

CREDIT RISK MANAGEMENT IN MICROFINANCE: THE CONCEPTUAL FRAMEWORK

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***Abstract.** Microfinance gained tremendous attention and became a buzz-word in policy-makers as well academic researchers mainly when Muhammad Yunus, the founder of Microcredit, received the Nobel Prize for Peace in 2006. This field attracted a considerable interest in the financial world and Microfinance institution sustainability problem was one of the main topics that has been hotly debated. In this paper, we traced developments in the credit risk management in microfinance institutions. We also discussed the interaction of judgemental and statistical forecasting methods as screening mechanism in the process of selecting individual microfinance borrowers.*

Keywords: Microfinance institutions, Default, Credit Risk Management.

Code JEL: G11, G21

Introduction

It is widely recognized that the exclusion of the poorest lenders, particularly in the rural areas, from the tradition financial banking system is one of the main obstacles for sustainable development and poverty reduction. Indeed, it is almost impossible for rural poor people who live in riskier environments and who lack assets collateral, formal wage job and limited credit history loans to obtain credit from traditional banking system because lending to them became very risky and very costly. There is little controversy in the literature about the fact that formal financial sector has little incentives to provide financial services to poor clients. Generally and according to economic theory, the exclusion of poor people from traditional bank can be explained by the high level of asymmetric information such as adverse selection and moral hazard, which raises problems of screening, monitoring and enforcement.

Excluded from formal financial institutions, poor people generally have to rely on loans from informal moneylenders, who are more likely to exploit the poor by providing loans on enormously high interest rates. To make the world a better place and to enhance international development, the United Nations Organization (UNO) announced in 2000 the millennium development goals, aimed to reduce poverty by half by the year 2015. In this regard, microfinance has recently attracted growing attention and has proven worldwide to be a promising tool to alleviate poverty. These Microfinance institutions (MFIs) have the function of

providing financial services to the low-income households who have long been deemed ‘unbankable’, including the self-employed and customers without collateral assets. Dedicated to improving the lot of the poor in developing countries, MFIs provide to them the much needed credit loans of small amount to finance their entrepreneurship projects, to finance their consumption, to cope to illness or for the education of their children without any collateral requirement.

It has been proven that microfinance programs have a great contribution in reducing poverty. More importantly, it has been proven that Microfinance can be viewed as a development strategy tool by enabling poor entrepreneurs to initiate their own business, teaching them how to protect the capital they have, to deal with risk, and to expand the circle of their economic activities. Availability of a microcredit schemes increases the number of small enterprises, which in turn creates employment opportunities for the poorest and stimulates therefore economic development and social inclusion.

Apart from their social mission success, MFIs have appeared to be a potentially viable and profitable business and have unregistered a well-known success of some third-world programs in generating impressive repayment rates.¹ Achieving self-sustainability means that the MFI should be self-sufficient, be able to cover all its present costs and make profits on services that they offer. In order to become a permanent and maximize their sustainability, MFIs must apply high interest rate, largely higher than market rates. This can be at expense of social aims, because high interest rate can exclude poor people particularly those living in rural or marginal areas. These dual objectives in serving poor clients with relatively small loans and achieving self-sustainability even profit represent one of the most widely discussed dilemmas among microfinance academics and practitioners. To face such a dilemma, it is vital for MFI’ stability to find the best practice, improve the efficiency of their portfolio risk management as well as apply accurate pricing policy, which allow for finding a better equilibrium between sustainability and outreach.

The recent instabilities in the financial sector related to subprime mortgage lending crisis in U.S provides an example of the dangers in providing an increasing array of higher-risk loans to higher-risk borrowers. The rapidly growing supply of funds for micro-loans, the increasing competition in microcredit markets, the increasing over-indebtedness among micro-entrepreneurs and the current financial crisis increase the credit risk and therefore lead to a growing need to estimate the risk of failure of microfinance borrowers. In order to improve both social outreach and financial sustainability in an increasingly constrained environment, developing powerful credit risk management tools in MFI becomes more than ever crucial.

The objective of this paper is to trace developments in the credit risk management in microfinance institutions. It is essentially divided into two sections. In the first one, we summarize the imperfection of credit markets cited as main barriers preventing formal financial markets to provide credit to the poor borrowers according to economic theory. In the second section, we expose the different mechanisms used by MFIs to achieve high repayment rate. The evolution of the literature on the credit-risk measurement of individual microcredit is also traced.

¹ It has been reported that the loan repayment rates of Grameen Bank in Bangladesh are almost always 95 percent (Morduch, 1999). In Malaysia, the repayment rates of Amanah Ikhtiar Malaysia (AIM), which is a modified replication of the Grameen Bank, is about 97 percent.

Traditional Bank's Difficulty in Lending to the Poor: An Economic-Theoretical Explanation

In order to supply cheaper credit, many commercial banks have attempted to offer financial services to the poor in rural areas by implementing large-scale subsidized credit programs between the 1950s and 1970s. Their objective is to provide a subsidized credit at below-market interest rate to small agricultural producers, enabling them promoting investment in agricultural, thereby increasing food production and, subsequently, stimulating overall economic growth (Yaron and Benjamin, 2002). However, usually these attempts have been failed, giving rise to abuses and corruption, and inevitably leading to a collapse. Morduch (1999) cites the work by Adams, Graham and von Pischke who claims that subsidized credit was a keystone for many developing countries in the 1950's as a poverty reduction effort but all these attempts were disappointments with repayment rates less than 50 percent.

Different barriers prevent traditional banking system from serving poor rural household. The theoretical framework that attempt to explain why this is the case can be found in the collateral debt. When Yunus (1994 a) asked traditional bank about the causes of financial exclusion of poor people, the bank explained that: 'Banks need collateral. The poor cannot offer collateral. Moreover, the poor are not to be trusted. They are not credit worthy. Banking is a business. It cannot indulge in charity for the poor' (Yunus, 1994a, p.5). Collateral is commonly used as a mechanism reducing both the screening and the enforcement problems. The existence of screening function of collateral is supported by empirical study by Machauer and Weber (1998) and by empirical evidence and experiments reported by Capra *et al.* (2001). Collateral debt can be viewed as a mechanism to reveal the information concealed *ex ante* from the lender. It can be used also as a credit enhancement or credit risk transfer mechanism from the lender to the borrower. If the borrower cannot (involuntary default) or would not (strategic default) pay back the loan, collateral would be the compensation. However, poor and self-employed people have little or no physical and livelihood assets or stable source of income that can be secured by a bank as collateral.²

The high transaction costs associated with the small loans is also a main barriers preventing traditional banking system from serving poor rural households. Actually, the process of lending a loan entails many bureaucratic procedures, which lead to extra transaction costs. This transaction costs have a large fixed-cost component regardless of the size of the loan. Thus, the costs for the bank to lend multitude loans of small amount of money to a multitude of borrowers are much higher compared to lower transaction costs for offering larger loans to fewer borrowers. Generally, poor borrowers are more likely to apply for loans of small sizes, and thus the lender's transaction costs increase. Giné *et al.* (2010) mentioned that moral hazard and adverse selection, coupled with small transaction sizes, together restrict the possibilities for banks to lend profitably to poor customers.

This failure of traditional commercial banking and the exclusion of poor borrowers raise the question on how poor people can improve their situation. According to Hulme and Mosley (1996), credit activities have faced severe difficulties where three of them must be overcome: (i) how to ensure that large numbers of poor borrowers can access loans; (ii) how to provide a

² Poor rural household have generally unacceptable collaterals such as crops, utensils and jewellery.

mechanism for screening out bad borrowers, both in terms of character and in terms of projects in the absence of written records and business plans; and (iii) how to give borrowers who cannot offer collateral an incentive to repay or, failing this, compel them to repay in time.

Mechanism of the Credit Risk Management in Microfinance

The failures of formal banks in rural sector especially the bad repayment rates of agricultural state banks that had provided subsidized loans to rural farmers have given rise to the innovative lending institutions that are Microfinance institutions. This type of organization has become an increasingly popular means that can alleviate poverty by making small, uncollateralized loans to poor customers. Moreover, what attracted attention to MFIs were its remarkably high repayment rates.

Microfinance institutions implement multiple mechanisms that overcome the screening and enforcement problems, which reduce the default risk and improve repayment rates. According to Armendariz and Morduch (2005) and Giné *et al.* (2010), microfinance has become a revolutionary way to reduce poverty due to the fact that this type of organization and the way that it operates are better designed to face information problems.

In order to explain the success of microfinance in providing credit to the poor, a large number of theoretical works uses the principal/agent theory to demonstrate that microfinance contracts lending to joint-liable groups solve the problems of asymmetric information in the credit market. They permit the lender to bypass adverse selection and moral hazard and hence help to maintain high repayment rates. Kono and Takahashi (2010) describe the existing literature and theoretical models on innovative factors underlying the high repayment rates in microcredit programs. They present simple models to argue that different elements of microcredit, such as group lending solve the problems of asymmetric information in the credit market. However, a large part of MFI does not offer group but just individual loans. Many practitioners of group lending are now turning steadily toward individual lending.³ This give rise to a very important question: when MFIs is not associated with joint liability lending mechanism and offer just individual loans, how MFIs manage their credit risk. In their interesting theoretical analysis, Armendariz and Morduch (2000) have highlighted several important mechanisms that allow MFI to generate high repayment rates from poor borrowers without requiring collateral and without using group lending contracts. These mechanisms include the use of non-refinancing threats, regular repayment schedules, collateral substitutes, and the provision of nonfinancial services.

Incentive Mechanism of Group lending

One of the major mechanisms that most MFIs employ is group lending. Group lending refers specifically to arrangements by individuals without collateral who get together and form groups with the aim of obtaining loans from a lender. According to Kono and Takahashi (2010), in the

³ According to Babu and Singh (2007), as MFIs are becoming older, there has been an increased need for designing individual loans for their mature clients. In practice, the members of the ACCION International network, among the earliest practitioners of group lending in Latin America, are now turning steadily toward individual lending. The trend is also very clear in Eastern Europe and Russia. For example, Opportunity International's Trust Banks as well as programs supported by the European Bank for Reconstruction and Development (EBRD) in Russia, Kazakhstan, and Bosnia have embraced individual-lending as a core component of micro-lending. Moreover, in developing countries where the individual financing needs of micro-entrepreneurs are more extensive, many profit-making MFI's choose to promote individual microcredit rather than group lending (McIntosh and Wydick, 2005).

typical group lending scheme: (a) each member is jointly liable for each other's loan, (b) if any members do not repay, all the members are punished (often in the form of denial of future credit access), and (c) prospective borrowers are required to form groups by themselves. Group lending model has attracted an enormous amount of public and academic attention mainly after the success of group lending program in Grameen Bank.

Many economic works on microfinance focus on the incentives induced by joint liability in group lending contracts and nearly all authors have proven that group lending enforces joint liability mechanisms, involves borrowers in sharing information and then reduces asymmetric information (Besley and Coate, 1995; Ghatak, 1999; Kono and Takahashi, 2010; Stiglitz, 1990; Van Tassel, 1999). Zeller (1998) uses information on 168 credit groups in Madagascar and shows that the group effectively generates insurance, transfer screening and monitoring costs from the bank to borrowers, providing an effective way for MFIs to overcome adverse selection, moral hazard, and enforcement problems, which leads to a better repayment performance.

On theoretical ground and drawing on contract theory, group lending is an innovative credit contract that essentially allows the poor borrowers to act as guarantors for each other. In a group lending contract, borrowers are required to form groups and the entire group is responsible for repaying the loan of any member who is unable to pay. Each borrower obtains a loan for her individual project but the liability is joint. This joint-liability induces group members to self-select each other and provides incentive for peer monitoring, such each borrower in the group will have information about the other's actions. Hence, it is believed that this interdependence between borrowers helps mitigate problems caused by adverse selection and moral hazard and therefore contributes significantly in obtaining high repayment rates.

First, peer selection in group lending model provides a screening mechanism for borrower's character, the choice of investment project and the proposed loan use, that can help to reduce adverse selection (Ghatak, 1999; Morduch, 1999; Van Tassel, 1999; Zeller, 1998). Ghatak (1999) and Van Tassel (1999) provide original theoretical models to explain how group lending with joint liability affects the problem of adverse selection. They mentioned that borrowers in group lending have perfect knowledge of their partners and every individual wants to form a group with safe borrowers. This peer selection and screening mechanism make the effective cost of borrowing lower to safer borrowers and hence improve repayment rates and efficiency. In his study, Wenner (1995) uses information on 25 Costa Rican credit groups and shows that lending groups use private information to select their peers and that this selection mechanism increases the group repayment performance.

In addition, joint liability in group lending can reduce the problem of moral hazard by increasing borrower's incentives to monitor each other and then to repay the loan. The original theoretical models dealing with the effect of group lending with joint liability on moral hazard can be found in Stiglitz (1990) and Varian (1990). These studies conclude that joint liability may induce borrowers in a group to monitor each other, thereby alleviating moral hazard problems. However, Kono and Takahashi (2010) advance that group lending alleviates the problem of moral hazard only if the group can coordinate its members' decisions and achieves higher repayment rates only if the returns are sufficiently high. According to Besley and Coate (1995), Karlan (2007), Wydick (1999), moral hazard can be reduced also by social sanctions against defaulting borrowers in group members. For example, Besley and Coate (1995) construct a model to compare the repayment performance between group lending with and without the use of social sanctions and argue that social sanctions can improve repayment rates under group lending. Social penalty function that describes the punishments implies that members in the community

who do not repay their share can be in the form of bad reputation, lost the trust among group members and can be excluded from the group. The consequence may be that the delinquent borrower will find it difficult to find partners that would be willing to co-sign for future loans. Cassar *et al.* (2007) show that social ties, relations and trust among members in group lending, which are often being referred to as *social capital* contribute to high repayment rates. Wydick (1999) working on 137 Guatemalan credit groups, finds that social capital affects group performance in terms of repayment rates, group insurance and moral hazard.

In sum, group-lending mechanism can potentially deal with information asymmetry, therefore reduces risk-taking and improves the lender's repayment rate. Armendariz and Morduch (2005) argue that the secret to the high repayment rates on loans is tied closely to the use of the group lending contracts. Besides the benefits of group lending in reducing information asymmetry, group lending can be an effective and efficient way to reduce the high transaction costs in both searching reliable borrowers and ensuring the repayment of credit .

However, group lending in practice suffer from some disadvantages such as domino effect or risk of contagion if one of the members is unable to meet repayments (Armendáriz and Morduch, 2000; Churchill, 1999).

Dynamic incentives

Lenders may use dynamics incentive as an important incentive mechanism (Besley, 1995; Kono and Takahashi, 2010; Morduch, 1999). Although group lending mechanism manages credit risk only in group loans, the mechanism of dynamics incentive or progressive lending, as named by Armendariz and Morduch (2005), can manage credit risk both in group and individual loans. Dynamics incentives mechanism boils down to the threat not to refinance a borrower who defaults on her debt obligations. This incentive has a large effect on microfinance borrowers' behaviour because they have considerable needs for future loans to develop their business. Morduch (1999) notes that the repeated nature of the interactions and the credible threat to cut off any future lending when loans are not repaid can be exploited to overcome information problems. Indeed, this mechanism allows lenders to build a long-term relationship with borrowers over time, to generate reputation mechanisms and screen out the worst prospects before expanding loan scale.

However, as noted by Morduch (1999), competition and increasing mobility of borrowers will diminish the power of this mechanism against moral hazard since borrowers will have the opportunity to take a loan elsewhere. Another limitation of progressive lending is related to the 'finite repeated games' problem. If the relationship has a clear end, the customer will have an incentive to default in the final period. Morduch (1999) states that dynamic incentives are enhanced further if borrowers can anticipate a stream of increasingly larger loans.

Collateral substitutes

In financing theory, the lender uses a guarantee to reduce the risk attached to the loan. As mentioned above, one particularity of MFI is that they do not require their clients to provide any physical collateral that traditional commercial banks do. However, in order to maintain high repayment rate, MFI can use important mechanism that is collateral substitutes. Collateral substitutes serve as a means to secure repayment since collateral. For example, following the model of Grameen bank, many MFIs especially during their initial years of operation require borrowers to pay 0.5 percent of every unit borrowed (beyond a given scale) in order to collect

the emergency fund. The emergency fund serves as insurance against loan default, death or disability (Morduch, 1999). The borrowers are also required to pay an additional five percent of the loan that is taken out as a ‘group tax’. These contributions are usually deducted from the members’ loans or form part of weekly contributions in addition to loan amortization and thus are forced savings. These forced savings can be withdrawn upon leaving, but only after the banks have taken out what they are owed.

Babu and Singh (2007) note that the lender may accept the borrower's degree certificate, driver's license, marriage certificate and such other documents as collateral substitutes in individual lending. Bank Rakyat Indonesia, a leading name in microfinance, uses this technique effectively. In Russia, household items may be considered as collateral if they have sufficient personal value for borrowers (Armendariz and Morduch, 2000; Churchill, 1999; Zeitinger, 1996). In rural areas of Albania, lender may accept tangible assets such as stocks as collateral substitutes. In addition, MFI providing individual microcredit may require guarantor agreeing to guarantee the borrower's loan. However, it must be noted that the essential role of a guarantor is to be a decisive factors for granting the credit and not a secondary repayment source.⁴ Indeed, presence of a guarantor primarily acts as an *ex ante* signal that can reduce adverse selection problem inasmuch as the request for guarantors requires costly efforts for the potential borrower to find one or more guarantors and hence bad borrowers will be discouraged.⁵ Moreover, presence of a guarantor is also an *ex post* sanction mechanism. Indeed, in case of default of payment, the cosigner who may lose his reputation to the same extent as the borrower can put pressure on the borrower to meet its obligations. The guarantor can even apply direct sanctions by revealing his or her bad conduct to neighbours or, more generally, to members of the community he or she belongs to.

Regular repayment schedule

Even though economic theory suggests that a more flexible repayment schedule would benefit clients and potentially increase their repayment capacity, microfinance practitioners believe that the discipline imposed by regular repayment maintains high repayment rates in the absence of collateral. Although that this feature is less usual than the previous mechanisms, it helps MFI to maintain high repayment rates (Armendariz and Morduch, 2000; Morduch, 1999). In the MFI, the repayment starts almost immediately after disbursement and then occurs on a weekly or monthly basis.

Morduch (1999) points out the different advantages of regular repayment schedules. He argues that it:

- Screens out undisciplined borrowers at an early stage

⁴ Churchill (1999) emphasised that ‘the use of guarantors [...] is similar to the screening mechanism employed by group lenders. Responsible guarantors would not cosign a loan if they did not think the applicants were trustworthy and that their businesses would be able to repay the loan. As with group lending, the use of cosigners creates a social obligation for the client to repay’ (Churchill, *ibid.*, p. 46). Thus, the request for guarantors permits to MFI to evaluate the borrower's social capital.

⁵ As underscored by Churchill (1999), it is not easy to find one or more guarantors because every cosigner also lays its reputation on the line by guaranteeing the borrower. Jaunaux and Venet (2009) advance that ‘being able to produce guarantors is often considered by MFIs as a mechanism that reveals the quality of the project upstream: if the individual accepts to look for guarantors and can produce them, his or her project can then be considered genuine’. Jaunaux (2007) shows that the number of guarantors presented by the borrower has a positive effect on the likelihood of access to the loan.

- Gives early warning to loan officers and peer group members about potential future problems.
- Permits the banks to get hold of cash flows before they are consumed or otherwise diverted
- Requires that the borrowers have an additional income source on which to rely since the repayment process begins before investments bear fruit. This permits a positive selection of clients for the lender and for diversified households (Armendariz and Morduch (2000)).

Field and Pande (2008) note that regular payment schedule provide clients a credible commitment device, which enables them to form the habit of saving regularly. They note also that frequent meetings with a loan officer may improve client trust in loan officers and their willingness to stay on track with repayments.

However, this early regular repayment schedules may exclude potential borrowers who have a single source of income from the market. These borrowers are mostly present in areas focussed sharply on highly seasonal occupations like agricultural cultivation. The income generation of agriculture areas is unstable and regular repayment schedules are difficult to respect.

The provision of nonfinancial services

MFIs usually use nonfinancial services also named Business Development Services (BDS). Some microfinance programs are also referred to 'credit plus' as they provide services such as health services or adult literacy or training that go beyond financial services. The main objective of these services is to develop client's managerial and technical skills, improve and update their knowledge in production technology. Edgcomb and Barton (1998) note that the provision of nonfinancial services as a complement to credit and saving services not only develops the economic ability of the borrower to repay but also makes the relationship with the MFI more valuable to him. Many authors (Godquin, 2004; McKernan, 2002) found that the provision of nonfinancial services was positively correlated with repayment performance and may be an important component of the success of microcredit programs. It must be noted that this main feature of the microfinance methodology have been little documented up to now.

Microfinance Mechanisms overcoming adverse selection in individual microcredit decision making: Interaction of Judgemental and Statistical Forecasting Methods

As we have noted above, a large part of MFIs does not offer group but just individual loans. Individual micro-lending targets small entrepreneurs who are not likely to have documentation (such as a firm's balance sheet as well as detailed business records) to indicate their risk level. According to Viganò (1993), the difficulty and the high cost of collecting relevant information on entrepreneurs is the major problem concerning loan analysis in MFI. This give rise to a very important question: How can MFI give collateral-free loans and manage adverse selection in the absence of joint liability lending mechanism? To prevent adverse selection, the creditors must screen the borrower. In theory, it is has been shown that interest rates is not a screening mechanism. Indeed, the raise of interest rates improves the adverse selection problem in the way that higher interest rates attract debtors with poor economic viability and suppress debtors with financially viable projects (Stiglitz and Weiss, 1981). The argument of Stiglitz and Weiss (1981) was as follows: it is only the borrowers having risky projects accept borrowing money to such high levels of interest rate because their projects have low probability of being successful and therefore, the loans will not be repaid. Stiglitz and Weiss (1981) argue that, in equilibrium, the

loan market is characterized by credit rationing driven by adverse selection. In this case, lenders must use another mechanism of credit risk management in order to judge repayment risk of borrower and to decide to grant him the loan or no. Hence, it is imperative for MFI to evaluate and assess the creditworthiness of the applicant before granting credit. According to Viganò (1993), a suitable creditworthiness analysis has become crucial in MFI especially in developing countries. Schreiner (2005) said, ‘The central challenge of microcredit is to manage the risk that a client will behave ‘badly’, whether by defaulting, paying late, or not returning for repeat loans’. (Schreiner, 2005, p. 207).

Credit Risk Assessment Approaches: Theoretical Aspects

Credit risk evaluation is the process through which a bank assesses the creditworthiness of prospective loan that exposes the financial institutions to credit risk. The credit analysis ultimately results in an estimation of the likelihood of customer default.

Outside microfinance, to optimize the credit decision, there exist three main approaches to estimate borrower’s probability of default: Structural approach or reduced form models, statistical approach and expert-judgement approach.

Structural approach is based on modelling the underlying dynamics of interest rates and firm characteristics that can lead to a default event. These financial dynamics, generally described by stochastic processes evaluate the default probability. This approach is used in portfolio credit risk models. However, it needs the use of complex mathematical and stochastic techniques that can be hardly modelled. In addition, a clear disadvantage of this approach is their limited applicability to public firms because it requires specific information, e.g. borrower’s stock prices, which are not available for all borrowers. Hence, MFI and banks offering consumer loans cannot benefit from this approach.

The second approach is the empirical or the statistical approach. Credit scoring models are used by some banks in their internal rating system. The principle 3 of Basel Committee (February, 2006) declares, ‘A bank’s policies should appropriately address validation of any internal credit risk assessment models’. ‘Models may be used in various aspects of the credit risk assessment process including credit scoring, estimating or measuring credit risk at both the individual transaction and overall portfolio levels, portfolio administration, stress testing loans or portfolios and capital allocation’ (p. 6). In this approach, credit scoring models link borrower characteristics, such as financial and non-financial variables to repayment performance on previous loans in order to estimate the borrower default. Hence, the relationship of default and information about the borrower is learned from historical data. The major advantage of credit scoring models is that they can be developed for all types of credit, from consumer credit to commercial loans. However, one of the credit scoring disadvantages is that there is no common consensus or rigorous theory on which variables should be included in scoring model. The choice of the explanatory variables will depend largely on data availability.

The third approach is the expert-judgment approach or subjective-judgment approach. In this approach, creditworthiness was estimated purely by credit experts based on their judgment and their intentions. The decision of granting credit is based on adoption of certain rules or principles of lending carefully build by skilled loan officers themselves. For example, under the 5C’s of credit evaluation criteria, evaluation is based on character, capacity, condition, capital and collateral. These principles are drawn from the experience of loan officers, but should be used generally and not rigidly as laws of lending (Kwan *et al.*, 1986).

Credit Risk Assessment Approaches in individual lending

Evidence regarding the better credit risk assessment approaches in individual lending in MFI is divergent and the literature highlights two main approaches: Judgmental and Statistical forecasting methods. According to Agier and Szafarz (2012), adverse selection is the main problem faced by the lending industry including microcredit institutions and in order to tackle this problem, bankers typically combine two mechanisms: subjective-judgment approach and statistical approach.

In the subjective judgment approach, the decision of granting credit is based on adoption of certain rules or principles of lending carefully build by skilled loan officers. The loan officers in MFI are trained to collect and make judgments about information on entrepreneur's personality, analyze the risk of potential borrowers and decide to approve or to reject the applicant. This would typically involve a face-to-face meeting with each applicant where the loan officer - intentionally or unintentionally - forms judgments about its creditworthiness after interviewing him. Furthermore, loan officers should consider information about business' project and business conditions such as forecasts about market, economic growth, and additional macro-economic factors. Those indications are essential in order to get a feeling about the management's ability to handle changes in the environment.

In the literature, different authors argue that subjective approach appears to be very suitable for MFI as it can mitigate opacity problems and be beneficial where little data exists (Bunn and Wright, 1991). Armendáriz and Morduch (2000) argue that the success of individual-based programs is linked to particular methods of gathering information. Loan officers must do a good job of collecting a host of information at the screening stage. For example, the Russian micro-lending program relies heavily on credit officers visits to applicants' businesses rather than just on business documents (Zeitinger, 1996). Cornée (2009) demonstrates the relevance of using loan officer's subjective judgment in order to predict future default of microenterprise and concludes that relationship lending technology is the most adequate for MFI because it makes extensive use of qualitative information. According to Schrader (2009), 'for microfinance in developing and transition countries, relationship lending is considered the most appropriate lending technique when lending to young firms and micro and small entrepreneurs' (p. 2).

However, subjective judgment for individual loans has its weaknesses. First, subjective judgment assessment requires a fair amount of time per applicant and is expensive for the lender. According to Babu and Singh (2007), evaluating the loan proposal and defining the terms for each particular client is costly to the MFI resulting in reduced profitability. Second, as written within the credit scoring literature (Hand, 1998; Lewis, 1992), judgmental approach lacks of quantification of credit risk. Moreover, borrowers' characteristics are analysed in this approach sequentially rather than in combination thereby ignoring their correlation. Finally and more importantly, loan officer, like other people may seriously have cognitive bias in processing information that affect his judgments and beliefs, so that he may be a victim of behavioural bias and appear irrational. Balthazar (2006) notes, 'studies of behavioral finance usually show that credit analysts are good at identifying what the main strengths and weaknesses of a borrower are, but integrating all the information into the final rating is not always done in a consistent way' (p. 118). Recently, in order to reach a greater number of applicants more efficiently, several MFIs judge repayment risk by the use of statistical tool used extensively in bank to monitor their credit portfolio. This tool is the credit scoring models. Credit scoring models represent a methodology accepted by the Basel Committee for Banking Supervision and the U.S. and European financial

systems in the construction of an internal rating system. This method presents an innovation for microcredit but is not at all new to others credit.

Credit scoring models have been used successfully with individual loan by a number of microfinance organizations and thus can be seen as a powerful tool that improves a microfinance institution's management of credit risk. For example, Credit Indemnity, a microfinance division of African Bank in South Africa experienced a decrease in default when they started to use the credit scoring. Indeed, the profit of Bank increases by \$2 million the year after implementing credit scoring (Kuhn and Olsen, 2008). ACCION (in Bolivia, Ecuador, and Peru) and Women's World Banking (in Colombia and the Dominican Republic) are also examples of MFIs that have adopted the credit scoring in their granting decision. Two WSBI members, Banco BCSC in Colombia and BancoEstado in Chile, have incorporated credit scoring systems and have found that scoring system is very important tool for making faster and more accurate credit decisions. Crediamigo, the largest Brazilian MFI, used the credit scoring system is an integral part of credit risk assessment and decision process for new loans and for loan renewals. Alexandria Business Associations (ABA), a Microfinance Service Provider in Egypt started full implementation of credit scoring in August 2007. El Tabaa (2007), the Executive Director of (ABA) said: 'In the first eight months following the implementation of the credit scoring model, ABA registered productivity in monthly disbursements of almost 15 percent over the previous year and an increase in amount of loans disbursed of 30 percent over the previous year. Some other interesting statistics include a slight lowering in administrative cost per loan disbursed. Repayment rates on credit approved through scoring is almost 99.5%' (p. 20).

Several researches have highlighted the usefulness of credit scoring. Credit scoring model automates the credit decision process, replaces manual loan decision and overcomes the high cost of collecting relevant information on borrower, leading to minimization of administrative costs. This is very profitable because the tight margins of microcredit render manual loan decision increasingly unprofitable (Dellien, 2003; Kuhn and Olsen, 2008; Schreiner, 2003; Viganò, 1993). Different authors (Berger *et al.*, 2005; Fishelson-Holstine, 2004) show that scoring increases not only profits but also the number of clients and the number of poor clients. Schreiner (2003, 2005) and Dellien (2003) conclude that scoring simultaneously increases breadth, depth, and length of outreach by reducing the high transaction costs, improving the time allocation of loan officers and hence improving credit decisions and portfolio management. Simbaqueba *et al.* (2011) advance that under the pressure of the demand of microcredit, it will be not practical or cost-effective for MFI to train and maintain an adequate staff of experienced credit evaluators and conclude that 'credit scoring as a technology meant to improve micro lending significantly' (p.1). In addition, scoring model allows to adjust interest rates and fees according to risk (Kuhn and Olsen, 2008; Schreiner, 2003). Furthermore, scoring approach identifies the most important risk-explaining factors. This enables to gain more effective advanced risk management systems, leading to a quantitative risk culture (Schreiner, 2005; Van Gool *et al.*, 2011). More importantly, by making the criteria explicit, credit scoring reduces the role of subjectivity in the loan decision and then reduces the effects of discrimination and prejudice by individual loan officers and minimizes human bias in the credit decision process (Kuhn and Olsen, 2008; Schreiner, 2005).

However, others advance that credit scoring is vulnerable to several limits. For example, ignoring qualitative factors and blindly applying a credit scoring in Microfinance context can led

to inaccurate evaluations and hence to high arrears and default.⁶ Schreiner (2003) argues that the installation of the credit scoring models requires an important fixed cost⁷ at the beginning and requires periodic updating and persistent training with the loan officers. Cornée (2009) concludes that transaction-based technologies are not well-suited for MFI and that credit scoring technique would potentially not be able to give a ruling on a borrower's creditworthiness if the project is too innovative. They explained this by two causes. First, the situation in MFI can be referred to as uncertainty not as risk because microenterprises are characterised by their idiosyncrasy and this high degree of uniqueness makes impossible to form homogenous classes of instances⁸. Second, as noted by Schrader (2009), the lack of certified financial statements for microenterprises increases the difficulty to use the credit scoring models.

Academic researches regarding the credit scoring models for MFI is yet at an embryonic stage and opinions on its applicability are divergent. Although some researchers highlight the necessity of implementation of credit scoring in MFI (Viganò, 1993), some other researchers think that it is difficult to incorporate and adapt this technique alone in the context of microfinance because of the information which is usually qualitative and informal in Microfinance context (Schreiner, 2004; Van Gool *et al.*, 2011). Viganò (1993) pioneered the application of credit scoring models for an African MFI especially for a rural development bank in Burkina Faso in order to predict the creditworthiness of entrepreneurs. Using a multivariate discriminant analysis and a database of 100 observations, the model accurately classified 77 percent of the 100 applications. In particular, the model correctly classified 91.84 percent of the 49 applications of bad credit applications and 62.75 percent of the 51 applications of good credit applications. Hence, she concluded that the use of relatively simple credit scoring techniques in development banks have a quite good predictability, particularly as concerns the elimination of Type I error.⁹ Mark Schreiner noted in his cornerstone paper 'Credit Scoring for Microfinance: Can It Work?' published in 2000, 'credit scoring for microfinance can work' (p.14). In 2004, he investigated her study to research whether microlenders in poor countries also take advantage of scoring. To do this, he presented a credit scoring model based on logistic regression. He used information on 39,956 loans to urban individuals in trade and manufacturing from Bolivia. He concluded that credit scoring models have enough predictive power to significantly improve the evaluation of the risk of microcredit applicants but less powerful than most scorecards for credit cards. He noted finally that scoring is a marked improvement in Microfinance area but it complements—not replace—loan officers and their subjective evaluations. Vogelgesang (2003) developed a credit scoring model based on bivariate probit estimation and used information on 8002 customers loans from Caja Los Andes, a microfinance Bank in Bolivia. He focused on 1996–2000 period characterized by strongly increasing supply in the microfinance market, high levels of indebtedness and the onset of an economic crisis. Vogelgesang (2003) hypothesized that credit scoring permit the MFI to maintain their high repayment in a more competitive

⁶ In this context, we can cite the example of company entered the Bolivian microcredit market in 1995 and in which scoring, and only scoring was used to evaluate loans (Rhyne, 2001). In the beginning, scoring allowed low-cost and rapid evaluation. However, by 1998, inaccurate evaluations led to high arrears and default and then bankruptcy.

⁷Costs of implementing scoring models include the cost of construction scoring project itself, the cost of collecting and entering the data and the cost of training loan officers to accept scoring tool.

⁸ Traditional credit scoring models are better adapted when the situation is risky, that is, when the future can be determined from past data with a relatively small margin of error. However, these models prove to be less relevant when the situation proves to be more uncertain.

⁹ Type I error that occurs when a bad credit applicant is classified as good credit applicant.

environment through the accurate selection of clients. However, he found that the explanatory power is relatively low. Using a threshold value of 15 percent, for example, the model correctly classifies 59.7 percent of all observations only. Van Gool *et al.* (2011) extended the knowledge on credit scoring for microfinance by developing and evaluating two logistic regression-based credit scoring models using data from a Bosnia–Herzegovinian microlender. Using information on 6722 individual loans, the result indicates that the predictive accuracy of the developed models is at the lower end of previous credit scoring studies for credit cards, consumer loans, etc. They concluded that the discriminatory power of credit scoring systems for microfinance is too weak to fully replace the human-intensive microfinance credit process towards fully automated credit scoring and they explained this by the fact that microfinance clients are subject to significant uncontrollable risks, which can be assessed only by loan officers.

These two approaches mainly differed in respect to the weights given to the human. According to Balthazar (2006), most of the banks lay between the two extremes as a function of their portfolios. A large portfolio of small exposures (e.g. retail portfolios) tend to be managed with statistical scoring models while smaller portfolios of large exposures (e.g. large corporate portfolios) are usually managed by qualitative individual analyses made by credit officers. As shown in Figure I, constrained expert model is well-suited for opaque SMEs that do not have audited financial statements or sufficient pledgeable collateral (micro-enterprises). Constrained expert models that try to combine objectivity and comprehensiveness can be viewed as the accurate approach for microfinance institution. The best mix is perhaps when a statistical model treats the hard information and when credit analysts spend more time to collect and analyse soft/qualitative information.

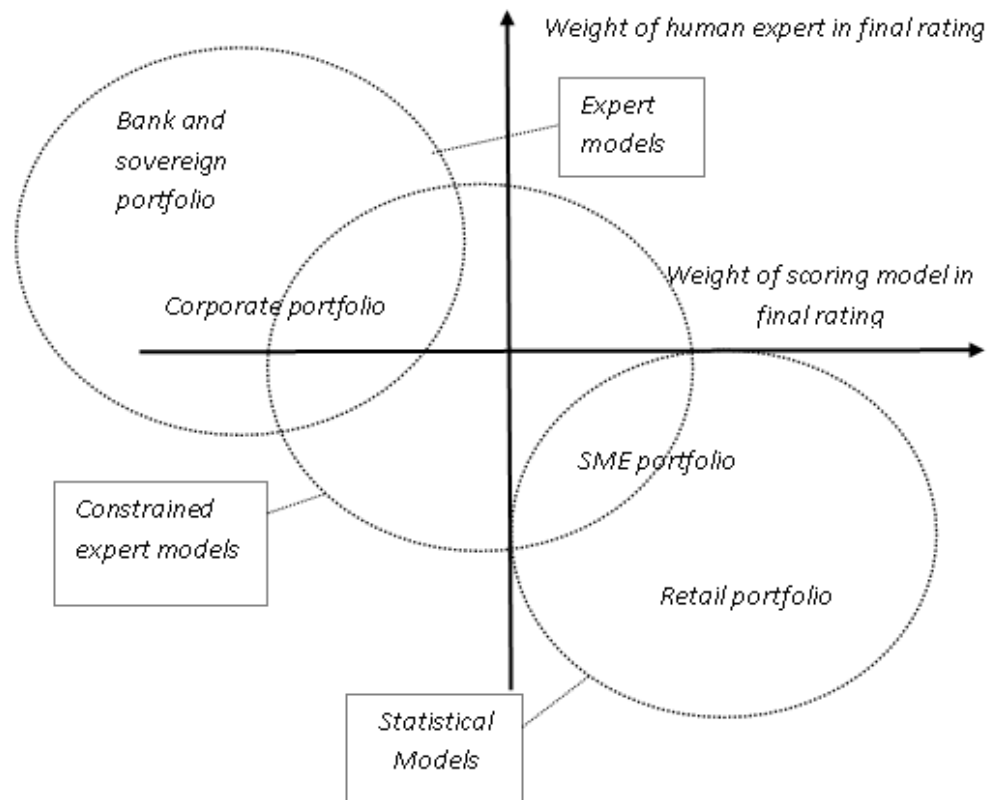


Figure I. Current bank practices: rating systems (Balthazar, 2006: From Basel 1 to Basel 3, p.118)

Conclusion

The sustainability of microfinance institution is a very important theme. The rapidly growing supply of funds for micro-loans, the increasing competition in microcredit markets, over-indebtedness among micro-entrepreneurs and the shifting of different MFI from joint-liability group lending towards individual microcredit programs, lead to a growing need to estimate the risk of failure of microfinance borrowers.

In this paper, we have traced the development of credit risk measurement mechanisms in Microfinance institutions. We showed how microfinance institutions can succeed in reaching the poorest of the poor in a more effective way than formal financial sector by devising innovative strategies, such as group lending, dynamic incentive, collateral substitutes, regular repayment schedule and the provision of nonfinancial services. In addition, we showed how literature regarding the better credit risk assessment approaches in MFI offering individual microcredit programs is divergent between judgemental and statistical assessment approaches. More research can be done in this area.

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CREDIT RISK MANAGEMENT IN MICROFINANCE: THE CONCEPTUAL FRAMEWORK

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