A Study of The Efficiency of Microfinance Institutions in India using Data Envelopment Analysis

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Abstract

The role of microfinance institutions is to provide credit to the poor who have no access to commercial banks. A major challenge for microfinance institutions is that of financial sustainability, with several of them appearing to be often loss making. Recently, however, there has been a renewed focus on the financial sustainability and efficiency of microfinance institutions, which is essential for the well-being of the financial system in developing countries.

This study examines the efficiency of microfinance institutions in India using a modified form of Data Envelopment Analysis. The data for the study was collected on a sample of thirty microfinance institutions in India from the Microfinance Information eXchange (MIX). The results of the analysis indicate the inefficiencies in the microfinance sector.

Keywords: *microfinance institutions, financial sustainability, efficiency, Data Envelopment Analysis.*

Introduction

Microfinance institutions play a vital role in developing economies, providing financial services to low-income segments, empowering them and integrating them into the mainstream economy. The services offered by microfinance institutions have experienced tremendous growth during recent years. Currently, several hundreds of microfinance institutions are operating in different parts of the country, but it is generally believed that only few are performing well. Efficient functioning of these microfinance institutions is crucial for their long-term sustainability. Thus, efficiency of microfinance institutions is an area of current academic interest.

The major objective of microfinance institutions was to help poor people who were financially constrained and vulnerable, with financial services to enable them to engage in productive activities or start small businesses - that is, outreach to the poor. On the other hand, financial performance is also important for the sustainability of microfinance institutions. These are often seen as conflicting goals for microfinance institutions.

Credit-lending transactions always carry asymmetric information risk, as the lender has less information about the creditworthiness of the borrowers, than the borrowers themselves. Such risks are even higher in microfinance market as the poor borrowers lack credit history.

The asymmetric information credit market risks include the ex-ante risk of adverse selection, interim risk of moral hazard, and the two ex-post risks of costly audits and enforcement. Adverse selection risk arises when the lender has poor information about the borrowers while negotiating the credit-lending transaction, so that the lender cannot screen the riskier

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borrowers from safer ones. Moral hazard risk arises because the lender has difficulty in monitoring the behavior of the poor borrowers once the loans are disbursed, so that the lender does not know whether the loan is being used optimally for the intended purpose for which it is sanctioned, and lacks information about the performance of the credit-lending transaction and the probability for the loans disbursed to be misused. Costly audit and enforcement risks arise as it becomes too costly for the lender to audit and enforce payments on the small loans disbursed to the poor, which generally lack collateral support (Markkath, 2012).

The mechanism used by microfinance institutions to mitigate these asymmetric information credit market risks is based on group lending models that work on the joint-liability principle, without collaterals. However, this tends to lead to higher intermediation costs. In order to cover these high intermediation costs and attain operationally-self sustainability, i.e. to generate enough revenue from its operations to cover its financing costs, transaction cost and loan loss provisions, microfinance institutions must achieve cost-efficiency.

Thus, the high prevalence of risk in microfinance is a factor that needs to be considered in studying the efficiency of microfinance institutions. This study examines the efficiency of microfinance institutions in India using a modified form of Data Envelopment Analysis, incorporating risk.

Literature

There are two major streams in the efficiency analysis literature, that of Stochastic Frontier Analysis (SFA), a parametric technique, and that of Data Envelopment Analysis (DEA), a non-parametric technique (Berger and Humphey, 1997). Stochastic Frontier Analysis has an advantage over Data Envelopment Analysis in that hypothesis testing can be carried out for the parameters. Also, nonparametric methods (including Data Envelopment Analysis) assume that the variations in firm performance are all attributed to inefficiency; however, this ignores measurement errors, omitted variables and exogenous shocks in the measurement. On the other hand, the disadvantage of using parametric methods (such as Stochastic Frontier Analysis) is that they specify a particular functional form on the data.

Gutierrez-Nieto et al (2008) suggested the use of Data Envelopment Analysis to analyze efficiency of microfinance institutions in Latin America, with operating costs, number of employees, and total assets and overall loan portfolio, total revenue, number of women beneficiaries, and number of poor beneficiaries as outputs.

Masood and Ahmad (2010) applied the Stochastic Frontier Analysis approach to measure efficiency of Indian microfinance institutions. They found a lot of variation in efficiency level, with very few of them working efficiently. They found the age/experience of the microfinance institution to be an important determinant of efficiency level, while size did not matter much. Also, they found no trade-off between efficiency and outreach. They found significant regional variation in efficiency level of microfinance institutions, with institutions located in the southern states more efficient than others, and unregulated microfinance institutions more efficient than regulated.

Another issue is that of analyzing financial efficiency (e.g. Hartarska et al., 2006; Isern and Porteous, 2006) or analyzing outreach (Hashemi and Rosenberg, 2006; Ahlin and Jiang, 2008). Hartarska et al (2006) found that labor, physical capital, and financial capital all significantly affect the financial efficiency of microfinance institutions. In particular, as microfinance institutions are financial institutions, there are two distinct approaches in defining inputs and outputs: the intermediation approach and the production approach (Haq et al, 2010). Under the intermediation model, financial institutions take deposits as inputs, and use these to generate loans and revenues as outputs. Under the production approach, financial institutions use human and physical resources to generate both deposits and loans.

Zeller and Meyer (2002) proposed that microfinance institutions should employ the concept of the triangle of outreach, financial

sustainability, and impact as they choose their target clients and create the products they will offer, the loan conditions they will set, and the application procedures they will require. This triangle suggests that broader and deeper outreach to the poor may require a tradeoff in financial sustainability. They suggested that the real cost for microfinance institutions was in obtaining information about a client's credit-worthiness, no matter how big or small the loan.

Haq et al (2010) investigated the cost efficiency of microfinance institutions - including bank-microfinance institutions, non-banking financial company (NBFC)-microfinance institutions, cooperative-microfinance institutions and non-governmental organization (NGO)-microfinance institutions - in Africa, Asia, and the Latin America using the intermediation and production approaches of Data Envelopment Analysis. They found that cost efficiency may have decreased due to the amount of non-performing loans specifically for bank-microfinance institutions under the intermediation approach, i.e. require better managing of loan customers and proper monitoring of operating costs. Further, the levels of efficiency have much more to do with efficient utilization of resources rather than scale of production.

Some studies have tried to balance these two approaches. Hermes et al (2008) used Stochastic Frontier Analysis to examine the trade-off between outreach to the poor and efficiency of microfinance institutions, and found that outreach and efficiency of microfinance institutions were negatively correlated.

Markkath and Ramanan (2012) found that only a few efficient microfinance institutions operated sustainably, by charging a reasonable interest rate of 26 per cent or lower from the poor, as specified by the Malegam Committee Report (2011). In fact, the Malegam Committee Report (2011) had identified a few large Indian microfinance institutions to be levying interest rates in excess of 50 per cent, reflecting higher operating costs and financing costs.

Markkath (2012) studied the innovative strategies used by efficient and sustainable Indian microfinance institutions. She suggested that the non-governmental organization (NGO)-microfinance institution partnership model should be used for reducing the operating costs of Indian microfinance institutions that use self-help group (SHG) credit delivery model, with an emphasis on the long-term sustainability of such a partnership. She also suggested that the non-banking financial company (NBFC)-microfinance institutions should use the securitization model for reducing financing costs, while the other microfinance institutions should use portfolio buyout model to reduce its cost of funds. She also emphasized that it was crucial for microfinance institutions to adopt strategies to reduce the cost of funds sourced from banks and financial institutions, as microfinance institutions cannot rely indefinitely on donor support for funding its operations.

Crabb and Keller (2006) identified key risk factors in loan portfolios, including institutional size and macroeconomic factors. He also found that the group lending methodology used by most microfinance institutions does in fact reduce loan portfolio risk. He also found that though greater lending to women consistently raised portfolio risk, the effect is mitigated by group lending. He suggested that microfinance institutions should continue to explore both individual and group lending, scale up their operations, and diversify to mitigate the effects of changes in the economy.

Raghunathan et al (2013) stressed the dual function of microfinance institutions, and considered a Bayesian distance function approach to evaluate efficiency of microfinance institutions by balancing their dual outputs of financial growth and borrower levels.

The literature of efficiency analysis in the microfinance sector is dominated by the Stochastic Frontier Analysis and Data Envelopment Analysis approaches. This study also addresses the problem of efficiency measurement for microfinance institutions, but also incorporates risk as a determinant factor. To do so, the study uses a modified form of Data Envelopment Analysis, which further extends

the scope of Data Envelopment Analysis.

Methodology

This study uses a modified form of Data Envelopment Analysis (DEA) to analyze efficiency of microfinance institutions, incorporating risk. Data Envelopment Analysis was first developed by Farrell (1957), and extended by Charnes et al. (1978). Data Envelopment Analysis is a non-parametric method that identifies what proportion of a units inputs are actually required to produce its given levels of outputs, as compared to other units. Mathematically, it is represented by the model expressed below.

$$\min E \quad s.t. \quad \sum w_j = 1$$
$$\sum w_j I_{ij} \leq E.I_{i*}$$
$$\sum w_j O_{ij} \geq O_{i!*}$$

The results of Data Envelopment Analysis are generally sensitive to the choice of inputs and outputs (Gutierrez-Nieto et al., 2007).

A modification for Data Envelopment Analysis is proposed, viewing the system as control system (Dash, 2013). Thus, using the same framework as Data Envelopment Analysis, but by replacing inputs by control factors, and outputs by performance characteristics, represents a notion of "control-efficiency". Mathematically, the model is represented as follows.

$$\min E \quad s.t. \quad \sum w_j = 1$$
$$\sum w_j C_{ij} \leq E.C_{i*}$$
$$\sum w_j P_{ij} \geq P_{i!*}$$

The control factors considered in this study were Equity and Debt (Total Assets), and Portfolio @ Risk (Loans due for more than 30 days). The first two are input factors, Equity and Debt, comprise Total Assets, which represents the total funds available for the microfinance institution to operate with. The latter factor, Portfolio @ Risk, is a control factor, comprising of Loans due for more than thirty days, and representing the risk exposure of the microfinance institution. On the other hand, the performance characteristics considered were Gross Loan Portfolio, Outreach, Total revenue from Loan Portfolio, and Operating Profits. The first, Gross Loan Portfolio, represents the total quantum of Loans disbursed by the microfinance institution to beneficiaries, while Outreach represents the total number of active beneficiaries of the microfinance institution; of course, Revenue and Operating Profit are the usual measures of financial performance.

The analysis was carried out for a sample of thirty microfinance institutions operating in India in the study period 2010-11.The sample units were selected from the Microfinance Information eXchange (MIX), based on availability of the relevant data.

Findings

The efficiency indices of the sample microfinance institutions with respect to financial and outreach performance, with and without Portfolio @ Risk as a control parameter, are shown in the table below.

Table: Comparison of Efficiency Scores

MFI	control-efficiency			DEA efficiency		
	financial	outreach	Overall	financial	outreach	Overall
AMPL	100.00%	100.00%	76.58%	0.00%	30.40%	42.66%
Arohan	100.00%	100.00%	100.00%	84.03%	100.00%	100.00%
Asirvad	86.83%	100.00%	100.00%	85.34%	100.00%	66.94%
Bandhan	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
BISWA	1.34%	100.00%	100.00%	73.24%	82.80%	82.89%
BJS	100.00%	100.00%	0.00%	0.00%	100.00%	100.00%
BSS	98.41%	100.00%	57.22%	71.51%	68.37%	100.00%
BWDA Finance	57.84%	100.00%	100.00%	57.70%	74.34%	48.51%
Chaitanya	0.00%	85.21%	100.00%	0.00%	63.55%	100.00%
Equitas	100.00%	100.00%	100.00%	88.21%	98.73%	99.06%
ESAF	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
GUARDIAN	22.19%	91.71%	100.00%	0.00%	0.00%	0.00%
Janalakshmi Financial Services Pvt. Ltd.	76.63%	84.48%	86.93%	66.75%	82.91%	87.11%
KCIPL	0.00%	64.92%	0.00%	34.88%	0.00%	65.10%
MMFL	56.93%	86.91%	94.01%	53.26%	69.54%	54.22%
Muthoot	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
RGVN	65.38%	82.87%	76.53%	71.36%	82.85%	65.28%
Sahara Utsarga	35.91%	100.00%	42.90%	70.43%	76.98%	35.67%
Saija	51.03%	100.00%	0.00%	2.59%	50.40%	0.00%
Samasta	53.35%	82.21%	62.84%	51.62%	82.14%	0.00%
Sarala	98.88%	85.35%	100.00%	97.08%	100.00%	0.00%
SCNL	62.65%	100.00%	100.00%	61.27%	98.61%	100.00%
SKS	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
SMILE	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Sonata	81.27%	82.51%	78.97%	77.61%	82.48%	63.79%
SVCL	90.90%	98.07%	88.03%	91.22%	98.00%	42.74%
Swadhaar	80.66%	86.13%	54.61%	80.63%	85.77%	52.53%
Trident Microfinance	100.00%	100.00%	67.71%	67.59%	73.86%	54.37%
Utkarsh	50.77%	75.99%	100.00%	50.94%	74.21%	43.11%
VFS	73.29%	78.23%	78.68%	69.43%	78.03%	61.08%
Average	71.49%	92.82%	76.58%	63.56%	78.47%	63.50%

The efficiency scores with Portfolio @ Risk as a control parameter are generally better than the true DEA efficiency scores. The DEA scores suggest that Bandhan, ESAF, Muthoot Finance, SKS, and SMILE are the efficient microfinance institutions with respect to both financial performance and outreach, while the control-efficiency scores suggest that AMPL, Arohan, BJS, and Equitas are also efficient. In terms of financial efficiency, 33.33% of the sample microfinance institutions were control-efficient, while only 16.67% were DEA-efficient. In terms of outreach, 56.67% were control-efficient, while only 30% were DEA-efficient. Also, only 3.33% of the sample microfinance institutions are 100% control-inefficient, while 16.67% of them are 100% DEA-inefficient. Overall, 50% of the sample microfinance institutions were 100% control-efficient, while only 10% of them were 100% control-inefficient, whereas only 33.33% of the sample microfinance institutions were 100% DEA-efficient, while only 13.33% of them were 100% DEA-inefficient.

Discussion

The study proposes a modified form of the DEA model, with inputs replaced by control factors and outputs replaced by performance characteristics. Thus, risk exposure, which is actually an outcome, could be taken as a control factor.

The results of the study suggest that the perception that microfinance institutions are relatively inefficient is perhaps wrongly founded. The DEA efficiency scores do indicate a high level of inefficiency, with an average efficiency score of 63.5%, however, the control-efficiency scores indicate a much higher level of efficiency, particularly with respect to outreach performance. This suggests that controlling for risk exposure gives a clearer picture of efficiency for microfinance institutions.

The results of the study also suggest that microfinance institutions have to incur increased risk exposure to achieve better financial performance and outreach. This is clear given the uncertain nature of microfinance operations. Markkath (2012) had discussed the asymmetric information risk in microfinance and emphasized its cost impact. She proposed the NGO-microfinance institution partnership model for reducing the operating costs of Indian microfinance institutions that use SHG credit delivery model, with an emphasis on the long-term sustainability of such a partnership. An important point to note is the diversity of risk profile, so that costs may not be the best measure of risk. The measure adopted in the study, Portfolio @ Risk, is, similarly, only one dimension of risk. Other measures of risk should also be used in conjunction, in order to capture a wider view.

The study suggests that Zeller and Meyer's (2002) triangle of outreach, financial sustainability, and impact should be extended to include risk. These four dimensions should be used to analyze the microfinance space.

There are several limitations inherent in the study. The sample used for the analysis was relatively small, taken from among the top players in the industry, so the results would not be expected to be generalisable to the entire industry. Also, the study only considered a few control factors and performance characteristics. Several other factors such as personnel and infrastructure should also have considered as control factors. Also, the cost structure of microfinance services should be investigated. There is a vast scope for further research in the area of efficiency of microfinance institutions and its drivers.

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