistic institutions. This, of course, gives an incentive to slow innovation and causes a danger of inefficiencies. Incompetent MFI management and inefficient operations therefore sometimes also determine the level of the interest rate. The competition on the market, however, is increasing with the birth of many new MFI's, and as observed in some countries, such as Bangladesh with the founding of Grameen Bank, competition is significantly increasing {{16 Gibbons, David S., Meehan, Jennifer W. 1999; }}.

Because of lack of registry and lack of transparency from the borrowers' points between MFI's, competition hasn't always shown signs of decreasing interest rates.

4.4 Cases

Two very different cases will be presented to get an idea of the diversity within the industry. The aspect of the cases shows the importance of doing an empirical study in order to see what factors actually determine profitability since in these cases it seem very different.

4.4.1 BancoSol in Bolivia

Banco Solidario S.A, better known as BancoSol, was originally founded as the Fundacion para Promocion y el Desarrollo de la Microempresa (PRODEM), a non-governmental organization (NGO) in the mid-to-late 1980s providing small capital loans to groups of three or more people dedicated to entrepreneurial activities. By 1992, PRODEM serviced 17,000 clients and disbursed funds totaling 4 million dollars in four branches. Constrained by the legal and financial regulations governing an NGO, the board of directors decided to expand their services, and PRODEM became the commercial bank, Banco Solidario, later that year.

Since BancoSol started operating, the volume of its operations has increased rapidly. Since 2009, BancoSol has over 129,700 clients and a loan portfolio of more than 351.8 million dollars. Banco Sol offers credit, savings, and a variety of insurance products. Their initial loan offering was based on Grameen-style joint-liability lending, offering a maximum of $3,000 per client to groups of three or four individuals with at least one year of experience in their proposed occupation. Now, the bank bases its lending methodology on individual credit technology. Using dynamic incentives, the size of the loan has gradually increased based on good repayment history. Annual average interest rates can be seen from the table below and loans can range from 1 to 60 months in length (120 months for a housing loan) (17 Sengupta, Rajdeep and Aubuchon, Craig P. 2008). Clients are self-employed micro-entrepreneurs that have a minimum of one year of experience in their current occupation.

Table 8: Selected indicators for BancoSol from 1997 to 2009

	1997	2000	2003	2006	2009
Number of active borrowers	76,216	67,082	42,831	103,786	129,705
Average loan per borrower/GNI per capita	89.96%	115.46%	231.09%	124.74%	158.08%
Gross loan portfolio	66,505,794	77,449,922	91,059,000	163,126,817	351,824,305
Yield on gross portfolio (real)	-	-	18.50%	16.03%	15.94%
Profit margin	14.02%	3.64%	12.13%	16.73%	20.20%
Note: diamond rank 5					

Source: Own table based on indicators from MIX

From the table it can be observed that BancoSol has an increase in the number of active borrowers, gross loan portfolio and profit margin. The average loan per borrower/GNI per capita seems very high and borders to what is known as 'micro'-loans[5]. The yield on the gross portfolio is, however, not very high, which is good to observe after detecting very high profit margins.

BancoSol relies much on deposits for it's funding. In 2009, it had a deposit-to-loan ratio of 97.45% and a deposit-to-total-asset ratio of 70.69%. Other than deposits, the bank has borrowings. Return on assets was 2.62%, and return on equity 33.93% in 2009, which are impressive figures, but since equity only has a small share in the financing structure, e.g. capita/asset ratio of 7.95% and a debt to equity ratio of 11.58, this is not as significant as it is in general.

Despite its large average loans/GNI per capita in the form of individual credit methodology, the case of BancoSol is a good example of a profitable MFI with low interest rates. It can be argued that the goal of poverty alleviation and outreach is put in second place since the bank chooses to have 'few' clients with 'large' loans, instead of a wider outreach of clients with smaller amounts of loans.

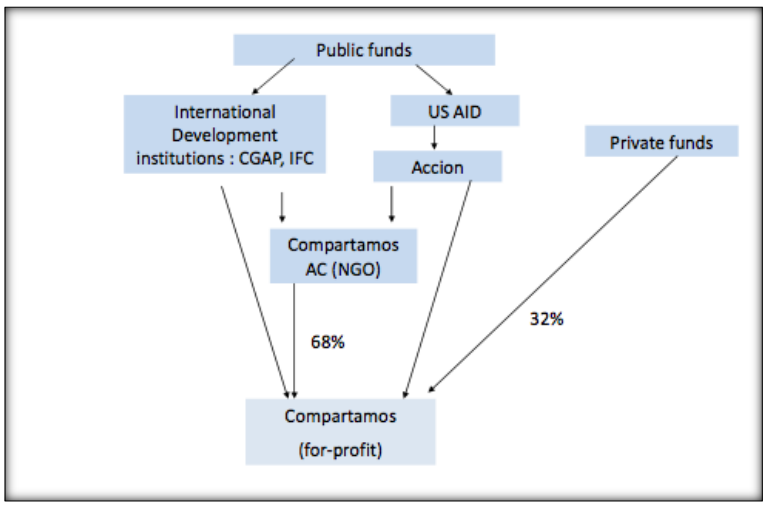
[5] Appendix 1

4.4.2 Banco Compartamos

Compartamos AC was a Mexican NGO established in 1990 as a 'non-profit' institution providing microcredit to poor people. Being an NGO, it could take donor funding as well as help from volunteers. During the decade between 1990 and 2000, Compartamos received donor funds of 6.3 million dollars from CGAP. Compartamos began by offering joint-liability loans to female borrowers to start up income-generating activities. Compartamos has only recently expanded their services to allow men to borrow through their solidarity group and their individual credit program.

In 2000, the 'non-profit' Compartamos AC created a 'for-profit' finance company Financiera Compartamos with a paid-in capital of 6 million dollars. Besides the NGO itself, the shareholders of Financiera Compartamos included ACCION International and IFC (International Finance Corporation), the private lending arm of the World Bank group. Together, these agencies with development missions had about two thirds of shares in the 'for-profit' Financiera Compartamos. The rest of the shares, about one-third, were predominantly with directors and managers with some outside private holding. Thus, public funds provided to public agencies were given to an NGO, who in turn invested it in a 'for-profit' agent {{ 12 Ashta, Arvind and Bush, Matthew 2009;}}. As such, the finance company was a 'for-profit' agent of a line of 'non-profit' principals, as summarized in the figure below:

Figure 2: Donation and equity to Compartamos



Source: {{ 12 Ashta, Arvind and Bush, Matthew 2009;}}

Financiera Compartamos made high profits, thanks to high interest rates and low operating expenses. The operating costs remained lower than those of comparable MFI's and other lending institutions. The high profitability financed outreach in the form of active borrowers, causing the growth rate to double from 24% per year in the 1996-2000 period to 46% in the 2000-2006 period. At end of 2006, the book value of the initial paid-in capital of 6 million dollars had reached 126 million dollars, a 21-time increase.

In 2006, the company obtained a banking license and transformed itself into Banco Compartamos. In 2007, Banco Compartamos made an IPO, in which existing investors sold 30% of existing stock, and no new stock was issued. They received $470 million (12 times the book value), which means that the original investors got 100% per year compounded for 8 years. Mainstream international fund managers and other commercial investors, not socially responsible investors, bought most of the shares, thereby being part of a diversification strategy {{ 12 Ashta, Arvind and Bush, Matthew 2009;}}.

The IPO of Compartamos in Mexico generated wealth for its management team and investors but has of course caused for considerable controversy. Some consider it as a great way to attract capital to a neglected sector of the economy, while others consider it as a danger that may irritate regulators to hit microfinance and its original social cause {{24 Reed, Larry R. 2011; }}.

Table 9: Selected indicators for Banco Compartamos from 1997 to 2009

	1997	2000	2003	2006	2009
Number of active borrowers	32,254	64,141	215,267	616,528	1,505,006
Average loan per borrower/GNI per capita	1.79%	3.29%	4.47%	4.76%	4.78%
Gross loan portfolio	2,149,425	10,786,266	63,277,580	271,111,111	577,488,515
Yield on gross portfolio (real)	-	-	79.55%	74.45%	64.08%
Profit margin	33.06%	50.26%	44.92%	44.80%	40.55%
Note: diamond rank 5					

Source: Own table based on indicators from MIX

The table above shows selected indicators for the bank. It is obvious that outreach and gross loan portfolio have increased dramatically after the IPO. Average loans are very low suggesting that Compartamos aims at poorer people than many other MFI's[6]. Yields on the gross portfolio are, however, extremely high, suggesting that the social purpose might have been lost in the pursuit of growth and profit. Compartamos does not take in any deposits, and the funding structure therefore primarily consists of borrowings and equity. Capital asset ratio was 43.91%, and debt to equity ratio was 1.28 in 2009. By accessing the commercial market, Compartamos has been able to lower the cost of obtaining funds. The bank is a self-sufficient MFI that has existed without subsidies for over a decade {{17 Sengupta, Rajdeep and Aubuchon, Craig P. 2008; }}.

This case has shown an example of an MFI that has reached very high profitability through measures very different from those used in the previous case. Despite Compartamos' high profitability, the interest rates charged are extremely high. Yet, as there is neither regulation, nor any interest ceiling holding interest rates down, this is likely to continue.

5. EMPIRICAL ANALYSIS

This section of the paper contains the empirical analysis and builds on both the background study and statistical tools that will be used throughout the analysis. First, the data processing will be described, hereby including an analysis of the sample. Secondly the quality of the model will be analysed through econometric tests. Thirdly the final variables included and excluded in the model will be described and discussed, were after the final models and results will be presented. Lastly the relationship between profitability and yield on gross portfolio will be analysed and discussed.

[6] Appendix 1

5.1 Data gathering and processing

The data set used in the empirical analysis is found on the website of MIX market, under 'Data Analytics', where a file with MIX Market MFI data is downloaded. MIX currently holds reported data from 1933 institutions, constantly adding new institutions and improved data. Some institutions report only general information, where others report several years of audited financial statements and ratings or other due diligence reports.

The downloaded file contains many different variables[7]. Based on my background study and other previous research studies in this field, I have chosen 7 areas, also called indicator groups, including 19 variables, which I want included in my original model for the empirical analysis. These variables are discussed in the following section. I'm aware that not all 19 variables will be included in the final model. Still, I choose to introduce them all and show the process of finding out which variables, within the different areas, are the best fit for my model. The table below shows the variables chosen, including the dependable variables.

Table 10: Description of variables

Nature of the variable	Identity of the variable	Abbreviation	Definition
Financial performance - profitability	Return on Assets	ROA	(Net Operating Income - Taxes) / Average Assets
	Profit Margin	PM	Net Operating Income / Financial Revenue
Outreach	Number of Active Borrowers	NAB	Number of Borrowers with loans outstanding, adjusted for standardized write-offs
	Gross Loan Portfolio	GLP	Average Gross Loan Portfolio
	Average Loan Balance per Borrower / GNI per capita	AB/G	(Average Total Loans / Average Total Number of Borrowers) / GNI per Capita
Financing structure	Debt to Equity Ratio	D/E	Total Liabilities / Total Equity
	Capital / Asset Ratio	E/A	Total Equity / Total Assets
	Gross Loan Portfolio to Total Assets	GP/A	Gross Loan Portfolio / Total Assets
Expenses	Operating Expense / Assets	OE/A	Operating Expense / Average Total Assets
	Financial Expense / Assets	FE/A	Financial Expense / Average Total Assets
Revenue	Financial Revenue / Assets	FR/A	Financial Revenue / Average Total Assets
	Yield on Gross Portfolio (real)	YGP	Interest and Fees in Loan Portfolio / Average Gross Loan Portfolio

[7] Appendix 2

Efficiency	Operating Expense Ratio or Efficiency Ratio	OE/GP	Operating Expense/Average Gross Loan Portfolio
	Cost per Borrower	CPB	Operating Costs / Average Number of Active Borrowers
	Borrowers per Staff Member	BS	Total Number of Borrowers / Total Number of Staff Members
Quality of portfolio	Write-off Ratio	WP	Value of loans written off / Average Gross Loan Portfolio
	Portfolio At Risk> 30 days	PAR	Outstanding balance, portfolio overdue > 30 days + renegotiated portfolio / Gross Loan Portfolio
Other variables (peer group comparison)	Deposits	DE	Either the institutions takes deposits or not, so (YES/NO)
	Age	AGE	New (1 to 4 years), Young (5 to 8 years) or Mature (more than 8 years)
	Current Legal Status	LS	Bank, Credit Union, Ngo, NBFI or rural bank
	Profit Status	PS	Registered as a 'for-profit' or as a 'non-profit' institution

Source: Own table based on definitions from MIX.

The sample chosen, i.e. my data set, is from the fiscal year of 2009 and had a number of 1140 observations before screening. The data is cross sectional data since it is a type of one-dimensional data set. The data is collected by many MFI's at the same point in time without regard to differences in time. The analysis consists of comparing the differences among the subjects.

After a screening where observations with only few data variables available are excluded, the number of observations in the sample is downsized to 902 observations. Reliability of the data is of high importance, and therefore, when looking over the data, two other measures must be taken; all observations with a D/E ratio less than zero are deleted as are all observations with gross loan portfolio to total asset over 1[8]. The final data set ends at 879 observations. Despite the screening, the data set is kept as large as possible in order to include as many of the institutions as possible and not just the biggest institutions or the institutions that have the best performance etc. Data is found both in the respective local currencies and in USD, where USD is used in this sample since it creates an easier ground for comparison, despite currency fluctuations.

[8] Gross loan portfolio to total assets is not a variable that can easily be found in books of theory since it's a relatively new term, but an analysis from the world bank shows that the ratio from their sample lies in the interval of 0.077 to 0.987 {{13 Cull, Robert (World Bank), Demirg ̈c-Kunt, Asli (World Bank) and Morduch, Jonathan (New York University) 2005; }}

As the institutions have been selected based on their amount of data, the data sample can, however, not be a perfect representative sample of all the MFI's in the world. A sense of the skewed distribution is therefore detected, but it is still the best possible sample that can be produced since MIX offers the biggest and most reliable sample. As also mentioned in the introduction, the skewed sample is partly due to the fact that the MFI's can voluntarily submit their data, and maybe only some kinds of institutions feel like contributing to the transparency of the industry.

The sample does, however, collectively serve a large fraction of microfinance customers worldwide, and in this sense, is can be seen as a representative sample {{ 13 Cull, Robert (World Bank), Demirg |c-Kunt, Asli (World Bank) and Morduch, Jonathan (New York University) 2005;}}.

Model 0: My original profitability model[9]

$Y_i = \beta_0 + \beta_{NAB}X_{NABi} + \beta_{GLP}X_{GLPi} + \beta_{AB/G}X_{AB/Gi} + \beta_{D/E}X_{D/Ei} + \beta_{E/A}X_{E/Ai} + \beta_{GP/A}X_{GP/Ai} + \beta_{OE/A}X_{OE/Ai} + \beta_{FE/A}X_{FE/Ai} + \beta_{FR/A}X_{FR/Ai} + \beta_{YGP}X_{YGPi} + \beta_{OE/GP}X_{OE/GPi} + \beta_{CPB}X_{CPBi} + \beta_{BS}X_{BSi} + \beta_{WP}X_{WPi} + \beta_{PAR}X_{PARi} + \beta_{DE}D^{Deposits}{}_i + \beta_{AGE}D^{Age}{}_i + \beta_{LS}D^{Legal\ status}{}_i + \beta_{PS}D^{Profit\ Status}{}_i + \mu_i$ where:

Y_i is either return on assets or profit margin (2 different models will be investigated)

β_0 is the intercept

X_{NAB} is the number of active borrowers

X_{GLP} is the gross loan portfolio

$X_{AB/G}$ is the average loan balance per borrower /GNI per capita

$X_{D/E}$ is the debt to equity ratio

$X_{E/A}$ is the capital to equity ratio

$X_{GP/A}$ is the gross loan portfolio to total assets ratio

$X_{OE/A}$ is the operating expense to assets ratio

$X_{FE/A}$ is the financial expense to assets ratio

$X_{FR/A}$ is the financial revenue to assets ratio

X_{YGP} is the yield on gross portfolio (real)

[9] All the dummy variables (4 kinds) are stated as one kind each in order to make the model easier to understand. The different categories are stated in the discussion about the variables. See the extended model in appendix 3

$X_{OE/GP}$ is the operating expense ratio, also known as the efficiency ratio

X_{CPB} is the cost per borrower

X_{BS} is the number of borrowers per staff member

X_{WP} is the write-off ratio

X_{PAR} is the portfolio at risk > 30 days

$D^{Deposits}$ is an abbreviation for the deposit dummy variables

D^{Age} is an abbreviation for the age dummy variables

$D^{Legal\ status}$ is an abbreviation for the legal status dummy variable

$D^{Profit\ Status}$ is an abbreviation for the profit status dummy variables

μ_i is the error term

In short, there are two models with all the same explanatory variables, one with ROA as the dependent variable and the other with PM as the dependable variable. There is an intercept of a constant term, which is not easy to interpret, and the next beta's are the partial regression coefficients, which measure the effect of the 15 quantitative and explanatory variables and the 4 explanatory dummy variables; 2 with 2 categories, 1 with 3 categories and 1 with 5 categories. The error term in the end is a random variable, and the nature of the error term is the effect of variables not in the model. In short, the models are intended to estimate the impact of all the explanatory variables on each of the dependable variables.

5.1.2 Variable discussion

The different variables included in my original profitability model and this discussion is based mainly on my background study. The variables are discussed, and when checking the assumptions, during the correlation matrix, and in the process of finding the final profitability model, I exclude the variables that are not relevant.

MFI's should seek to maximize performance in many areas, whether it is social or economical. This could be improving outreach, minimizing risk, reducing costs and strengthening returns among others. Improving efficiency, productivity and other measures should be the road to profitability and thereby financial sustainability. MFI's should increasingly adopt good management structures and incorporate

existing efficient banking practices in their management {{ 4 Ayayi,Ayi Gavriel 2010;}}.

As mentioned in section 4.2.2, there are many kinds of measures of profitability. Return on assets (ROA) is the most basic and most comparable measure of profit for MFI's, but the profit margin (PM) is also an interesting measure as it takes efficiency into in a different way than ROA. Here is an example {{ 34 Gaul, Scott 2011;}}:

	MFI 'A'	MFI 'B'
Assets	100	100
Revenue	80	20
Expenses	75	15
- *Financial*	3	3
- *Loan losses*	2	2
- *Personnel*	65	5
- *Administrative*	5	5
Donations	5	5
Net profit	5	5
ROA	5%	5%
Profit margin	6%	25%

MFI 'A' charges a high yield and earns 80 USD for the year on its loans, where MFI 'B' charges a low yield and earns 20 USD. The high income MFI has higher personal expenses. Maybe salaries are higher, or there is more staff. The two MFI's end up with the same net income of 5 USD. Many would say that MFI 'A' is worse when it comes to both financial and social performance, however ROA cannot distinguish the MFI's from each other as the PM does. Therefore I decide that both ROA and PM should be used and thereby making 2 models with different dependant variable and same explanatory variables. Since this paper focuses on the 'objective' profitability, I choose not to use ROE, since ROE is a ratio that is most relevant to investors. Unlike ROE, ROA allows the comparison of commercial and non-commercial MFI's, as NGO's and Credit Unions {{ 33 Tchakoute-Tchuigoua, Hubert 2010;}}

The explanatory variables in the empirical analysis follow next. The variables are grouped in main indicator groups to cover all the different areas as mentioned in the background study.

The hypothesis behind outreach influencing profitability is the idea that the bigger the MFI, the better the MFI. This is a common thought by many researchers in the industry {{ 2 Dieckmann, Raimar;}}.
Representation of the indicator group 'outreach':

- Number of active borrowers is the first and most obvious variable in this group. It is expected that large MFI's are more efficient than small MFI's, due to the potential dilution of fixed costs over a large base ("008 MIX Global 100", p 11).
- Percentage of women borrowers is another variable in the group. The aspect of this variable is connected to Muhammed Yunus, who was one of the first lenders to focus on lending to women as he considered them to be more reliable. However, as this is not a variable that is commonly reported on to MIX, this cannot be used.
- Gross loan portfolio is an institutional factor, and is measured in US Dollars (USD) to reflect differences in income levels across regions. The definition of the variable is all outstanding loan principal due for all microfinance clients. This includes current, delinquent, and renegotiated loans, but not loans that have been written off. It does not include interest receivable.
- Average loan balance per borrower/ GNI per capita is a factor that reflects whether it is more profitable to grant bigger loans than smaller loans. When analyzing variables that differ 'per borrower', the variable gets divided by GNI per Capita, when possible, to make them relative to the local income level.

There is no single optimal capital structure for an MFI according to researchers. It all depends on the internal factors, e.g. growth of the loan portfolio, or on the external factors, e.g. the regulatory framework, whether there are donors available, and whether the financial system is open and developed {{ 2 Dieckmann, Raimar;}}. There is, therefore, no real hypothesis behind this area, but it is still an important area, since the capital structure is an area constantly debated in the financing industry.

Representation of financing structure:

- Debt to equity ratio is one of the main ratios when discussing the capital structure. It indicates what proportion of equity and debt the company is using to finance its assets. This is very much connected to where the MFI is located in its life cycle. Traditionally, the funding structure follows a certain pattern over the life cycle of an MFI. Start ups are characterized by a larger dependency on donations, usually in the form of equity grants, whereas the more mature MFI's tend to display a higher debt leverage through borrowing and even evolve into a formal institution or a regulated niche bank. Some MFI's even access capital markets by issuing bonds or by going public (IPO).
- The Capital/Asset ratio is defined as the percentage of banks', in this case MFI's, assets represented by capital. It is the amount of money which a MFI has in the form of equity, shown as a percentage of its assets. Internationally, this has been agreed to be minimum 8%.
- Gross loan portfolio to total assets is the last variable within the indicator group of financing structure. This variable explains how great a part of an institution's assets is actually used to loan out. This aspect is important since some MFI's have other activities due to the social aspect of the industry.

Further, the indicator group of expenses is an efficiency aspect, but is discussed separately since it concerns the operating and financial expenses only. The hypothesis is that the lower expenses compared to assets, the more profitable.

Representation of expenses:

- The operating expense/assets ratio is one of the ratios that capture good management. This ratio is comparable to the efficiency ratio explained later. The difference between the two ratios is that this ratio relates to the assets instead of the gross loan portfolio. This means that if gross loan portfolio to total assets is not significant in the final profitability model, then the difference between these two ratios is irrelevant.
- Financial expense/assets is another ratio which disregards the operating aspect of the MFI and only focuses on the total financial expenses.

Revenue is defined as the source of income for MFI's and is therefore a very relevant indicator of profitability.

The hypothesis is that the application of interest rates, and thereby financial revenue, should significantly contribute to the profitability of MFI's, and the size of yield as well as the ratio of financial revenue to the assets should therefore play a role.
Representation of revenue:

- Financial revenue/assets
- Yield on gross portfolio (real) is the variable that comes closest to the interest rate since it is defined as the interest and fees from the loan portfolio divided by the loan portfolio. It can, therefore, be seen as a better measure since it does not only include the interest rate, but also other costs that can sometimes be hidden from the inexperienced borrower. I choose the real term instead of the nominal, since I hereby eliminate the influence of the different inflations of the countries. In general, inflation affects the rich far less than the poor, as the rich hold greater assets and have higher incomes which allow them adjust to rising prices {{10 Zaidi, S. A., Farrooqi, Maheen S. and Naseem, Ameena (for the Pakistan Microfinance Network) Spring 2009; }}. By ignoring inflation, a better comparison can be made.

Representation of good management is captured by both the efficiency and productivity variables. A well-managed MFI that applies best practices can effectively control its operating expenses. Good management can simply boost productivity {{ 16 Gibbons, David S., Meehan, Jennifer W. 1999;}}. The hypothesis is that good management, through investment in human and technological resources together with financial incentive mechanisms, should increase the quality and profitability of loan officers, lower personnel costs etc.
Representation of efficiency:

- Operating expense/loan portfolio is the firm variable that captures good management.
- Cost per borrower is another variable that covers an aspect of good management. Yet the variable also included the aspect of different lending methodologies since group lending should be cheaper than with individual lending. To improve the model, a type of variable, maybe a dummy variable, would also be included if it was available. However, such a variable is not available. Another improvement might be to include the aspect of income

levels and thereby changing the variable to be' cost per borrower/GNI per Capita', but again, this kind of variable is not available.

- One of the basic measures by the microcredit Summit's Challenge to measure MFI field staff efficiency is the average number of active loan clients per field staff. Efficiency is a dynamic, not static, process. Therefore, the specific output measures do not tell the whole story about staff productivity, but it is the best measures available when making an empirical analysis based on data. Therefore, the 'borrowers per staff member' variable is the last variable included in the efficiency group. This variable also shows something about the lending methodology.

Risk and liquidity are other words for the quality of portfolio. Several risk management methods are used by MFI's, such as sequential loans, credit scoring etc.
E.g. when a borrower stops making payments on a loan, an MFI has two options. First, it can keep the loan on its books and try to collect the outstanding payments, thereby keeping the loan registered in the portfolio. Delinquent loans are tracked in the portfolio-at-risk ratios, depending on how long they have been in non-payment status. The other option for the MFI is to decide that it cannot collect the loan and write the loan off its books. In this case the loan registers in the write off ratio, thereby reducing the loan portfolio by the remaining balance of the loan. Due to the critics on the issue of repayment, these variables are considered less valid, since many MFI's are suspected of misreporting this issue. Yet the hypothesis on the quality of portfolio is that good quality, i.e. low portfolio at risk and low write off ratio, means high profitability since the MFI's get high repayment{{ 4 Ayayi,Ayi Gavriel 2010;}}.
Representation of quality of portfolio is therefore:

- Portfolio at risk > 30 days, which has replaced the repayment rate, is the leading measure of loan portfolio quality, following the lead of traditional commercial banks. This relatively new and valuable measure of loan portfolio quality compares the remaining outstanding balance of loans with at least one instalment overdue for a specific period, here 30 days, to the total loan portfolio. It's an indication of the proportion of loans outstanding that may not be able to be recovered in the future {{ 16 Gibbons, David S., Meehan, Jennifer W. 1999;}}.

- The write-off ratio is a measure of actual loss on portfolio, as recognised by the MFI's policy on portfolio management. High write-offs are certainly an indication of poor quality micro-finance and a strong indication of clients having to pay the price for an institution's inefficiency. Ranked inversely, this metric favors MFI's with no or very lax write-off policies {{ 21 Microfinance Information eXchange, Inc. (MIX) December 2008, updated March 2009;}}.

The last indicator group is the peer group comparisons, which are all qualitative explanatory variables, in other words dummy variables. Peer groups represent groups of institutions that share common traits, such as legal status, country of operations, scale of lending operations, or age. These groups are organized and categorized based on the peer group methodology applied in MIX's MicroBanking Bulletin.

The peer group comparisons are:

- Deposits, which categorize MFI's based on whether or not they take deposits. The hypothesis here is that MFI's that do take deposits have higher profitability since deposits are a cheap form of equity.
- Age, which categorize MFI's based on their age, grouped by new (1 to 4 years), young (5-8 years) or mature (more than 8 years). The number of years is calculated as the difference between the year they started their microfinance operations and the year of data submitted by the institutions. The hypothesis here is: the older the MFI, the more experience and thereby profitability.
- The current legal status categorizes MFI's based on their legal status, which can take the form of Bank, Credit Union, NGO, NBFI or rural bank. More on the different aspects of these different types can be observed in the background study in table 5 and 6.
- Profit status is the last peer group comparison, and the hypothesis is here that 'for-profit' MFI's are forced to operate efficiently due to the need to create a profit, or at least break even. This means that they need to create an ongoing operational efficiency culture. Over time, this must mean that the cost savings can possibly be passed along to poor clients in the form of lower interest rates or fees. 'Non-profit' MFI's should by definition not be concerned with profit, and instead then focus only on social aspects.

5.1.3 Non-present variables or variables excluded

The following variables could either not be retrieved, though they might also offer interesting aspects of what determines the profitability of MFI's, or are consciously excluded since I do not consider them relevant.

Some analysts argue that regulatory supervision imposes a restriction on the profitability and outreach of Microfinance institutions {{19 Cull, Robert, Demirg ┣e-Kunt, Asli and Morduch, Jonathan (The World Bank) June 2009; }}. Yet this aspect has been included as well as possible in the regulation issues faced by MFI's which are included in the legal status. However, more on the regulation differences between countries could not be retrieved.

Study by the World Bank shows that contract design is essential when considering different trade-offs in finance, including a possible trade-offs concerning profitability and interest rates. The contact design includes both levels of interest rates and the lending methodology, which includes group lending, village banking and individual-based lending. This kind of variables could neither be retrieved.

A level of possible subsidies is the variable most wanted, but lacking from the model and from my data source. This variable could bring important insights to how much the profitability of MFI's depends on subsidies.

Macroeconomic variables, such as inflation and lending rate, are common and available by the statistics branch of the International Monetary Fund (IMF), but were difficult to merge with my data sample. Instead of lending rate, the yield of the gross portfolio has been included since this is what the MFI's actually charge, and the aspect of inflation has been extracted from all relevant variables in order to make the MFI's more objective and comparable.

The country of origin has been excluded from the analysis in the belief that the country in which an MFI is based, should not by definition have a direct influence on its profitability. Indirectly though, the origin does have an influence, in the sense of inflation, regulation issues etc, and these issues have been dealt with separately as well as possible.

5.1.3 Sample analysis

Before analyzing the quality of the model through checking the assumptions, an

analysis of the sample is necessary as a first step in understanding the data behind the regression analysis.

As mentioned earlier, MIX is the source of my sample data, and the diamond ranking system signals the level of transparency for the MFI, and can also be seen as their level of reliability.

Table 11: Sample by diamond ranking

Diamond ranking	No. of MFI's
Non existing	3
1	5
2	2
3	221
4	386
5	262

As can be seen from the table, the majority of my data lies within the ranking of 3 to 5 diamonds, which is a good signal. It is, however, not until level 4 that audited financial statements are part of the disclosure requirements {{ 7 MIX 2011;}}. Therefore, level 4 and 5, which count for 74% of the data sample, is my own view constitute truly reliable data and is therefore also used in the robust test after the regression analysis.

As mentioned in the background study, it has been found that a small number of institutions serve the majority of the clients worldwide.

Table 12: Sample by number of borrowers

Number of active borrowers	No. of MFI's	Total number of borrowers
< 5000	280	563.321
5.000 - 10.000	120	908.036
10.000 - 20.000	138	1.978.679
20000 - 50.000	151	4.877.306
50.000 - 100.000	86	6.390.039
100.000 - 500.000	82	16.294.228
>500.000	22	43.259.837

The sample can be seen as reliable in the sense that the same trend, as stated in the study from the Microcredit Summit Campaign, is seen here; 22 out of 879 institutions cover 58% of the total number of borrowers, and 104 of the 879 institutions cover

80%. In other words, a small part of the institutions serve a large part of the market.

The legal status is one of the variables that indicates the regulation of the institution, its funding structure (including donations), profit status and more, and is therefore an important factor when looking at the nature of an individual MFI. Following, these variables should in theory also be a part of determining the profitability, e.g. since by definition a NGO works as a 'non-profit' etc. Also, sometimes an MFI start out with one legal status and shifts as it develops and matures.

Table 13: Sample by legal status

Current legal status	No. of MFI's
Bank	67
Credit Union	131
NGO	336
NBFI	298
Rural Bank	47

Evidently, there is a majority of NGO's and NBFI's, and thereafter Credit Union, who all (except for a few NBFI's) hold the status of 'non-profit'. There are obvious tax benefits for being an NGO, yet the financial services are restricted, including being allowed to take deposits, which can be seen as a negative aspect.

Table 14: Sample by deposit status

Deposits	No. of MFI's
Yes	480
No	399

From the two tables above it can be connected that if an MFI has the opportunity, it will choose to take deposits. This is off course very reasonable, since deposits are considered a cheap form of funding. The capital structure indicated the mix of funding, and the capital asset ratio is one of the measures describing the capital structure of an MFI.

Table 15: Sample by capital / asset ratio

Capital / Asset ratio	No. of MFI's
0 - 0.10	105
0.11 - 0.20	267

0.21 - 0.30	169
0.31 - 0.40	106
0.41 - 0.50	74
0.51 - 0.60	38
0.61 - 0.70	33
0.71 - 0.80	31
0.81 - 0.90	26
0.91 - 1.00	30

More than 80% of the MFI's has a capital / asset ratio below 0.5, and more than 40% has a ratio between 0 and 0.20. Though there is no optimal capital structure, the general view is that a high capital asset ratio is to be preferred since it functions as a cushion against credit risks and results in a better chance for profitability.

Some argue that age is another variable that influences profitability. As seen in the background study[10] there has been an enormous progress in the existence of MFI's and client outreach. As more and more MFI's start up, it is also interesting to investigate whether only the mature MFI's have found their way to profitability, or whether the new MFI's entering the industry has different set of goals and operational set of skills leading to profitability.

Table 16: Sample by age

Age	No. of MFI's
Mature	654
Young	145
New	80

First, it is noticeable that 74% of the sample consists of mature MFI's, meaning that they are more than 8 years old. Yet, the number of MFI's is increasing, there must be many new and young institutions on the market. The mix of age in my sample is, therefore, not very representative. This, however, also connects to the diamond ranking, since an MFI must have outreach and financial data for two consecutive years to get ranking 3. And for ranking 4, the MFI's must also have audited financial statements, including auditors' opinion and notes for at least two consecutive years, which might not be the first priority of a new or young MFI.

[10] see page 10

Profitability of MFI's and their interest rates, which are under investigation in the paper, are important pieces of the sample analysis. The table below shows the distribution of MFI's by the chosen variables.

Table 17: Sample by profit margin, return of assets and yield on gross portfolio (real)

Profit margin	No. of MFI's	ROA	No. of MFI's	Yield on gross portfolio	No. Of MFI's
<0	19	<0	0	<0	0
0 - 4%	137	0 - 4%	568	0 - 4%	18
5% - 8%	110	5% - 8%	155	5% - 8%	49
9% - 12%	125	9% - 12%	82	9% - 12%	76
13% - 16%	108	13% - 16%	25	13% - 16%	136
17% - 20%	80	17% - 20%	14	17% - 20%	134
21% - 24%	54	21% - 24%	12	21% - 24%	103
25% - 28%	52	25% - 28%	6	25% - 28%	78
29% - 32%	39	29% - 32%	2	29% - 32%	66
33% - 36%	32	33% - 36%	4	33% - 36%	49
37% - 40%	18	37% - 40%	2	37% - 40%	38
41% - 50%	45	41% - 50%	3	41% - 50%	66
51% - 60%	23	51% - 60%	3	51% - 60%	26
61% - 70%	12	61% - 70%	3	61% - 70%	22
71% - 80%	12	71% - 80%	0	71% - 80%	13
81% - 90%	8	81% - 90%	0	81% - 90%	4
91% - 100%	5	91% - 100%	0	91% - 100%	1

Return on asset and profit margin are representing profitability in my two models, and it is obvious that ROA has the tightest distribution, where PM is more bell-shaped, of course with a tail on the positive side. I consider it a positive aspect that ROA and PM don't follow the exact same distribution, since this also means that the two variables show different sides of profitability. The difference is further explained in the variable discussion. The yield on gross portfolio (real) is the interest rates plus fees and indicates the real 'price' for a loan. This variable is one of the most important ones in this analysis, due to the many critics concerning the connection between high interest rates and high profitability.

The distribution of the yield is similar to that of the profit margin, but the bulk is shifted more to the left. From the distribution[11] a relationship between profit margin and yield on gross portfolio seem to exist. This relationship will be further analyzed in

[11] Appendix 4

section 5.3.

5.2 Model quality

Before making the regression analysis, the assumptions behind the OLS regression model needs to be checked since it can be proven that given the 10 assumptions of the regression model the OLS estimators are BLUE (Best, Linear, Unbiased, Estimator).

Any empirical analysis should begin with an exploration of the data, as done in the sample analysis. Next, a more visual exploration can be done through plotting the different explanatory variables against the dependant variables. These explorations are made in order to get a feeling of my data set, and to spot possible outliers and trends. When plotting first ROA, and then the profit margin, against all the different variables, it can be observed that there are observations, which are very much bigger than the main part of the observations. In general, a dummy variable should be created for each outlier. But as I choose only to delete outliers that I believe are misreported (and which actually shift the significance of a variable), I do not need the estimates of the dummies, and I therefore delete them.

For ROA, 15 different outliers have been checked to see whether the significance of the variables shift when excluding these outliers from the sample. Only one outlier, the observation with a D/E ratio of 757,51, makes the variables go from being significant to insignificant. This outlier changes the significance of the variable and is therefore excluded from the sample.

For PM, the same process is applied, and the same result appears. So since the outlier with the D/E ratio of 757,51 radically changes the significance, this outlier is excluded. Further, there are several outliers with PM below zero. When looking at any scatter plot, it is clear that one observation with PM=-12.62 is a clear outlier! Before excluding any of the outliers, only 5 variables turn out to be significant in the regression analysis. From the plots it looks like these outliers, as a whole, truly shift the picture of what is the 'reality'. Therefore, I choose to exclude the observations with PM below zero, since I believe that these are either extreme outliers, or indeed false observations.

The largest conflict when working with data samples of this sort arises when dealing with observations that are extreme and could be misreported. I also notice from the plots that some explanatory variables have wide spans with the majority of observations in one end of the scale, which is normal when comparing a wide scale of small and new MFI's with large and mature MFI's, are when comparing small and large businesses. This could create a necessity for using logs to diminish this impact, which I will comment on later. As I go through checking the assumptions, the results of the test and the graphs below are for the profitability model with ROA as the dependant variable, but the exact same process is carried out for PM.

5.2.1 Checking the assumptions

The following assumptions are usually adopted in connection with the simple linear regression model {{ 36 Gujarati, Damodar N., Porter, Dawn C. 2009;}}:

1) The regression model is linear in the parameters.
2) Fixed x-values or x-values independent of the error term.
3) The error term has zero expected value.
4) The error term has constant variance for all observations.
5) The random variables are statistically independent.
6) The number of observations n must be greater than the number of parameters to be estimated.
7) The nature of X: the variance must be different from 0.
8) No exact collinearity between X values.
9) The error term is normally distributed.

Some of the assumptions can be observed from the original profitability model stated earlier, others are rooted in the theory of econometrics, and some need to be tested for. In particular, I need to test for three kinds of assumptions: no multicullinearity, no heteroscedasticity, and the error term being normally distributed. Testing for autocorrelation is only important if data is for more than one point in time. Since my selected data is only for one observation (many are therefore averages) in 2009, there is no need to test for autocorrelation.

Testing for multicullinearity (muco) is important when there is more than one explanatory variable, and it is therefore important in this case. There must be no exact

collinearity between X values. An exact linear relationship (correlation) among two of the regressors equals perfect collinearity. This could be the case if a dummy trap is present, or if there are two x variables that follow each other. An indication of muco is insignificant parameter estimates and high R^2 {{ 36 Gujarati, Damondar N., Porter, Dawn C. 2009;}}. A high pair-wise correlation among the explanatory variables indicates muco, and a correlation matrix must therefore be made. In my oroginal profitability model there are many variables linked to each other. This should lead to correlations between explanatory variables within each area, but hopefully not between the different areas. If, and when, some variables turn out to be highly correlated, some variables must be dropped. Since the size of the sample is relatively large, the regular assumption or normality of the residuals is not needed. However, the influence of outliers still has a major impact on the correlations {{ 37 StatSoft 2011;}}.

The correlation among the explanatory variables is both positive and negative[12]. In the area of outreach, the number of active borrowers and the gross loan portfolio are positively correlated with a significant coefficient, of 0.66, but the coefficient is not high enough to be a strong correlation. The variables within financing structure and expenses show no high coefficients. The two variables representing revenue are correlated with a high coefficient of 0.82 and are likewise both correlated with a high coefficient to operating expenses/assets. The two operating expense ratios are highly correlated which was to be expected. Representing efficiency, cost per borrower and borrowers per staff member are also significantly negatively correlated, which makes sense since if the number of borrowers per staff member increases, then the cost per borrower should decrease. It can be seen from the table that in general the correlations between the independent variables analyzed in pairs are weak. Accordingly, I do therefore not observe collinearity between the explanatory variables despite significant correlation coefficients between some of them.

The correlation between PM and ROA can be seen below.

Table 18: Correlation coefficient between PM and ROA

	Return on assets	*Profit margin*

[12] Appendix 5

Return on assets	1	
Profit margin	0.756999931	1

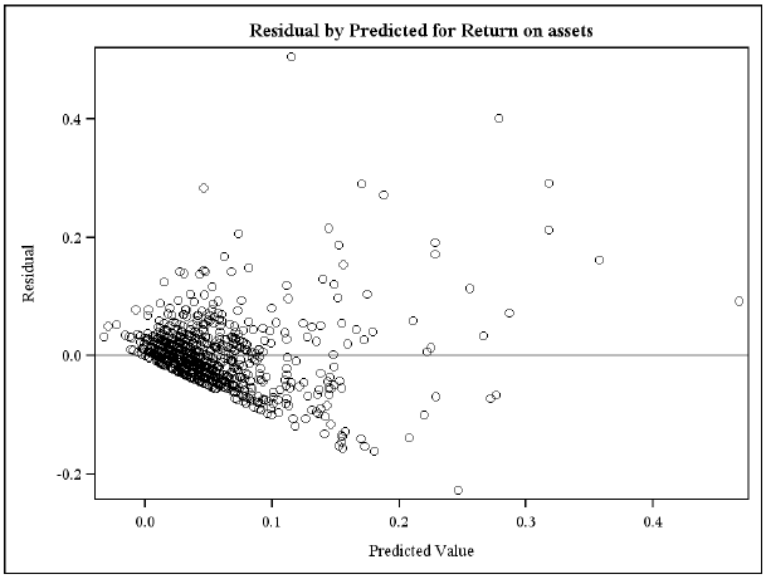
The table shows that the two dependable variables do follow each other but are not perfectly correlated, which is good since they then show different sides to profitability. This aspect is likewise discussed from a theoretical point of view in the previous section 5.1.2.

One of the important assumptions of the classical linear regression model is that the variance of each disturbance term μ_i (error term) is some constant number equal to σ^2. This is the assumption of homoscedasticity, or equal (homo) spread (scedasticity), that is equal variance {{ 36 Gujarati, Damodar N., Porter, Dawn C. 2009;}}. Sources of heteroscedasticity are many:

- It can arise as a result of the presence of an outlier => distinctive outliers has already been detected earlier.
- Important variables could be omitted from the model => this could be a possibility since my original model is based on previous research, theories and my own ideas.
- Skewness in the distribution of one or more regressors included in the model => the bulk of borrowers comes from only a few MFI's as seen in the sample analysis.
- Incorrect functional form => from the plots mentioned with the explanatory variables against the dependant variable I get a rough idea about the appropriate functional forms. It turns out that using the 'Log' on number of active borrowers (nab), gross loan portfolio (glp) and cost per borrower (cpb) is a more appropriate functional form for these variables.

Heteroscedasticity can be detected both through graphical detection and through numerical tests. The graphic detection is primarily used first to get an idea of the subject. In this case different plots can be used, and I choose to look at the 'Residual by predicted value' plot:

Plot 1:



A trend can be detected from the plot since the variance of each error term is not constant. It is therefore necessary to do further numerical testing.

There are various tests to detect heteroscedasticity, and I use a test directly through SAS: analyze -> regression -> statistics -> diagnostics -> heteroscedasticity test:

Table 19: Results from heteroscedasticity test in SAS (with all variables).

Test of First and Second Moment Specification		
DF	Chi-Square	Pr > ChiSq
283	297.53	0.2648

With all the variables included in the model, the p value is larger than 0.05, and we therefore accept H_0. However, when I start to remove the insignificant variables in the model, the p value is getting smaller. When the model only includes the significant variables, the p value is extremely low, and I therefore have to reject H_0,

Table 20: Results from heteroscedasticity test in SAS (only with significant variables).

Test of First and Second Moment Specification		
DF	Chi-Square	Pr > ChiSq
62	124.71	<.0001

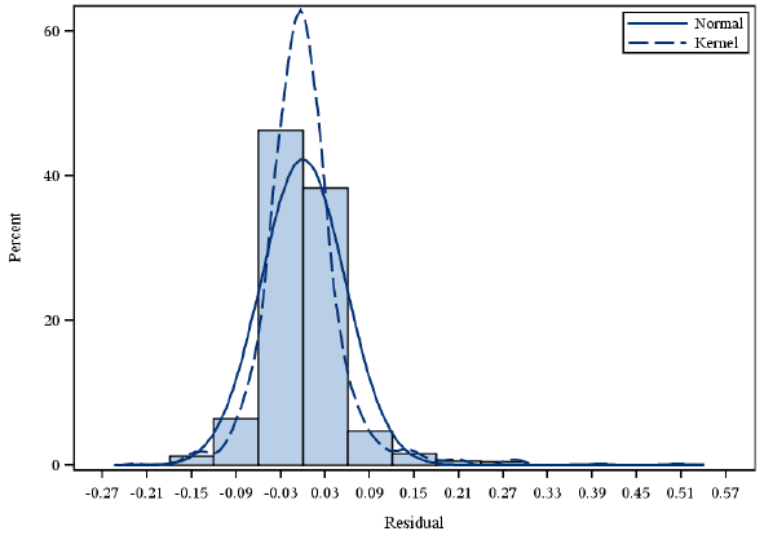
A significant problem arises if the H_0 (=no heteroscedasticity) is rejected, since I then know very little about the nature of the heteroscedasticity. I have stated different possible sources, but there are no ways to find out the exact one.
The problem of heteroscedasticity is likely to be more common in cross sectional than in time series. If we chose to go on with the analysis, there is no longer minimum variance, and no longer 'Best' since there can be derived another linear, unbiased estimator with a smaller variance {{ 36 Gujarati, Damodar N., Porter, Dawn C. 2009;}}.

In the presence of heteroscedasticity, one answer could be to use GLS. However, in practice it is not easy to apply GLS. So unless heteroscedasticity is very severe, one may not abandon OLS in favour of GLS or WLS. Other solutions include using dummies for outliers and using other functional forms. I also choose to use OLS with White's heteroscedasticity corrected standard errors for hypothesis testing. White's does not rely on the normality assumption and is therefore a good solution to the problem.

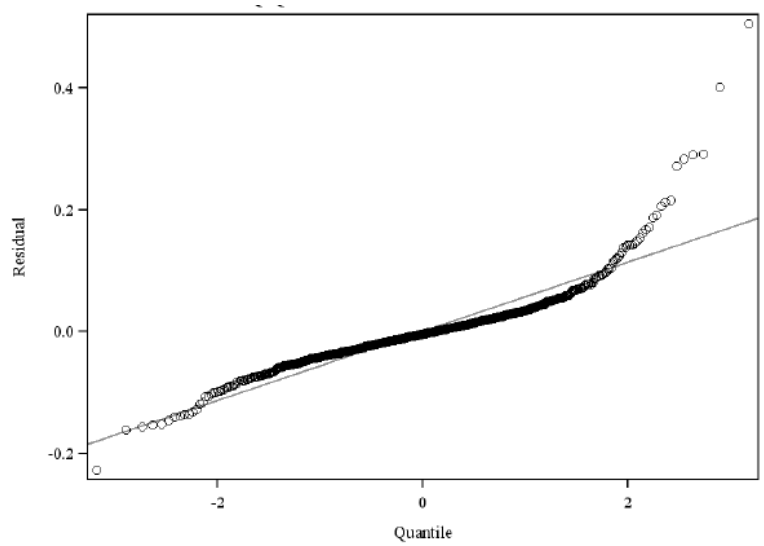
A residual analysis is needed when the regression model has been estimated, and the normality assumption can be detected by inspection of the residuals. Again, both visual and numerical tests are used.

Both a histogram and a probability plot show the visual impressions of the distribution of data. Some argue that the probability plot is the best, since it can be difficult to base a decision only on a histogram.

Plot 2: Distribution of residuals for ROA (histogram)



Plot 3: Q-Q plot of residuals for ROA (probability plot)



The histogram suggests normal distribution due to the distribution, being around the value 0, and the bell-shape. The probability plot provides a doubt to the assumption of normality due to the high end of the quantile, which could be caused by outliers. A numerical testing is necessary to get a clear idea.

The JB test is used in SAS: analyze => time series => regression analysis with autoregressive errors => put in variables => in the tab, options, choose 'maximum likelihood' as method and un-choose to 'fit an autoregressive model' => in the tab 'statistics' I choose the Jaque-Bera (JB) normality test.

Table 21: Result from normality test in SAS (with significant variables)

Miscellaneous Statistics			
Statistic	**Value**	**Prob**	**Label**
Normal Test	9244.7938	<.0001	Pr > ChiSq

The Jaque-Bera statistics reject the hypothesis that the errors are normally distributed, as the JB statistics are very high, much larger than the 5.99 (5% level), and the p value is practically zero. If residuals are not normally distributed, there is the possibility that the dependent variable or one of the explanatory variables have a wrong functional form, or that an important variable is missing from the model. These aspects have already been taken care off. The role of the normality assumption is critical in small samples, but due to the high number of observations in my sample it is less critical to have residuals not normally distributed.

As a conclusion to the model quality, the assumption of homoscedasticity of the residuals is violated, but as various changes to the model have been made in order to eliminate the effect, I choose to work with heteroscedasticity. Despite the background study concerning theoretical and empirical links to the profitability of microfinance institutions, my models are still not considered perfect, which will be commented on further on. Yet, as the industry of microfinance is young and changing, and researchers are constantly learning new things, I believe the non-perfect models to be the best possible models.

5.3 The final profitability models and results

This section explains the results of the two different regression models, both the final results, problems occurring along the way and a robust check of the models. The detailed explanation will concern the analysis of the ROA model, and similarities and differences to the PM model will be described.

Table 22: The values of the variables included in the final ROA model[13]

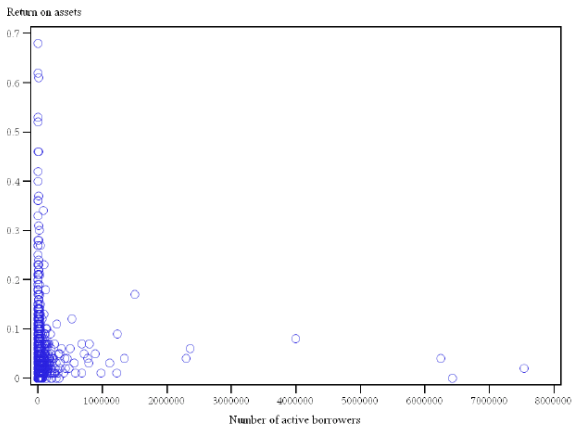
[13] Appendix 6

Parameter Estimates									
							Heteroscedasticity Consistent		
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-0.08404	0.02647	-3.18	0.0015	0.04135	-2.03	0.0424
Capital/asset ratio		1	0.02512	0.00950	2.64	0.0084	0.01160	2.17	0.0306
Gross loan portfolio to total as	Gross loan portfolio to total assets	1	0.06690	0.01331	5.03	<.0001	0.01545	4.33	<.0001
Operating expense/ loan portfoli	Operating expense/ loan portfolio	1	0.26699	0.01842	14.49	<.0001	0.03706	7.20	<.0001
Ddeposits		1	-0.01045	0.00459	-2.28	0.0229	0.00431	-2.42	0.0156
Dage,new		1	0.03642	0.00711	5.12	<.0001	0.01283	2.84	0.0046
Dlegal status,credit union		1	-0.00838	0.00648	-1.29	0.1961	0.00411	-2.04	0.0418
log_nab		1	-0.03264	0.00552	-5.92	<.0001	0.00755	-4.32	<.0001
log_glp		1	0.03067	0.00545	5.63	<.0001	0.00782	3.92	<.0001
log_cpb		1	-0.03441	0.00532	-6.47	<.0001	0.00725	-4.75	<.0001

The significant variables from the table above are included in the ROA model, since they all have a statistical significance. The results of each variable will be discussed below:

- Number of active borrowers. This variable has a negative sign and has a high significance level. The interpretation of this result is the higher number of active borrowers, the lower the return on assets. This result suggests the opposite of what was first expected.

Plot 4: Return on assets vs. number of active borrowers

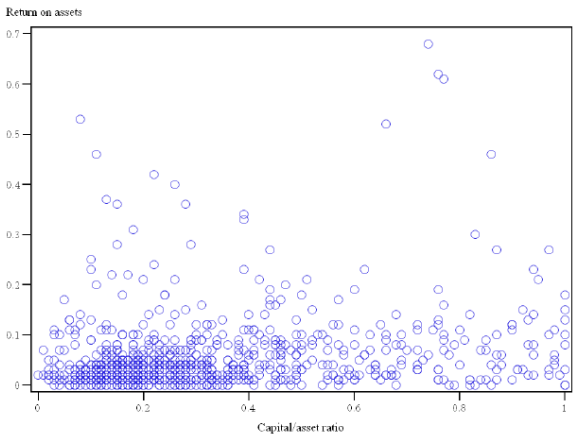


The log is used since I need a linear connection between the two variables and does not change the interpretation of the variable. From the plot above it can be observed that the main parts of the observations are centred around a small area. The negative sign of the variable could be a suggestion of an elasticity of

the variable; until a certain point, an increasing number of borrowers increases return on assets e.g. due to dilution of fixed costs, where after this point diseconomies of scale take effect. This elasticity can also be detected from the graph above showing return on assets vs. the number of active borrowers, where the non-linear relationship is easier to spot. This elasticity is therefore not translated into a linear relationship due to the non-linearity. This result might also simply mean that having a small number of active borrowers is more profitable. These considerations are important since this variable have turned out both to have a significant and theoretical significance. A trade-off between outreach and profitability is also mentioned in a report by the Development Research Group from the World Bank{{ 19 Cull, Robert, Demirg ̧c-Kunt, Asli and Morduch, Jonathan (The World Bank) June 2009;}}.

- Gross loan portfolio. This variable has a positive sign and has a high level of significance as well. The interpretation of this result is that the higher a loan portfolio, the higher the return on assets, which fits the theory of the variable. These two first variables represent the indicator group outreach, which has turned out to be statistical significant, as well as in theory.
- Capital / Asset ratio. This variable has a positive sign and is significant close to the significance level of 5%. The interpretation of this result is that the higher share of total equity an institution has out of its total assets, the higher is the return on assets.

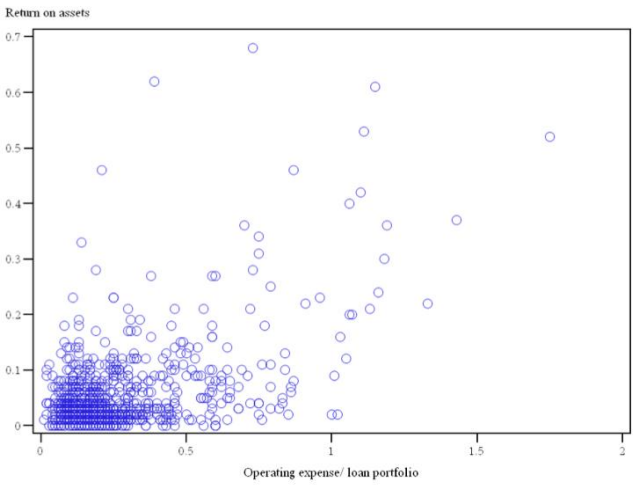
Plot 5: Return on assets vs. capital asset ratio



The plot shows the relationship between return on assets and the capital asset ratio. A bulk of the observations has a low ratio, ranging from 0.1 to 0.3, and a low return on assets, below 0.08, which suggests that a low capital asset ratio, i.e. a majority of debt, means low return on assets. As many institutions are dependant on donations especially in the start-up phase, it seems reasonable that the bigger part equity plays, the better. The positive sign on this variable could also suggest that capital market involvement is a positive initiative, especially as donations are not going to last forever. However, as in theory of financing structure, the relationship between debt to equity, and thereby also the capital/asset ratio, is a curve that breaks at some point. The breaking point is, however, different from industry to another, and from institution to another, and is the reason why there is no optimal capital structure overall.

- Gross loan portfolio to assets. This variable has a positive sign and has a high level of significance. The interpretation of this result is that the higher share of total assets that the gross portfolio holds, the greater the return on assets. This significance tells us that it is profitable for an MFI to use all its assets on its loan portfolio and not on other activities, e.g. social activities. This variable, as well as the one above, represent the indicator group financing structure.
- Operating expense to gross loan portfolio. This variable has a positive sign and has a high level of significance.

Plot 6: Return on assets vs. operating expense / gross loan portfolio



From the plot it can be observed that the majority of the observations has a low ratio and a low return on assets. A negative sign would, however, appear

if all other observations outside this bulk were excluded. This suggests that some of these observations are influenced by other variables. The theory of good management behind this variable does, therefore, not appear. Consequently, the positive sign of this variable does not fit into the general theory. A variable that could shed some light on this issue is donations. As previously detected by Gibbons and Mehan, operating expenses are increasing faster than interest income when expanding the business of an MFI. If donations were often given when expanding, which sounds very reasonable, this could be lead to higher profitability and thereby form this connection between operating expenses and return on assets {{ 4 Ayayi,Ayi Gavriel 2010;}}. Though this cannot be tested, due to the lack of a variable showing size of donations, I would suspect that is the cause, since otherwise the result makes no sense at all. Another interesting aspect, which might shed some more light on this variable, is the year-by-year development in this ratio for each individual MFI, which might show that if one MFI uses good management and lowers the operating expense to gross loan portfolio ratio, then the ROA might increase. However, this kind of data is not included in my data sample and can therefore not be investigated.

- Cost per borrower. This variable has a negative sign and has a high level of significance. The interpretation of this variable is that the more the MFI spends on each borrower, the lower the return on assets. This is considered a very simple variable and fits according to theory. This variable, along with the operating expense to gross loan portfolio represents the indicator group efficiency.
- Deposits. This is the first significant variable that represents a peer group comparison. The variable has a negative sign, which does not match the theory. However, many sources could explain the reason to the negative sign. Since the dependant variable is return on assets, the size of assets, and thereby the possible return, could have a connection to the possibility of having deposits. After investigation, it turns out that MFI's which do take deposits actually include a portion of MFI's which have much higher assets than the rest of the sample. The possibility of deposits also depends on the legal status of the MFI. The true relevance and significance of the dummy variable can also be questioned due to the size of the parameter estimate, which is very

small. As this is a dummy variable for deposits, this means that if an MFI does take deposits, ROA will fall by 0.01045, which could be considered insignificant. The true relevance of this dummy variable is therefore questioned.

- Age (new). This dummy variable is significant with a positive sign. The interpretation of this variable is that if an MFI is new its ROA is 0.03642 higher than the ROA of mature MFI's. There are two different arguments to be made from an economic view. First, mature MFI's would be expected to have more experience and thereby a better chance for a high ROA, making this variable economically insignificant. Second, which is the opposite point of view, new MFI's often start up in a new location with little competition, and therefore with bigger possibilities for more revenue from interest, maybe due to a larger yield.
- Legal status (credit union). This dummy variable is borderline significant and holds a negative sign. The interpretation of this variable is that if an MFI holds the legal status of a Credit Union, it has 0.008838 lower ROA than an MFI with the legal status of a Rural Bank. There is no existing theory on the subject of legal status, but I consider it as a socially good sign that, statistically, it is more profitable to be a banking institution that aims at clients in non-urban areas, while being regulated and having a 'for-profit' status, as opposed to Credit Unions.

With the results of all the variables being discussed and interpreted above, the final ROA model is depicted below with all statistically significant variables.

Model 1: My final profitability model with ROA as the explanatory variable

$$ROA_i = -0.08404 - 0.03264\log(X_{NABi}) + 0.03067\log(X_{GLPi}) + 0.02512X_{E/Ai} + 0.06690X_{GP/Ai} + 0.26699X_{OE/GPi} - 0.03441\log(X_{CPBi}) - 0.01045D^{Deposits}{}_i + 0.03642D^{Age,\ new}{}_i - 0.00838D^{Legal\ status,credit\ union}{}_i + \mu_i$$

The ROA model has a high significance level and the adjusted R-square is 38.05%[14], which gets slightly lower (37.11%) when excluding the yield on the gross portfolio

[14] Appendix 6

from the model. This signifies that 38.05% of the variance of the dependant variable is explained by the independent variables.

The PM model has many similarities to the ROA model. All the variables that are significant in the PM model are also significant in the ROA model, except the yield on gross portfolio, which is truly significant in this model. The ROA model, however, holds a few significant variables which are not significant in the PM model. The statistically significant variables in the PM model are depicted below.

Table 23: The values of the variables included in the final PM model[15]

Parameter Estimates									
							Heteroscedasticity Consistent		
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	0.02528	0.07239	0.35	0.7270	0.08069	0.31	0.7541
Capital/asset ratio		1	0.15916	0.02677	5.94	<.0001	0.03338	4.77	<.0001
Operating expense/ loan portfoli	Operating expense/ loan portfolio	1	0.48421	0.06618	7.32	<.0001	0.08851	5.47	<.0001
Dage,new		1	0.11998	0.02087	5.75	<.0001	0.03194	3.76	0.0002
Dlegal status,credit union		1	-0.05852	0.01771	-3.31	0.0010	0.01628	-3.59	0.0003
log_nab		1	-0.09905	0.01784	-5.55	<.0001	0.02196	-4.51	<.0001
log_glb		1	0.09298	0.01753	5.30	<.0001	0.02142	4.34	<.0001
log_cpb		1	-0.10050	0.01744	-5.76	<.0001	0.02104	-4.78	<.0001
Yield on gross portfolio (real)		1	-0.24422	0.05593	-4.37	<.0001	0.07833	-3.12	0.0019

All the variables hold the same signs as in the ROA model, but all the parameter estimates are higher, thereby having a greater influence on the profit margin. The variable that has the highest influence on both return on assets and the profit margin is operating expense /loan portfolio. Though the first interpretation of this did not make sense, this does not mean that good management is not significant, but rather that the non-available variable of donations is very significant. The dummy variable for the age (new) of an MFI is very interesting since this is the other variable that is different between the two models. The interpretation of this variable is that a new MFI (1 to 4 years) has a PM 0.11998 higher than a mature MFI. This could be an indication of the

[15] Full linear regression results in Appendix 7

transition of the industry, despite the traditional theory which says that with age comes profitability.

Since all the variables hold the same signs in the PM model, this can be taken as a good indication that the dependable variables are good representatives of profitability and likewise of the robustness of the models. The yield on the gross portfolio has a negative sign again as in the first model, despite its borderline significance then. The connection between this variable and profitability will be thoroughly examined in section 5.4. Below, the final PM model is depicted with all the statistically significant variables.

Model 2: My final profitability model with PM as the explanatory variable

$PM_i = 0.02528 - 0.09905\log(X_{NABi}) + 0.09905\log(X_{GLPi}) + 0.15916X_{E/Ai} - 0.24422X_{YGPi} + 0.48421X_{OE/GPi} - 0.10050\log(X_{CPBi}) + 0.11998D^{Age,\ new}_{i} - 0.00838D^{Legal\ status,credit\ union}_{i} + \mu_i$

5.3.1 Problems while detecting significant variables

The decision of only deleting one outlier in ROA model was based on the fact that this was the only outlier that by itself had an impact on the significance of a variable. If, however, I start to delete more outliers detected by one or another technique, the significance of some of the variables included in the model changes and others would become significant. If I choose to start deleting outliers through choosing the largest Cook D values (another proceeding could be through deleting high or low residuals), the following variables can sometimes become significant, depending on the number of outliers deleted:

- Yield on gross portfolio (real) – this variable quickly becomes constantly significant with a few exceptions.
- Financial expense/assets – this variable is sporadically significant.
- Write-off ratio – this variable quickly becomes constantly significant with a few exceptions.
- Profit status – this variable sometimes become significant, but often only in connection with dummies of legal status
- Operating expense/ assets – this variable is sporadically significant.

- Legal status (NGO, or NBFI) – these dummy variables become significant only after many high Cook D values are deleted.
- Financial revenue – this variable rarely becomes significant, and it only does so when the variable of financial expense/asset is not significant.

As some variables become significant, there are also a few of the already significant variables which become insignificant:

- Age (new) - this variable only rarely becomes insignificant.
- Legal status (Credit Union) – this variable becomes insignificant sporadically.
- Gross loan portfolio to total assets - this variable also becomes insignificant sporadically.

The approach to the PM model is different, since before deleting any of the outliers, the significant variables are financial expenses/assets, financial revenue ratio, operating expenses/loan portfolio, legal status (Bank) and the gross loan portfolio. However, after looking into the data I believe that a truer picture of MFI's is shown when ignoring the observations with PM<0, since I believe that these are either extreme outliers, or they are indeed false observations. So, after deleting these observations, variables that are shown in the final PM model become significant.

If looking into the robustness of the variables, by deleting more outliers through high Cook D values, no variables are instantly changing their significance. It is only after deleting around 10 outliers that the dummy variable for deposits sometimes becomes significant, depending on the number of deleted outliers.

With the impact of outliers, and in general a very diverse sample, it is clear that all the aspects of the profitability of MFI's can be observed from an OLS regression model. A few of the variables has turned out contrary to expectations both due to other impacts, possible variables not included in the model, sensitivity to outliers etc. Also, some variables which have an economic and theoretical influence, does not turn out be statistical significant in my sample.

5.3.2 Robustness check

The robustness of the two models will be further checked in this section. The previous section showed that some of the significant variables could even become insignificant when I started to delete extreme cases. And on the other hand, some of the insignificant variables can even become significant in the same process. This fact may reveal a weakness of the robustness of the models. On the other hand, many of the variables occur in both models, proving that they are truly significant.

A regression analysis of the same variables in only a sub sample of the entire sample is made for both ROA and PM in order to test the robustness. The sub sample holds only MFI's with the diamond ranking 4 and 5, meaning that all MFI's with a diamond ranking from 1 to 3 are deleted. This means that the sub sample is only made from MFI's with the most reliable data.

The ROA robust analysis deletes 230 observations with the least reliable data, thereby making the sample consist of 647 observations, where 9 have missing values, due to missing values for the write-off ratio. This regression reveals the following variables to be significant: Capital/asset ratio, Operating expense/assets, Financial expense/assets, Financial revenue ratio, Write-off ratio, Deposits, Log_number of active borrowers, Log_gross loan portfolio and Log_cost per borrower[16]. The adjusted R^2 of the model is 0.4119 and therefore higher than my final ROA model. Also, some variables become significant and some become insignificant when looking at the two regressions. The following variables, which turn out with a high significance level in each regression and do not change significance when outliers are deleted, can therefore be seen as actually significant when estimating ROA:

- Capital/asset ratio
- Deposits
- Log_number of active borrowers
- Log_gross loan portfolio
- Log_cost per borrower.

[16] Appendix 8

When dividing the subsample for ROA into a 'for-profit' regression and a 'non-profit' regression, some interesting results appear. The 'for-profit' model has 261 observations with a adjusted R^2 of 0.5118, and the capital/asset ratio becomes insignificant, but 3 other variables becomes significant besides the general significant variables mentioned above[17].

The 'non-profit' model has 386 observations, with an adjusted R^2 of 0.4066, and has all the general significant variables plus four others[18]. The difference between these two models signifies that the estimation of ROA could still be different from each other when it comes to profit status, but depends on the sample used. Surprisingly, only the 'non-profit' model holds the yield on the gross portfolio as a significant variable.

The PM robust analysis deletes 222 observations with the least reliable data, thereby making the sample consist of 637 used observations, where 9 have missing values, due to missing values for the write-off ratio. This regression shows the following variables to be significant: Capital/asset ratio, Financial revenue ratio, Operating expense/loan portfolio, write off ratio, Deposits, Age (new), Legal status (credit union), Legal status (NGO), Profit status, Log_number of active borrowers, Log_gross loan portfolio and Log_cost per borrower[19]. The adjusted R^2 is 0.1933 and is also larger than the original regression. The same issue with shifting significances between the ROA regressions also occurs here. The following variables do not change significance in any of the cases and can therefore be seen as actually significant when estimating PM:

- Capital/asset ratio
- Operating expense/loan portfolio
- Age (new)
- Legal status (credit union)
- Log_number of active borrowers
- Log_gross loan portfolio
- Log_cost per borrower.

[17] Appendix 9
[18] Appendix 10
[19] Appendix 11

When dividing the subsample for PM into a 'for-profit' regression and a 'non-profit' regression, some differences appear just as in the case with the ROA models. The 'for-profit' model has 256 observations with an adjusted R^2 of 0.1863 and both the capital/asset ratio and the operating expense/loan portfolio become insignificant, but 3 other variables become significant besides the generally significant variables mentioned above[20].

The 'non-profit' model has 381 observations, with an adjusted R^2 of 0.1663 and the dummy variable for 'age' becomes insignificant, but 3 other variables also become significant here besides all the generally significant variables[21]. Again, the profit status has an impact when estimating the dependable variable.

These robust tests show that while some variables stay significant in different shapes and sizes of the sample, there are many variables that shift significance status from one sample to the other. This indicates that the final profitability models are actually not that robust since the relationships are not all linear and perfect. However, as the industry is expanding both regarding size and range, this is not a surprising conclusion.

5.4 Relationship between profitability and yield

Profitability measures the goal of delivering services in a financially sustainable manner. The critics of the high profits of MFI's and their connection to the high interest rates charged are the reason for the analysis of this relationship {{ 35 MIX publications 2011;}}.

It is important to avoid confusing moral and economic judgments: In order to make credit accessible to a large number of players, one must follow a financial logic. This would include covering one's costs and setting interest rates and fees accordingly. As the loans are small and have a relatively short duration, this does not pose a problem for micro entrepreneurs. It is this financial logic that has led MFI's around the world to charge higher interest rates than those of regular and commercial banks {{ 4 Ayayi,Ayi Gavriel 2010;}}.

[20] Appendix 12
[21] Appendix 13

To attain profitability and financial sustainability, MFI's must apply high but not excessive interest rates. This reasoning was confirmed by Cull, Kunt and Morduch (2007) who show that MFI's granting individual loans are no longer profitable when the interest rates applied surpass 60%, because the demand for credit decreases and will penalize the still existing clients making them unable to repay their loans.. Raising the interest rates too high would in other words undermine the portfolio quality and profitability {{ 13 Cull, Robert (World Bank), Demirg ̧c-Kunt, Asli (World Bank) and Morduch, Jonathan (New York University) 2005;}}.

Next, the relationship between profitability and the yield will be examined in my sample.

5.4.1 Correlation and results

Where the regression analysis tries to estimate or predict the average value of one variable on the basis of the fixed values of other variables, the primary objective of a correlation analysis to measure the strength of a linear association between two variables. Here the two variables are treated symmetrically, in other words, there are no distinction between the dependable and explanatory variable.

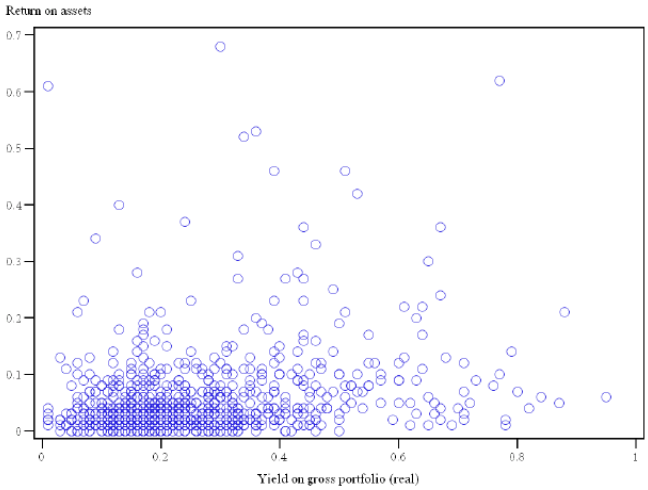
The objective is to find the true association between profitability, represented by ROA and PM, and the yield on gross portfolio (real).

Table 24: Correlation between ROA and yield on gross portfolio

	Return on assets	*Yield on gross portfolio (real)*
Return on assets	1	
Yield on gross portfolio (real)	0.260977912	1

The correlation coefficient between ROA and YGP is not considered a strong correlation. However, it exists since the correlation coefficient is not 0. If I remove the observations with PM<0, the coefficient increases to 0.340169. The correlation coefficient for MFI's with 'non-profit' status then becomes 0.339767, and for 'for-profit' it is 0.341459, so not any real difference.

Plot 7: Scatter plot of ROA and the yield on gross portfolio



The regression analysis showed that the values of the yield were not significant in estimating the average value of ROA, which tells me that this correlation is not significant when estimating ROA on the basis of the yield. This makes sense since in a regression analysis there is a big difference between dependable and explanatory variables.

Table 25: Correlation between PM and yield on gross portfolio

	Profit margin	*Yield on gross portfolio (real)*
Profit margin	1	
Yield on gross portfolio (real)	-0.01022539	1

The value of the correlation coefficient between PM and YGP is representing a lack of correlation. Correlation coefficient for 'non-profit' are -0.01149, where for 'for-profit' it is -0.00814, again no real difference between MFI's with different profit status.

Despite the lacking correlation the variable of the yield is significant in the regression analysis. This means that even though the linear relationship between PM and the yield is not strong, the estimation of PM can depend on the yield. An important note in these comparisons between correlation and the regression analyses is that in the regression analyses there are many other variables also taken into account, and it is therefore not the dependency of one variable on the other that is investigated.

In conclusion, there seems only to be a weak association between ROA and the yield, and a lack of association between PM and the yield. Further, the profit status of the MFI's does not change the correlations significantly.

5.5 Indications and further investigations

As in almost any analysis, more data and further analysis would increase the quality of the result. Some of the variables in my regression models, e.g. the dummy variable for deposits, have been difficult to interpret and more data and an even deeper analysis of these variables would be very necessary to further understand their meaning and there influence on the profitability of MFI's.

Further, I discover many indications of a changing industry. E.g. the dummy variable for 'age' (new) is positive indicating that many of the new institutions have found ways to become more profitable than mature institutions. Outreach, in the sense of the number of active borrowers, has a negative influence on profitability, but the gross loan portfolio is positive, indicating that it is more profitable for MFI's to focus on getting a large loan portfolio and avoid splitting up these loans in small quantities to many borrowers. This result is not a positive indication for the industry since it is therefore more profitable to do lending like commercial financial institutions. Due to the different results and indications, a deeper analysis of the changing industry would be interesting. Many of the further investigations suggested here and in the the previous analysis would, however, need more data in the form of a bigger sample with sub-samples, as is done with 'for-profit' vs. 'non-profit', more variables, such as donations and lending types (individual, joint liability or mixed), and finally time series data would be necessary in order to see how these variables are changing, both for the individual MFI and as a measure for the entire industry. Time series data would also be interesting in order to investigate the life cycle of the MFI's and to follow how the importance of the traditional donor driven start up phase is possibly changing.

The relationship, or more specifically the lacking relationship, between profitability and the yield on the gross portfolio is an surprising result, and again more analysis with time series data would be interesting to see whether this result is due to the one dimensional type of data as mentioned in the beginning, or the relationship have always been weak.

6. Conclusion

The industry of microfinance has become both more crowded and more complex. Counting on donations has become more difficult and thus profitability for the individual MFI is vital in the long run. Therefore, determining the most important factors of profitability was one of my main objectives in this paper. The other main objective concerns finding the true relationship between profitability and the yield on the gross portfolio, since critics have been claiming that the new focus on profitability would simply mean a higher interest rate and fees for the borrower.

To attain the objectives I began by reviewing previous literature, studies and theory concerning the commercial banking industry, formulating it into a descriptive background study. A characterization of the industry, the innovative methods used, the market, how the industry is changing, the theory of profitability and interest rates along with some benchmarks and last two cases, showed the diversity of the industry. Despite the diversity, the background study identified the following indicator groups; outreach, financing structure, expenses, revenue, efficiency, quality of portfolio, and the peer group comparisons of deposit taking, age, legal status and profit status. These factors have shown to have an economical significance when determining profitability, and will therefore be interesting factors to investigate further in the empirical analysis to see if they also have a statistical significance.

The data in the empirical analysis was found on the MIX Market site and a basic sample of 879 MFI's was used. I processed and analyzed the data gathered to test my two profitability models with return on assets and profit margin as the dependable variables. The aim of my empirical analysis was to describe patterns in the data. Concerning the model quality, the assumption of homoscedasticity of the residuals was violated, but as various changes to the model were made in order to eliminate the effect, I chose to work with heteroscedasticity. Considering the industry of microfinance being young and changing, I believe the non-perfect models, to be the best possible ones with the data available. The two linear regression results showed many of the same significances and all with the same signs, but the parameter estimates turned out to be different.

In general, positive influencing factors on profitability consist of first the capital asset ratio, which is aligned with the theoretical view that a high capital asset ratio is better since it acts as a cushion against credit risk. Another positive effect is age (new), which could also be an indicator of the changing industry; it is no longer maturity and experience that provides profitability as in many industries. In my sample, if an MFI is new, its ROA is 0.04 (and PM is 0.12) higher than that of a mature MFI. This indicates that new MFI's entering the industry has different set of goals and operational set of skills leading to profitability. The last general positive factor is the gross loan portfolio, which aligns with theory of outreach as a positive factor of profitability.

Negative influencing factors on profitability consist of first legal status (credit union), which, however, has only a borderline significance. The interpretation of this variable is that if a MFI holds the legal status of a credit union, it has a 0.009 lower ROA, and a 0.059 PM than an MFI with rural bank as legal status. The cost per borrower also has a negative effect and the interpretation of the statistical significance aligns with the economic, since as cost go down, profitability goes up, other things being equal.

A few of the statistically significant variables do not align with theory or experience. First, the operating expense over loan portfolio ratio does not indicate the theory of good management. The positive influence of this variable could be explained by other influencing variables, time, or the faster increasing operating expenses compared to interest income in an expansion process. Second, the number of active borrowers has a negative influence on profitability, which is very unexpected, but when looking at a plot of the observations, it is clear that the relationship is not linear.

When testing the robustness of these results, I see that many of the variables stay significant in different shapes and sizes, but some variables also shift their significance. This indicates that the final profitability models are not that robust since the relationships are not all linear and perfect as they are influenced by my heterogeneous sample. However, as the industry is growing and changing, this result is expected.

The one variable that, surprisingly, is not considered an indicator of profitability is the yield on gross portfolio. This variable was significant in the final profitability model for the profit margin, but is not considered one of the true

significant variables. In order to make credit accessible to a large number of players, one must follow a financial logic, which includes covering one's cost and setting interest rates and fees accordingly. However, this theory does not turn out to be of the significant players when it comes to determining profitability. Likewise, from the correlation between the two different profitability measures and the yield, there seems only to be a weak association between ROA and the yield, and a lack of association between PM and the yield. When taking the profit status into of the individual MFI's into account, this does not change the correlations significantly. However, when diving the sample into two sub samples, 'for-profit' in one sample and 'non-profit' in the other, this does have an impact when estimating the dependable variables. The critics concerning high interest rates and high profits does not comply with my models based on the 879 MFI's in my sample at this point. And the possibility that 'for-profit' MFI's are exploiting borrowers more than 'non-profit' MFI's has likewise been rejected. However, as with the two cases in the background study and due to the heterogeneous sample, though it is not the trend, it does happen that MFI's exploit borrowers by charging a high yield at the same time as having a high profitability.

Economical and statistical significance does not match in all areas. The background study shows aspects that the data analysis cannot show, and the other way around, which is why both sides are important and bring necessary aspects to the analysis of the profitability of the MFI's and its connection to their yield.

All the factors found in the background study is economical significant when determining profitability, where some of them have also been statistically accepted, and others have not. The otherwise enticing win-win argument has not been proved present in this analysis since the number of active borrowers has a negative influence while the variable of the gross loan portfolio is positive. The hypothesis of a direct relationship between the yield and profitability has likewise not been accepted. The rapid growth in the industry is therefore not due to a clearly defined set of best practices since there are still many differences between the MFI's and their operations.

Appendix 1: Comparative analysis for 2009

	Cases		Profit status		Age		Current legal status					
	BancoSol	Compartamos	Non-profit	Profit	New	Mature	Bank	Credit Union / Cooperative	NBFI	NGO	Other	Rural Bank
Number of active borrowers	129,705	1,505,006	8,426	14,109	2,489	13,230	44,354	3,209	11,662	10,420	9,813	10,119
Average loan per borrower/GNI per capita	158.08%	4.78%	25.22%	37.64%	27.29%	30.30%	111,06%	53,71%	34,71%	16.36%	26.36%	35.83%
Gross loan portfolio	351,824,305	577,488,515	3,697,249	7,549,310	1,532,434	7,150,068	97,949,109	3,059,701	5,986,779	3,523,282	5,441,629	4,740,457
Yield on gross portfolio (real)	15.94%	64.08%	20.89%	22.05%	22.90%	20.05%	16.37%	14.92%	25.44%	22.66%	30.06%	22.91%
Profit margin	20.20%	40.55%	8.25%	8.96%	2.78%	10.17%	4.46%	8.52%	7.39%	8.25%	35.09%	14.40%

Appendix 2: variables in the downloaded file

MFI ID, MFI name, Fiscal year, period, as of date, country, current legal status, diamonds, profit status, region, regulated, age, fiscal intermediation, outreach, scale, sustainability, target market, administrative expenses/assets, assets, average deposit account balance, average deposit account balance/GNI per capital, average deposit balance per depositor, average deposit balance per depositor/GNI per capita, average loan balance per borrower, average loan balance per borrower/GNI per capita, average outstanding balance, average outstanding balance/GNI per capita, average salary/GNI per capital, borrowers per loan officer, borrowers per staff member, capital/asset ratio, cost per borrower, cost per loan, debt to equity ratio, deposits accounts per staff member, depositors per staff member, deposits, deposits to loans, deposits to total assets, financial expense/assets, financial revenue ratio, gross loan portfolio to total assets, loan loss rate, loan portfolio (gross), loans per loan officer, loans per staff member, non-earning liquid assets as a % of total assets, number of active borrowers, number of deposit accounts, number of depositors, number of loans outstanding, offices, operating expenses/assets, operating expense/loan portfolio, operating self-sufficiency, percent of women borrowers, personnel, personnel allocation ratio, personnel expense/assets, personnel expense/loan portfolio, portfolio at risk>30 days, portfolio at risk>90 days, profit margin, provision for loan impairment/assets, return on assets, return of equity, risk coverage, total expense/assets, write-off ratio, yield on gross portfolio (nominal) and yield on gross portfolio (real).

Appendix 3: the full original model

$$Y_i = \beta_0 + \beta_{NAB}X_{NABi} + \beta_{GP}X_{GPi} + \beta_{AB/G}X_{AB/Gi} + \beta_{WB}X_{WBi} + \beta_{D/E}X_{D/Ei} + \beta_{E/A}X_{E/Ai} + \beta_{GP/A}X_{GP/Ai} + \beta_{OE/A}X_{OE/Ai} + \beta_{FE/A}X_{FE/Ai} + \beta_{FR/A}X_{FR/Ai} + \beta_{YGP}X_{YGPi} + \beta_{OE/GP}X_{OE/GPi} + \beta_{CB}X_{CBi} + \beta_{BS}X_{BSi} + \beta_{WP}X_{WPi} + \beta_{PAR}X_{PARi} + \beta_{DE}D^{Deposits}{}_i + \beta_{AGE}D^{Age,\ new}{}_i + \beta_{AGE}D^{Age,\ young}{}_i + \beta_{LS}D^{Legal\ status,bank}{}_i + \beta_{LS}D^{Legal\ status,credit\ union}{}_i + \beta_{LS}D^{Legal\ status,NGO}{}_i + \beta_{LS}D^{Legal\ status,NBFI}{}_i\ \beta_{PS}D^{Profit\ Status}{}_i + \mu_I$$

$D^{Deposits}$: 1 if the institution does have deposits, 0 if not.

$D^{Age,\ new}$: 1 if the institution is new, 0 if it is not.

$D^{Age,\ young}$: 1 if the institution is young, 0 if it is not. Notice: a mature institution is the reference age.

$D^{Legal\ status,bank}$: 1 if the current legal status of the institution is bank, 0 if not.

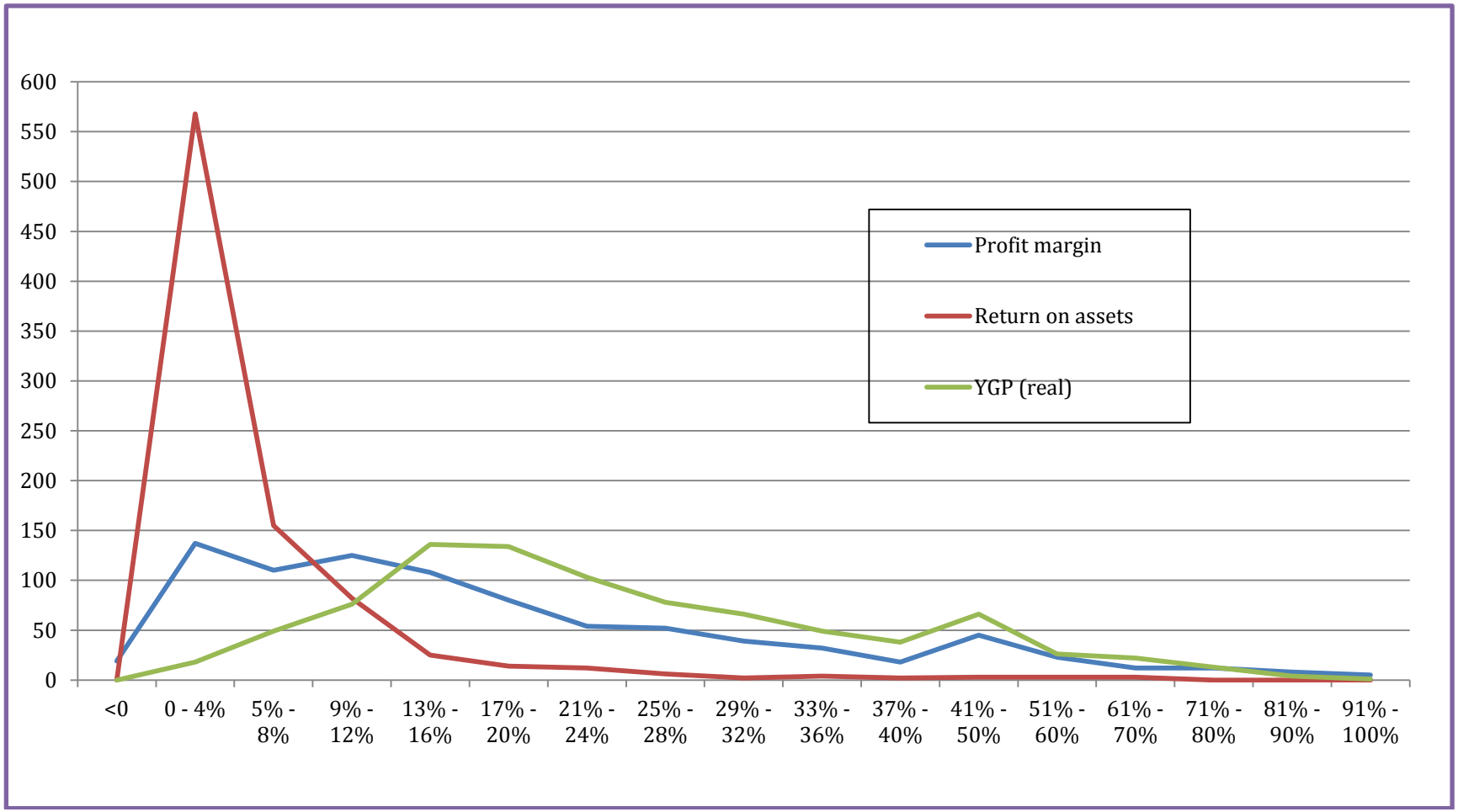
$D^{Legal\ status,credit\ union}$: 1 if the current legal status of the institution is Credit Union, 0 if not.

$D^{Legal\ status,NGO}$: 1 if the current legal status of the institution is NGO, 0 if not.

$D^{Legal\ status,NBFI}$: 1 if the current legal status of the institution is NBFI, 0 if not. Notice: an institution with the legal status of a rural bank is the reference legal status.

$D^{Profit\ Status}$: 1 if the institution has a ‘Profit’ status, 0 if it has a ‘non-profit’ status.

Appendix 4: Chart over the distribution of the sample



Appendix 5: Correlation between the variables

	Number of active borrowers	*Loan portfolio, gross*	*Average loan balance per borrower / GNI per capita*	*Debt to equity ratio*	*Capital / asset ratio*	*Gross loan portfolio to total assets*	*Operating expense/ assets*	*Financial expense/ assets*	*Financial revenue ratio*	*Yield on gross portfolio (real)*	*Operating expense/ loan portfolio*	*Cost per borrower*	*Borrowers per staff member*	*Write-off ratio*	*Portfolio at risk > 30 days*
Number of active borrowers	1.00														
Loan portfolio, gross	0.66	1.00													
Average loan balance per borrower / GNI per capita	-0.04	0.05	1.00												
Debt to equity ratio	0.00	0.00	0.01	1.00											
Capital/asset ratio	-0.07	-0.13	-0.08	-0.18	1.00										
Gross loan portfolio to total assets	0.01	0.04	-0.14	0.01	0.01	1.00									
Operating expense/ assets	-0.09	-0.13	-0.18	0.05	0.15	-0.03	1.00								
Financial expense/ assets	0.01	-0.01	-0.06	0.10	-0.45	0.20	-0.04	1.00							
Financial revenue ratio	-0.05	-0.10	-0.20	-0.08	0.12	0.19	0.75	0.23	1.00						
Yield on gross portfolio (real)	-0.06	-0.10	-0.21	-0.06	0.17	-0.09	0.72	0.03	0.82	1.00					
Operating expense/ loan portfolio	-0.08	-0.12	-0.13	0.02	0.17	-0.34	0.89	-0.13	0.55	0.67	1.00				
Cost per borrower	-0.11	0.04	0.51	0.01	0.03	-0.06	0.05	0.01	-0.04	-0.03	0.06	1.00			
Borrowers per staff member	0.32	0.23	-0.24	-0.04	-0.05	0.17	-0.14	0.02	-0.07	-0.13	-0.17	-0.45	1.00		
Write-off ratio	-0.02	0.02	-0.03	-0.03	0.09	-0.14	0.27	-0.03	0.18	0.25	0.31	0.09	-0.12	1.00	
Portfolio at risk > 30 days	-0.04	-0.01	0.08	-0.02	0.02	-0.14	0.01	-0.01	-0.06	-0.03	0.04	0.12	-0.16	0.22	1.00

Appendix 6: The final ROA model

Linear Regression Results 12:32 Thursday, June 9, 2011 **1**

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets

Number of Observations Read	878
Number of Observations Used	878

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	9	1.76557	0.19617	58.50	<.0001
Error	868	2.91093	0.00335		
Corrected Total	877	4.67650			

Root MSE	0.05791	**R-Square**	0.3775
Dependent Mean	0.05308	**Adj R-Sq**	0.3711
Coeff Var	109.11002		

Parameter Estimates									
							Heteroscedasticity Consistent		
Variable	**Label**	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	Intercept	1	-0.08404	0.02647	-3.18	0.0015	0.04135	-2.03	0.0424
Capital/asset ratio		1	0.02512	0.00950	2.64	0.0084	0.01160	2.17	0.0306
Gross loan portfolio to total as	Gross loan portfolio to total assets	1	0.06690	0.01331	5.03	<.0001	0.01545	4.33	<.0001
Operating expense/ loan portfoli	Operating expense/ loan portfolio	1	0.26699	0.01842	14.49	<.0001	0.03706	7.20	<.0001
Ddeposits		1	-0.01045	0.00459	-2.28	0.0229	0.00431	-2.42	0.0156
Dage,new		1	0.03642	0.00711	5.12	<.0001	0.01283	2.84	0.0046
Dlegal status,credit union		1	-0.00838	0.00648	-1.29	0.1961	0.00411	-2.04	0.0418
log_nab		1	-0.03264	0.00552	-5.92	<.0001	0.00755	-4.32	<.0001
log_glp		1	0.03067	0.00545	5.63	<.0001	0.00782	3.92	<.0001
log_cpb		1	-0.03441	0.00532	-6.47	<.0001	0.00725	-4.75	<.0001

Generated by the SAS System ('Local', XP_PRO) on June 09, 2011 at 02:08:07 PM

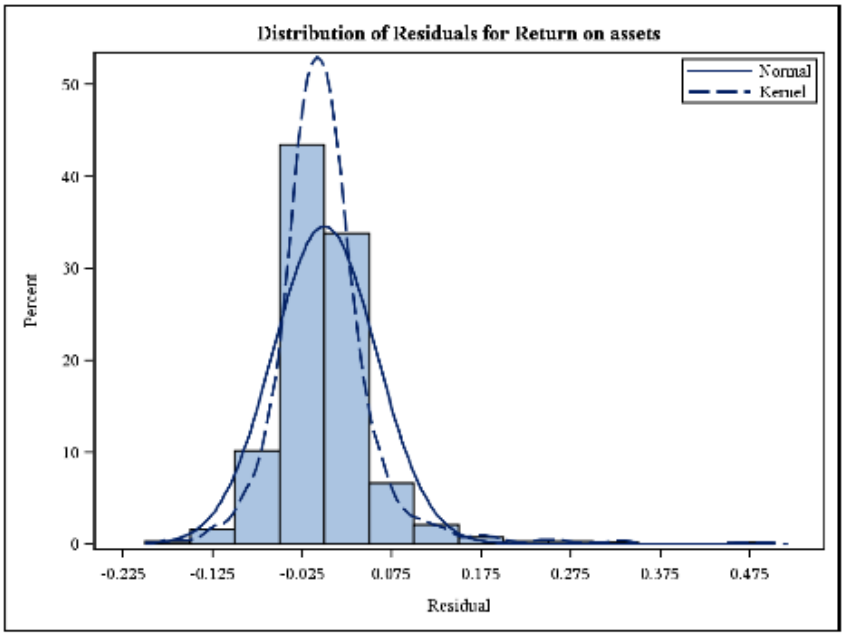
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets

Heteroscedasticity Consistent Covariance of Estimates					
Variable	**Label**	**Dlegal status,credit union**	**log_nab**	**log_glp**	**log_cpb**
Intercept	Intercept	-0.000024606	0.0001845617	-0.000233717	0.0001461783
Capital/asset ratio		0.0000121284	5.1217281E-6	1.7632528E-6	6.2768432E-7
Gross loan portfolio to total as	Gross loan portfolio to total assets	1.845317E-6	1.0736335E-6	-3.21119E-6	-1.103365E-6
Operating expense/ loan portfoli	Operating expense/ loan portfolio	-6.051103E-6	-0.000249664	0.0002608345	-0.000235165
Ddeposits		-4.374883E-6	1.1064768E-6	-2.234078E-6	1.5976605E-6
Dage,new		3.5785247E-6	3.4990273E-6	-5.649698E-6	-2.336145E-6
Dlegal status,credit union		0.0000168835	7.2546037E-6	-4.423482E-6	4.6669159E-6
log_nab		7.2546037E-6	0.0000570516	-0.000057799	0.0000527008
log_glp		-4.423482E-6	-0.000057799	0.0000611596	-0.000052759
log_cpb		4.6669159E-6	0.0000527008	-0.000052759	0.0000525419

Test of First and Second Moment Specification		
DF	**Chi-Square**	**Pr > ChiSq**
51	113.75	<.0001

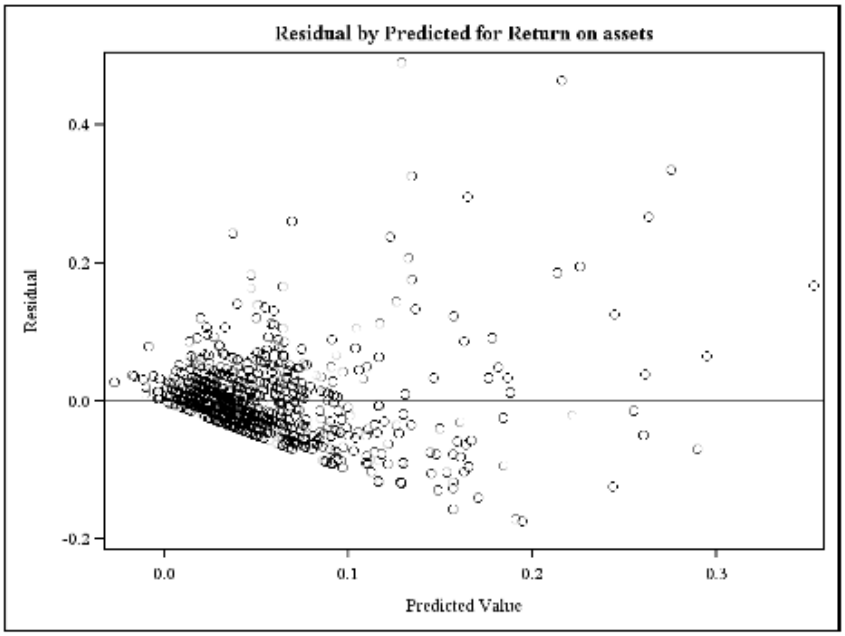
Generated by the SAS System ('Local', XP_PRO) on June 09, 2011 at 02:08:07 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



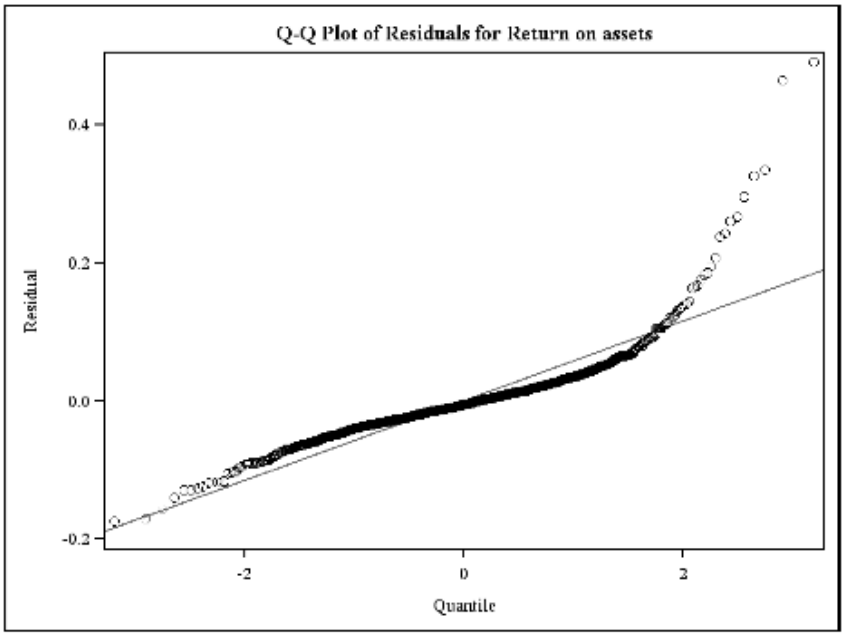
Generated by the SAS System ('Local', XP_PRO) on June 09, 2011 at 02:08:07 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



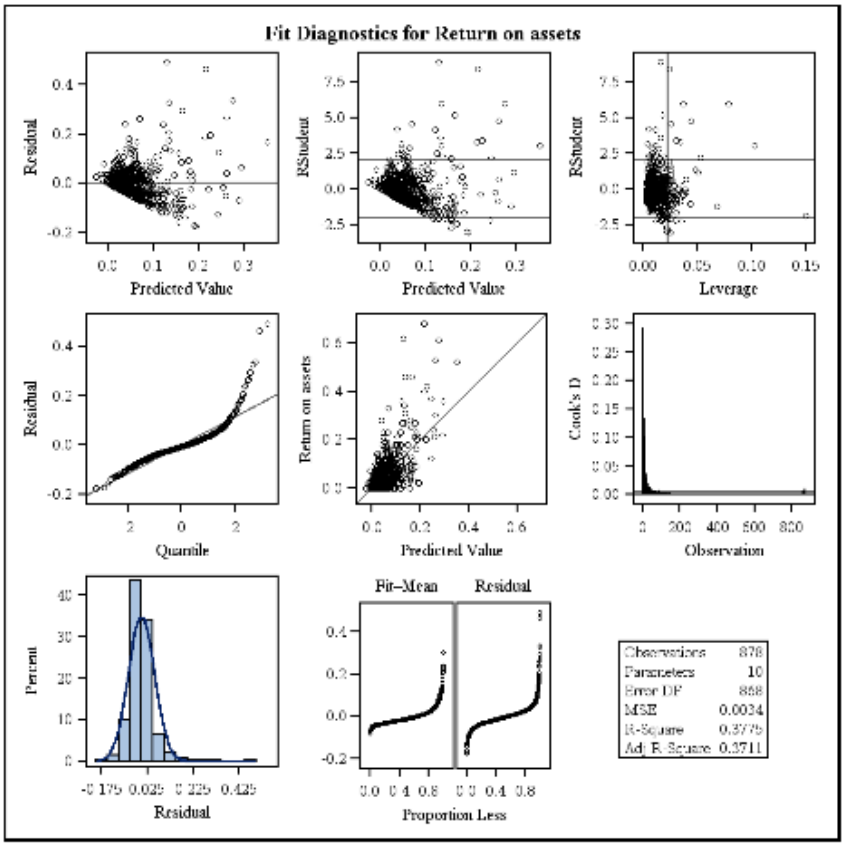
Generated by the SAS System ('Local', XP_PRO) on June 09, 2011 at 02:08:07 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



Generated by the SAS System ('Local', XP_PRO) on June 09, 2011 at 02:08:07 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



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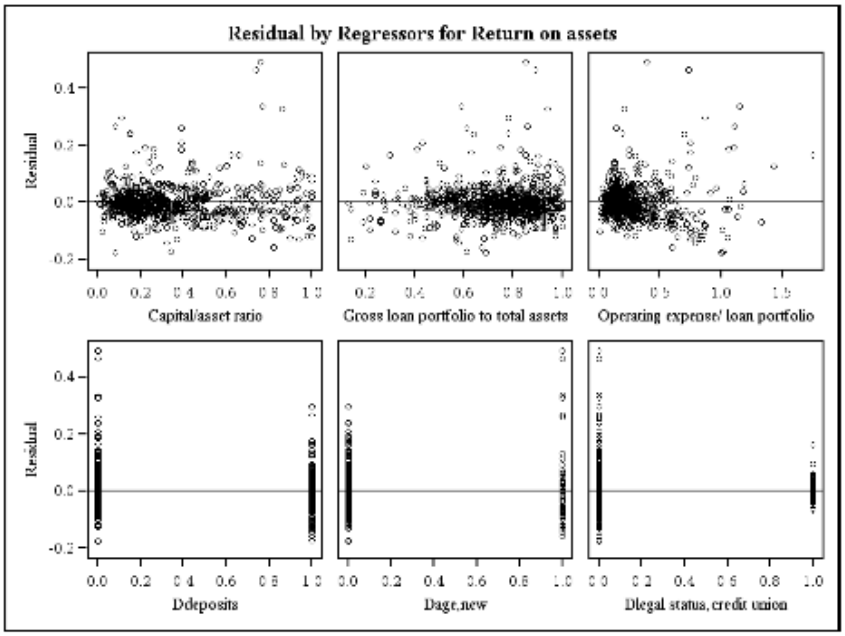
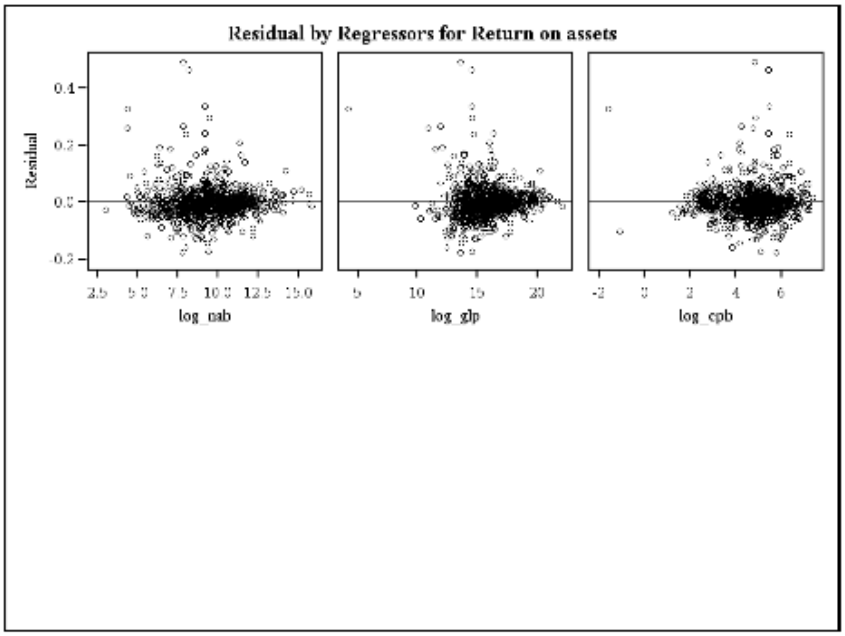
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



Generated by the SAS System ('Local', XP_PRO) on June 09, 2011 at 02:08:07 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



Generated by the SAS System ('Local', XP_PRO) on June 09, 2011 at 02:08:07 PM

Appendix 7: The final PM model

Linear Regression Results 15:50 Thursday, June 9, 2011 **1**

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin

Number of Observations Read	860
Number of Observations Used	860

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	8	5.02418	0.62802	23.23	<.0001
Error	851	23.00998	0.02704		
Corrected Total	859	28.03415			

Root MSE	0.16443	**R-Square**	0.1792
Dependent Mean	0.19853	**Adj R-Sq**	0.1715
Coeff Var	82.82405		

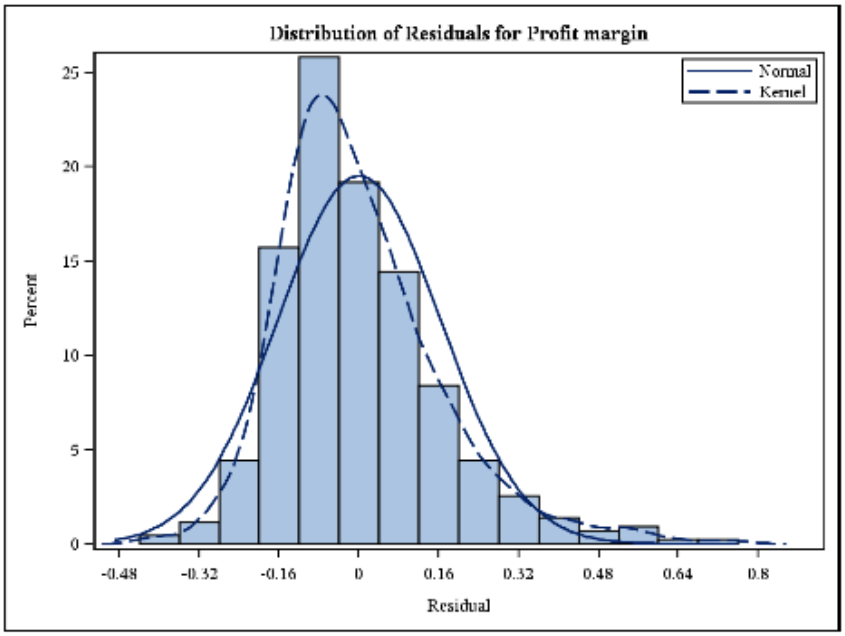
Parameter Estimates									
							Heteroscedasticity Consistent		
Variable	**Label**	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	Intercept	1	0.02528	0.07239	0.35	0.7270	0.08069	0.31	0.7541
Capital/asset ratio		1	0.15916	0.02677	5.94	<.0001	0.03338	4.77	<.0001
Operating expense/ loan portfoli	Operating expense/ loan portfolio	1	0.48421	0.06618	7.32	<.0001	0.08851	5.47	<.0001
Dage,new		1	0.11998	0.02087	5.75	<.0001	0.03194	3.76	0.0002
Dlegal status,credit union		1	-0.05852	0.01771	-3.31	0.0010	0.01628	-3.59	0.0003
log_nab		1	-0.09905	0.01784	-5.55	<.0001	0.02196	-4.51	<.0001
log_glb		1	0.09298	0.01753	5.30	<.0001	0.02142	4.34	<.0001
log_cpb		1	-0.10050	0.01744	-5.76	<.0001	0.02104	-4.78	<.0001
Yield on gross portfolio (real)		1	-0.24422	0.05593	-4.37	<.0001	0.07833	-3.12	0.0019

Generated by the SAS System ('Local', XP_PRO) on June 09, 2011 at 04:34:59 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin

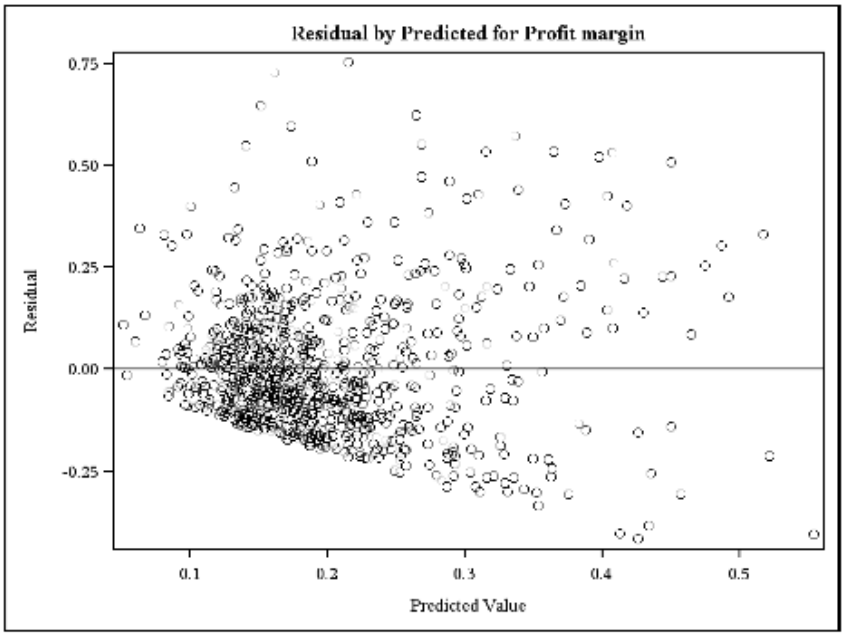
Test of First and Second Moment Specification		
DF	Chi-Square	Pr > ChiSq
42	100.86	<.0001

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



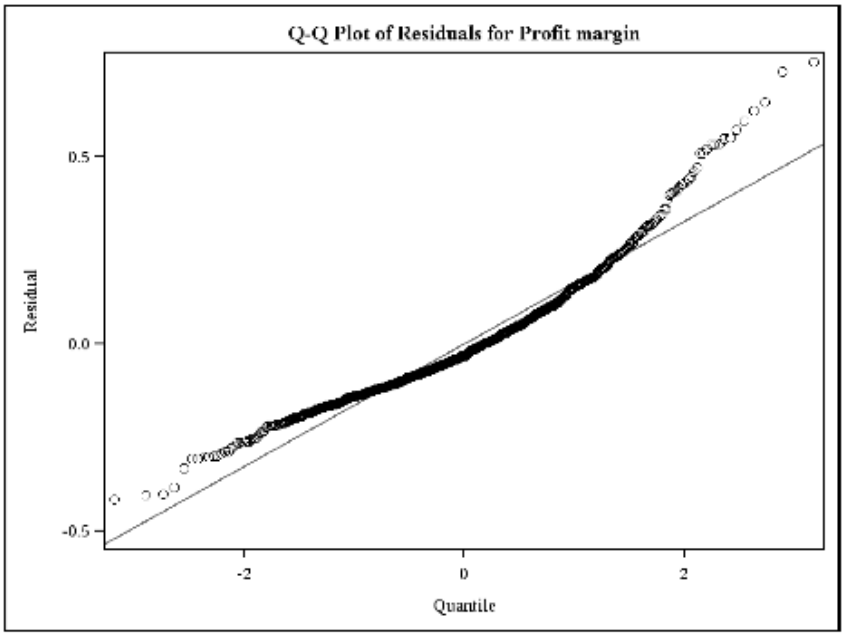
Generated by the SAS System ('Local', XP_PRO) on June 09, 2011 at 04:34:59 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



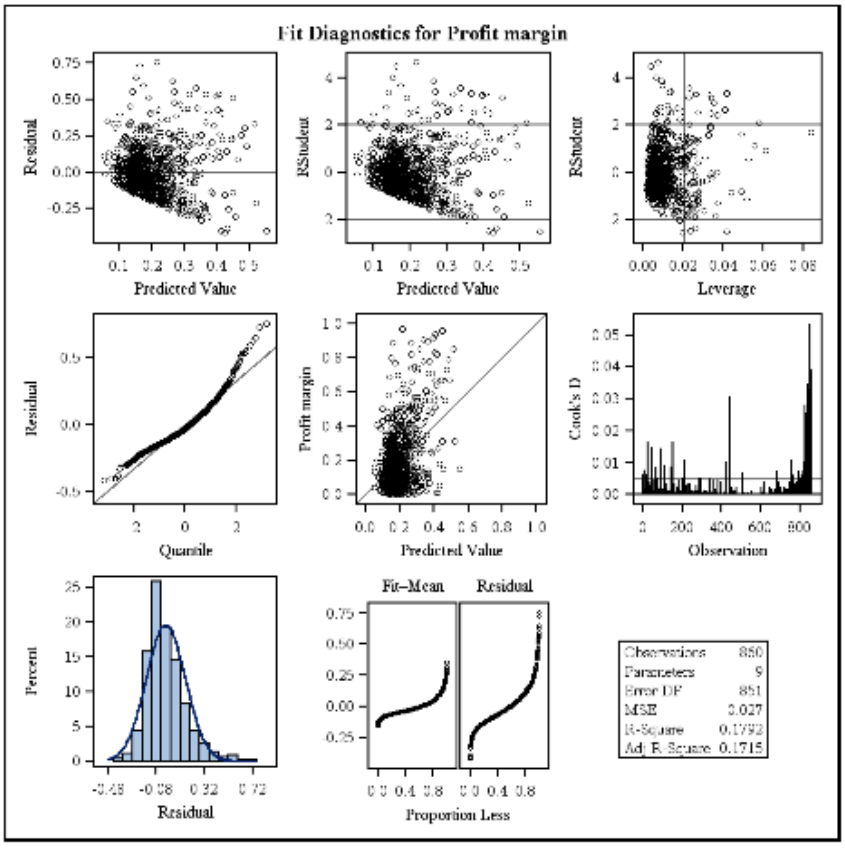
Generated by the SAS System ('Local', XP_PRO) on June 09, 2011 at 04:34:59 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



Generated by the SAS System ('Local', XP_PRO) on June 09, 2011 at 04:34:59 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



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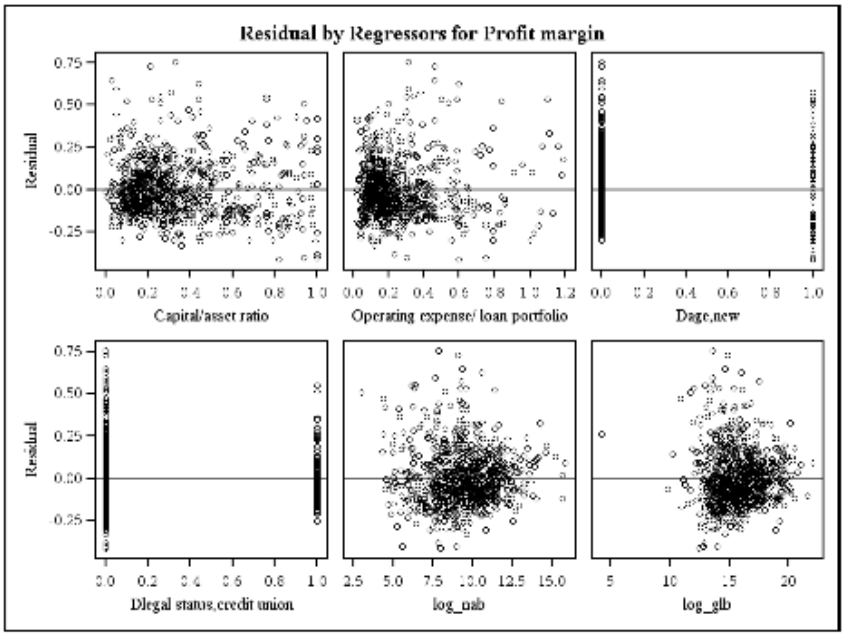
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



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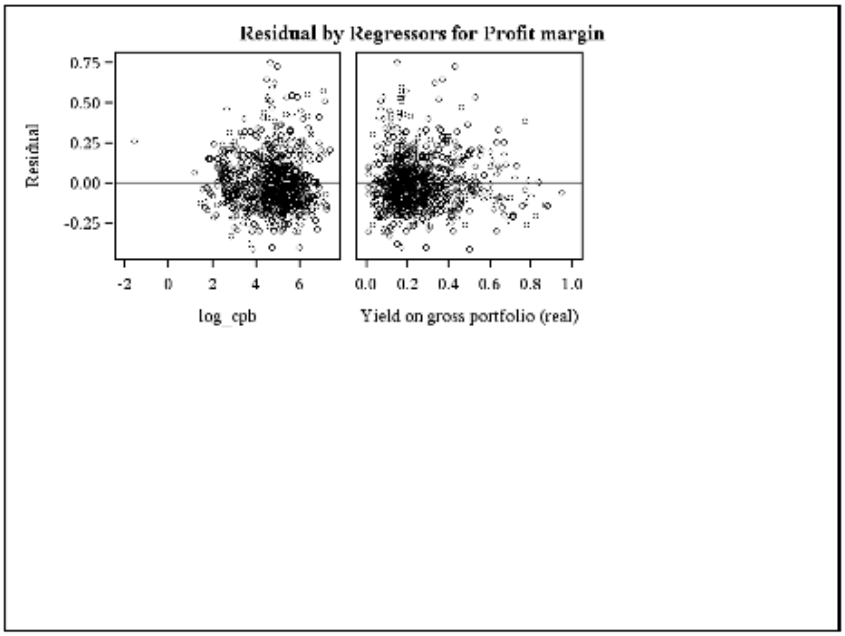
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



Generated by the SAS System ('Local', XP_PRO) on June 09, 2011 at 04:34:59 PM

Appendix 8: The ROA robustness regression

Linear Regression Results 16:35 Friday, August 5, 2011 **1**

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets

Number of Observations Read	647
Number of Observations Used	638
Number of Observations with Missing Values	9

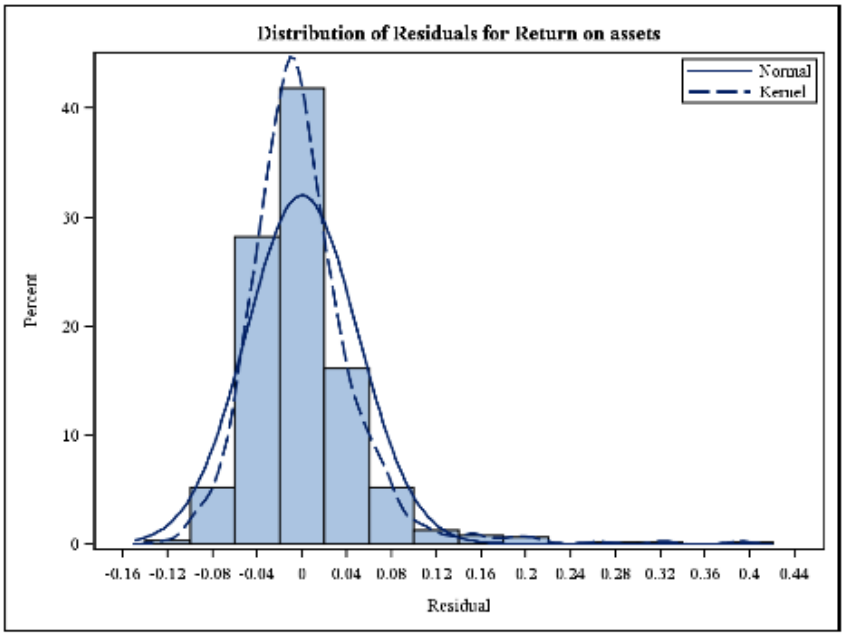
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	9	1.14470	0.12719	50.57	<.0001
Error	628	1.57947	0.00252		
Corrected Total	637	2.72418			

Root MSE	0.05015	R-Square	0.4202
Dependent Mean	0.04918	Adj R-Sq	0.4119
Coeff Var	101.96333		

Parameter Estimates								
						Heteroscedasticity Consistent		
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standard Error	t Value	Pr > |t|
Intercept	1	-0.06915	0.02649	-2.61	0.0093	0.03148	-2.20	0.0284
Capital/asset ratio	1	0.05837	0.01162	5.02	<.0001	0.01619	3.60	0.0003
Operating expense/ assets	1	0.56655	0.03782	14.98	<.0001	0.09999	5.67	<.0001
Financial expense/ assets	1	0.34427	0.07568	4.55	<.0001	0.11230	3.07	0.0023
Financial revenue ratio	1	-0.32139	0.03067	-10.48	<.0001	0.08554	-3.76	0.0002
Write-off ratio	1	0.20091	0.04464	4.50	<.0001	0.07299	2.75	0.0061
Ddeposits	1	-0.01389	0.00448	-3.10	0.0020	0.00445	-3.12	0.0019
log_nab	1	-0.01890	0.00570	-3.32	0.0010	0.00785	-2.41	0.0164
log_glp	1	0.02301	0.00559	4.12	<.0001	0.00791	2.91	0.0037
log_cpb	1	-0.02513	0.00575	-4.37	<.0001	0.00798	-3.15	0.0017

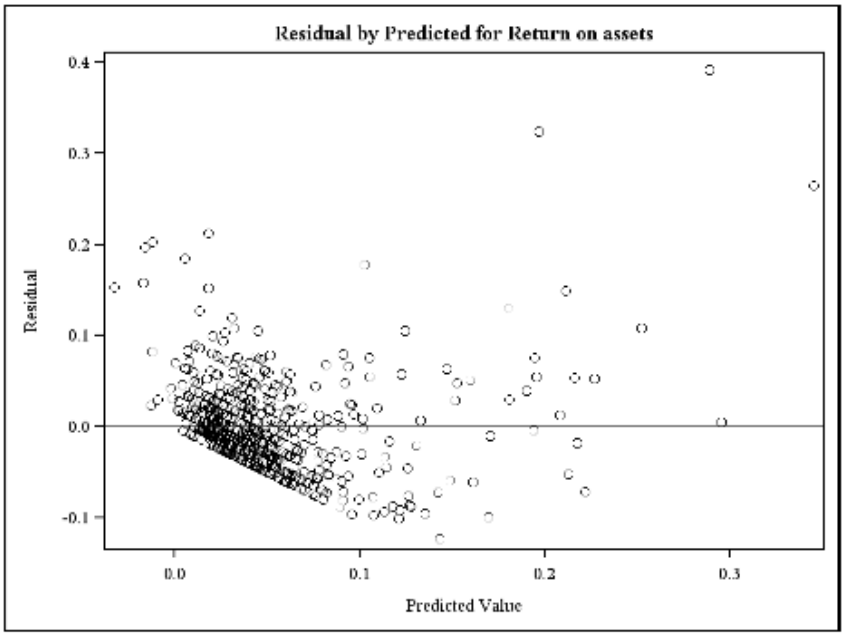
Generated by the SAS System ('Local', XP_PRO) on August 05, 2011 at 05:23:30 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



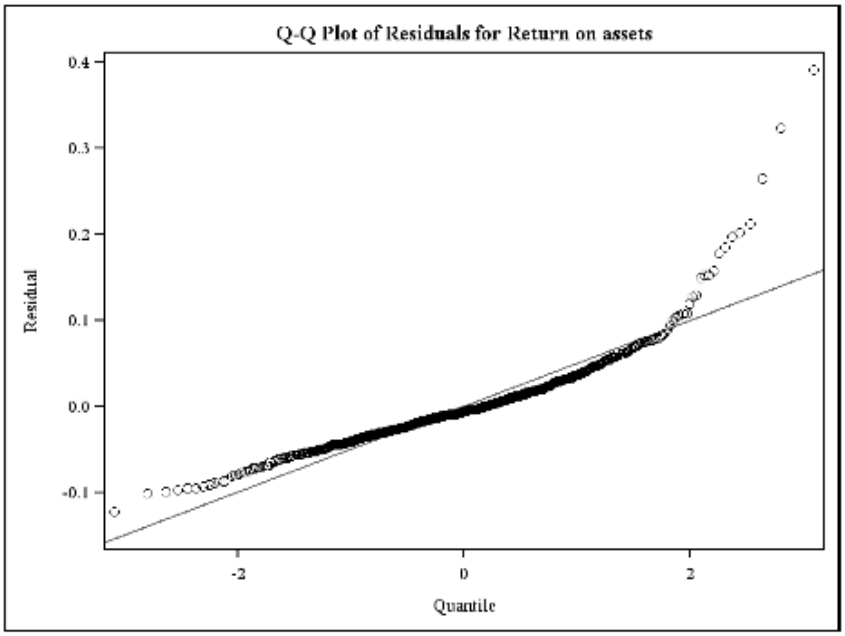
Generated by the SAS System ('Local', XP_PRO) on August 05, 2011 at 05:23:30 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



Generated by the SAS System ('Local', XP_PRO) on August 05, 2011 at 05:23:30 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



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Appendix 9: ROA for-profit regression

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets

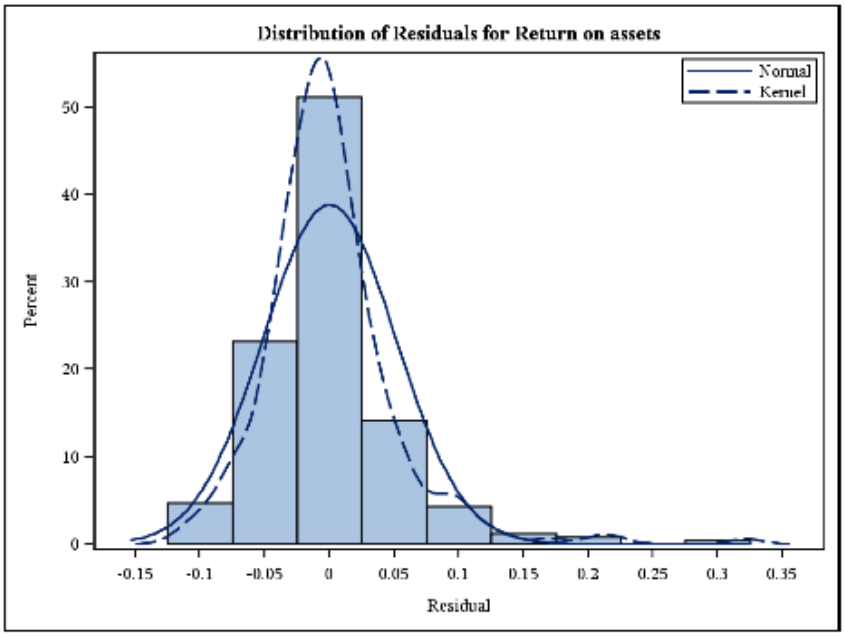
Number of Observations Read	261
Number of Observations Used	254
Number of Observations with Missing Values	7

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	0.73799	0.10543	38.89	<.0001
Error	246	0.66681	0.00271		
Corrected Total	253	1.40480			

Root MSE	0.05206	R-Square	0.5253
Dependent Mean	0.04618	Adj R-Sq	0.5118
Coeff Var	112.73765		

Parameter Estimates								
						Heteroscedasticity Consistent		
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standard Error	t Value	Pr > |t|
Intercept	1	-0.04480	0.04099	-1.09	0.2754	0.03859	-1.16	0.2468
Operating expense/ assets	1	0.69731	0.05805	12.01	<.0001	0.14570	4.79	<.0001
Financial revenue ratio	1	-0.41308	0.03998	-10.33	<.0001	0.10777	-3.83	0.0002
Write-off ratio	1	0.43789	0.09902	4.42	<.0001	0.20121	2.18	0.0305
Ddeposits	1	-0.02575	0.00748	-3.44	0.0007	0.00849	-3.03	0.0027
log_nab	1	-0.02722	0.00996	-2.73	0.0067	0.01369	-1.99	0.0479
log_glp	1	0.03162	0.00956	3.31	0.0011	0.01306	2.42	0.0162
log_cpb	1	-0.03425	0.00965	-3.55	0.0005	0.01419	-2.41	0.0165

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



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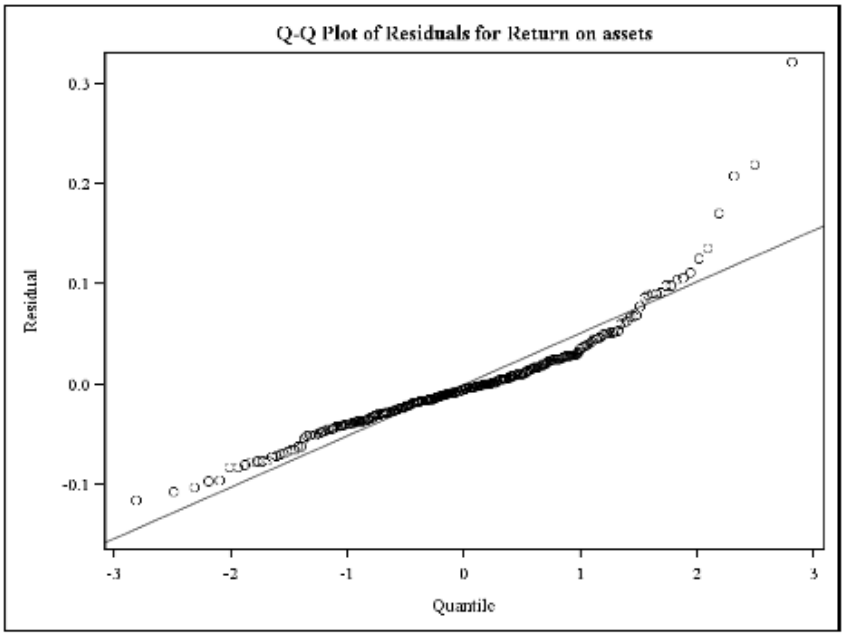
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



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Appendix 10: ROA non-profit regression

Linear Regression Results 16:35 Friday, August 5, 2011 **1**

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets

Number of Observations Read	386
Number of Observations Used	386

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	9	0.55381	0.06153	30.31	<.0001
Error	376	0.76327	0.00203		
Corrected Total	385	1.31708			

Root MSE	0.04506	**R-Square**	0.4205
Dependent Mean	0.05127	**Adj R-Sq**	0.4066
Coeff Var	87.87919		

Parameter Estimates									
							Heteroscedasticity Consistent		
Variable	**Label**	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	Intercept	1	-0.09042	0.03461	-2.61	0.0094	0.03435	-2.63	0.0088
Capital/asset ratio		1	0.03084	0.01098	2.81	0.0052	0.01209	2.55	0.0112
Gross loan portfolio to total as	Gross loan portfolio to total assets	1	0.05746	0.01704	3.37	0.0008	0.01632	3.52	0.0005
Yield on gross portfolio (real)		1	-0.10422	0.02629	-3.96	<.0001	0.03244	-3.21	0.0014
Operating expense/ loan portfoli	Operating expense/ loan portfolio	1	0.28648	0.02433	11.78	<.0001	0.04095	7.00	<.0001
Ddeposits		1	-0.02009	0.00508	-3.95	<.0001	0.00471	-4.27	<.0001
Dlegal status,NBFI		1	0.01759	0.00677	2.60	0.0098	0.00680	2.59	0.0101
log_nab		1	-0.02191	0.00787	-2.78	0.0057	0.00893	-2.45	0.0146
log_glp		1	0.02413	0.00772	3.12	0.0019	0.00893	2.70	0.0072
log_cpb		1	-0.02673	0.00805	-3.32	0.0010	0.00913	-2.93	0.0036

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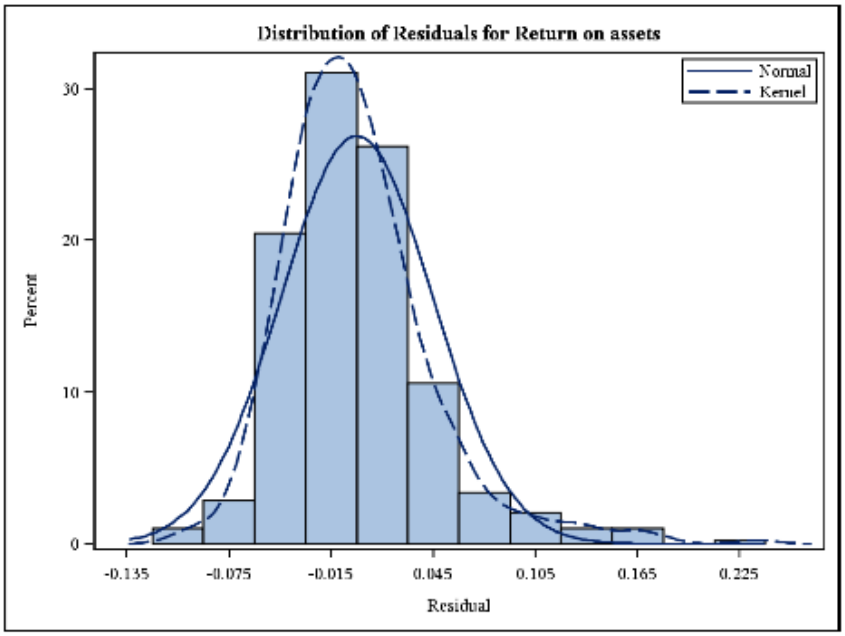
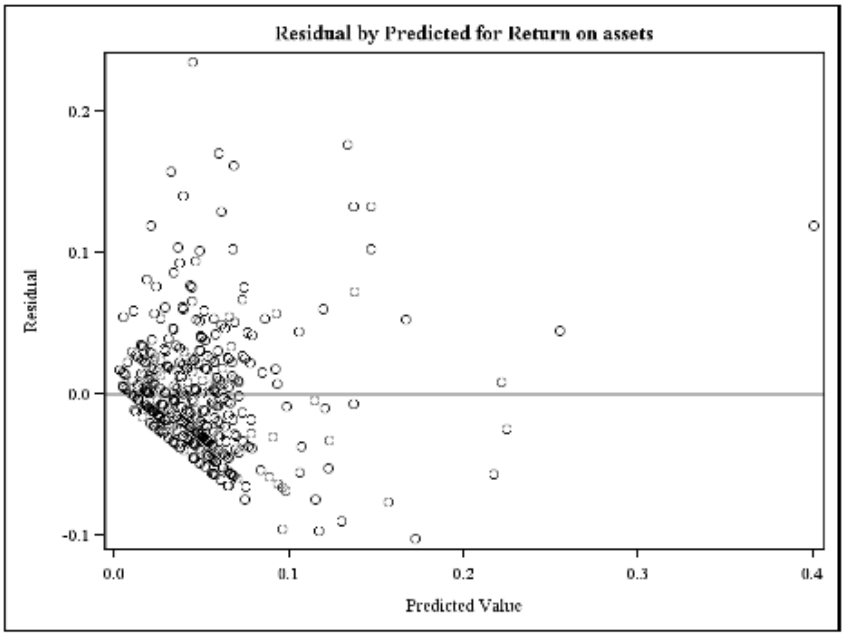
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



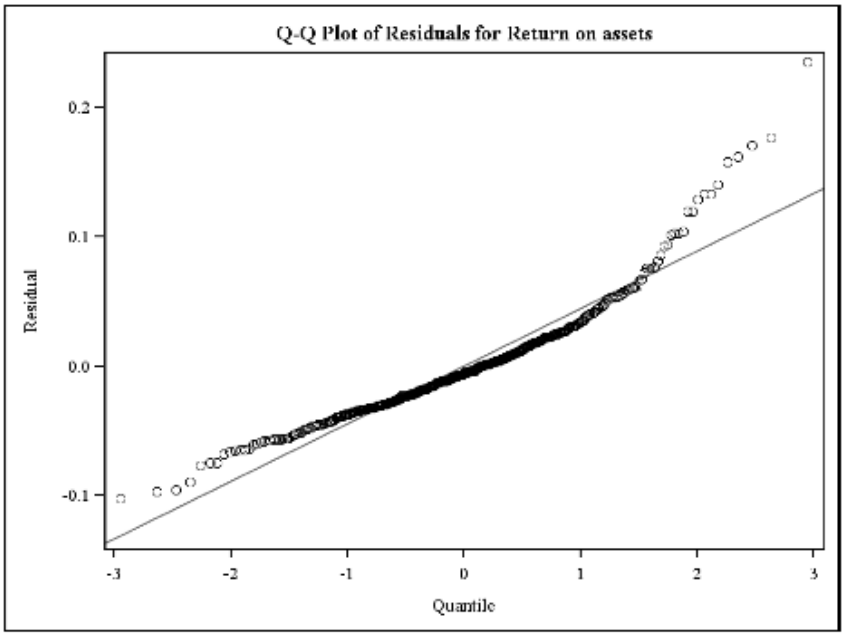
Generated by the SAS System ('Local', XP_PRO) on August 05, 2011 at 05:42:26 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



Generated by the SAS System ('Local', XP_PRO) on August 05, 2011 at 05:42:26 PM

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Return on assets



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Appendix 11: PM robustness regression

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin

Number of Observations Read	637
Number of Observations Used	628
Number of Observations with Missing Values	9

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	13	3.89327	0.29948	12.56	<.0001
Error	614	14.64436	0.02385		
Corrected Total	627	18.53762			

Root MSE	0.15444	R-Square	0.2100
Dependent Mean	0.18721	Adj R-Sq	0.1933
Coeff Var	82.49243		

Parameter Estimates									
							Heteroscedasticity Consistent		
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	0.23319	0.10126	2.30	0.0216	0.11384	2.05	0.0409
Capital/asset ratio		1	0.09758	0.03217	3.03	0.0025	0.04277	2.28	0.0228
Financial revenue ratio		1	-0.37453	0.07532	-4.97	<.0001	0.11315	-3.31	0.0010
Operating expense/ loan portfoli	Operating expense/ loan portfolio	1	0.49351	0.08002	6.17	<.0001	0.09917	4.98	<.0001
Cost per borrower		1	0.00017372	0.00005387	3.22	0.0013	0.00006307	2.75	0.0061
Write-off ratio		1	0.68043	0.16378	4.15	<.0001	0.20917	3.25	0.0012
Ddeposits		1	-0.04405	0.01525	-2.89	0.0040	0.01568	-2.81	0.0051
Dage,new		1	0.09967	0.02722	3.66	0.0003	0.03945	2.53	0.0118
Dlegal status,credit union		1	-0.07276	0.02900	-2.51	0.0124	0.02429	-3.00	0.0028
Dlegal status,NGO		1	-0.05045	0.02301	-2.19	0.0287	0.02361	-2.14	0.0330

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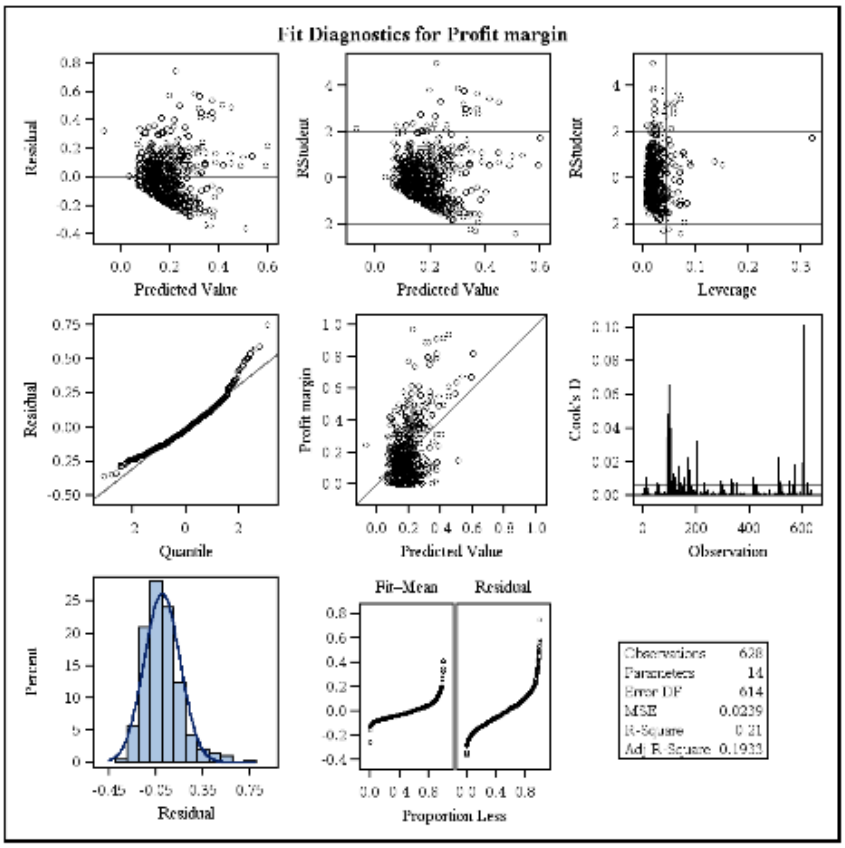
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



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Appendix 12: PM for-profit regression

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin

Number of Observations Read	256
Number of Observations Used	249
Number of Observations with Missing Values	7

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	1.50348	0.21478	9.11	<.0001
Error	241	5.68066	0.02357		
Corrected Total	248	7.18414			

Root MSE	0.15353	R-Square	0.2093
Dependent Mean	0.18225	Adj R-Sq	0.1863
Coeff Var	84.24143		

Parameter Estimates								
						Heteroscedasticity Consistent		
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standard Error	t Value	Pr > |t|
Intercept	1	0.17308	0.12247	1.41	0.1589	0.13012	1.33	0.1847
Operating expense/ assets	1	0.70028	0.20910	3.35	0.0009	0.24305	2.88	0.0043
Financial revenue ratio	1	-0.54779	0.14880	-3.68	0.0003	0.21910	-2.50	0.0131
Write-off ratio	1	0.94492	0.31343	3.01	0.0028	0.42626	2.22	0.0276
Dage,new	1	0.16447	0.03180	5.17	<.0001	0.05083	3.24	0.0014
log_nab	1	-0.06257	0.02938	-2.13	0.0342	0.03114	-2.01	0.0456
log_glb	1	0.06040	0.02869	2.11	0.0363	0.02915	2.07	0.0393
log_cpb	1	-0.07750	0.02891	-2.68	0.0079	0.02904	-2.67	0.0081

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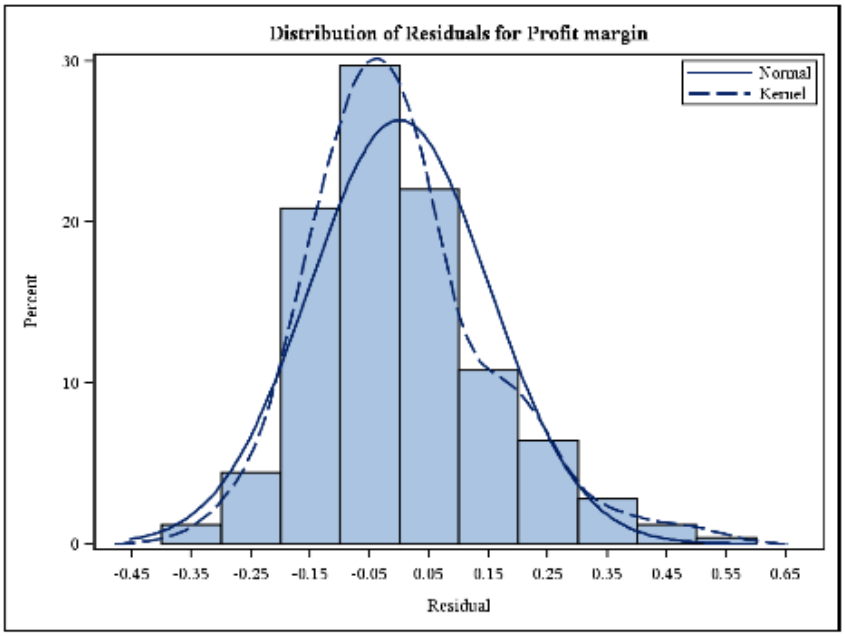
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



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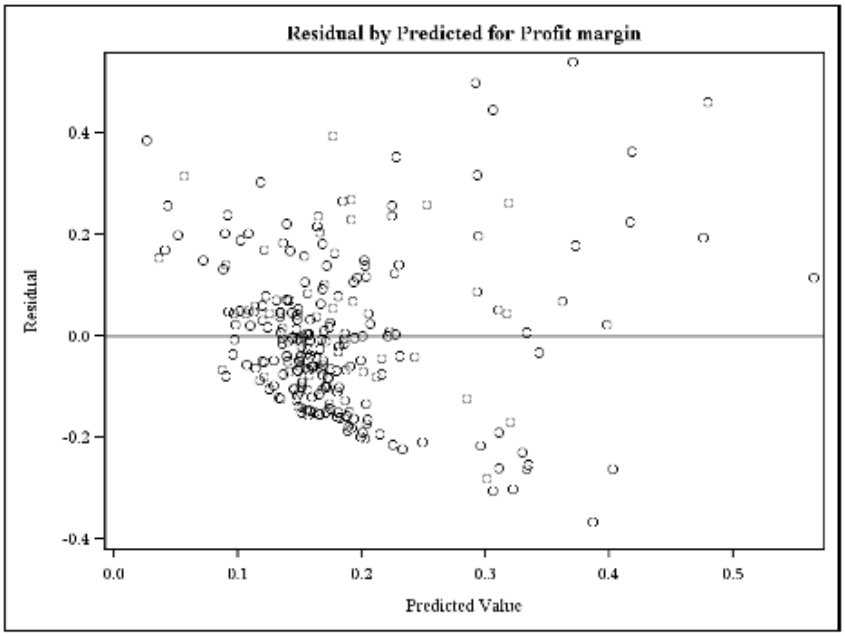
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



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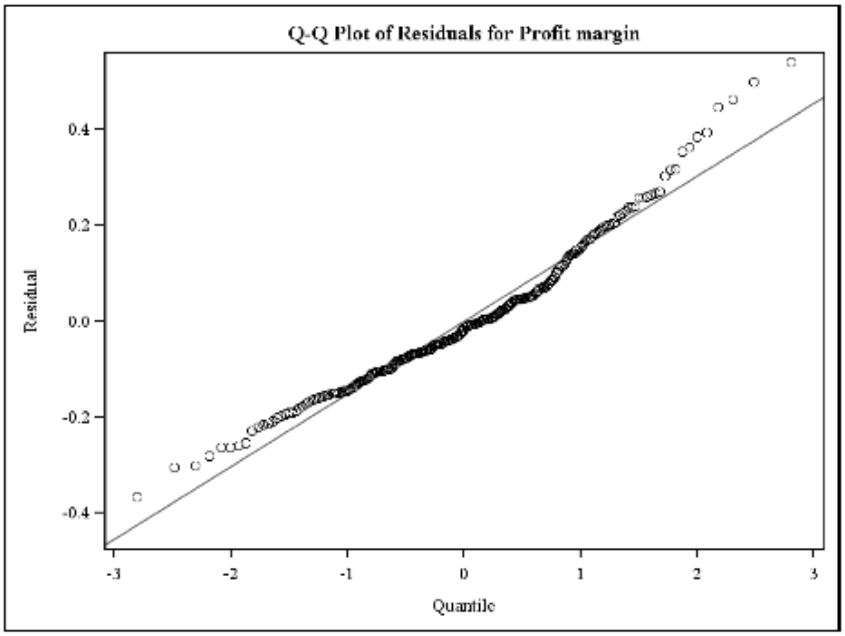
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



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Appendix 13: PM non-profit regression

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin

Number of Observations Read	381
Number of Observations Used	379
Number of Observations with Missing Values	2

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	2.08600	0.26075	10.42	<.0001
Error	370	9.25732	0.02502		
Corrected Total	378	11.34331			

Root MSE	0.15818	R-Square	0.1839
Dependent Mean	0.19047	Adj R-Sq	0.1663
Coeff Var	83.04317		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	0.11637	0.12337	0.94	0.3462
Capital/asset ratio		1	0.09955	0.03839	2.59	0.0099
Financial revenue ratio		1	-0.42235	0.10338	-4.09	<.0001
Operating expense/ loan portfoli	Operating expense/ loan portfolio	1	0.58913	0.10595	5.56	<.0001
Write-off ratio		1	0.64832	0.19988	3.24	0.0013
Ddeposits		1	-0.07128	0.01789	-3.98	<.0001
log_nab		1	-0.08671	0.02796	-3.10	0.0021
log_glb		1	0.08715	0.02786	3.13	0.0019
log_cpb		1	-0.11391	0.02855	-3.99	<.0001

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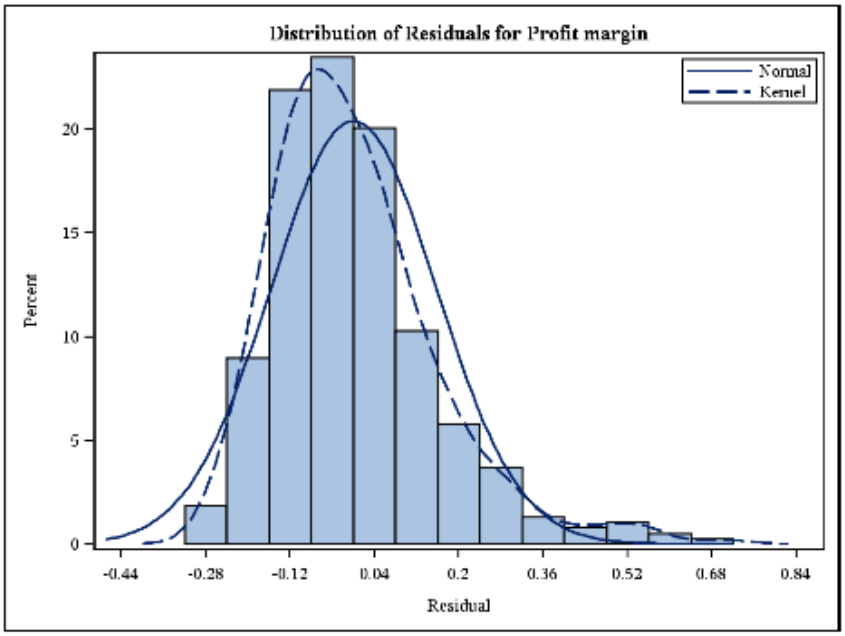
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin

Test of First and Second Moment Specification		
DF	Chi-Square	Pr > ChiSq
43	58.11	0.0618

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



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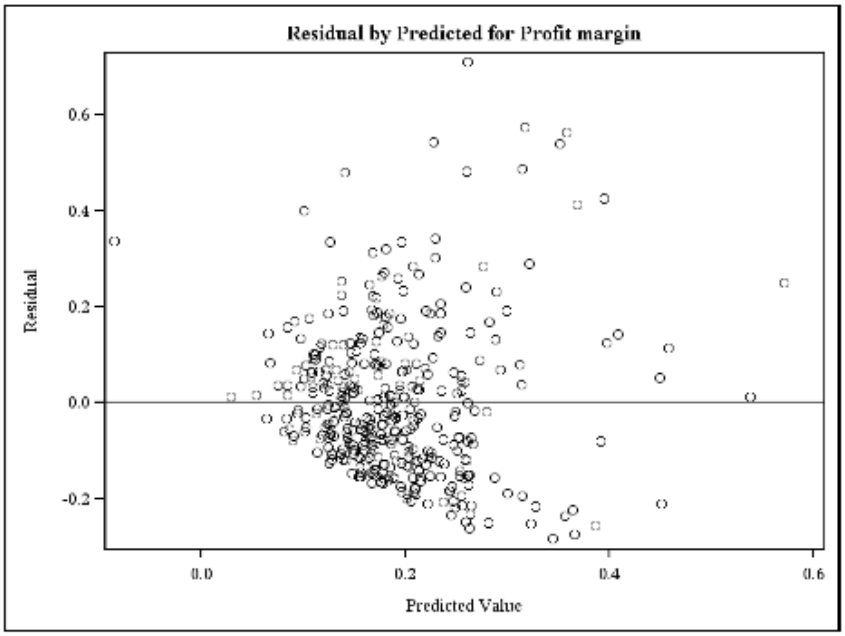
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



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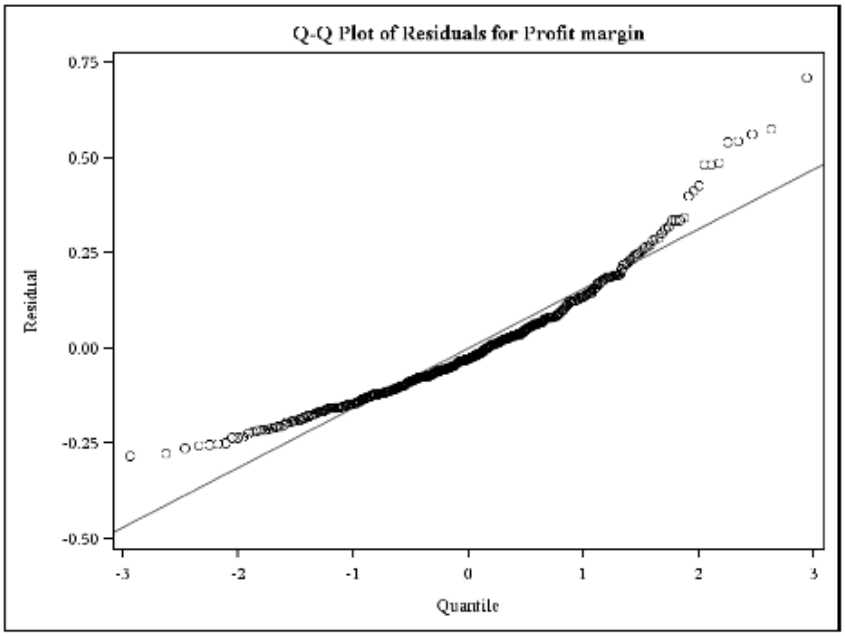
The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: Profit margin



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