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DATA ENVOLOPMENT ANALYSIS (Malmquist) OF MICROFINANCE INSTITUTIONS *IN INDIA*

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Abstract
"Microfinance" is concerned with the financial service needs of poor and low-income clients groups. Financial services are offered by Microfinance Institutions in the form of provision of loans, operation of savings accounts, and other basic financial services like insurance. MFIs' prime motive is of social nature because they serve the poor people. However, they have to drive with minimum profit to outreach their performance. Under traditional method, the financial ratios are used to measure their performance. In this study, the researcher used Data Envelopment analysis to measure the efficiency of Indian MFIs collecting data for the years 2008 to 2010. This secondary data is extracted from mix market database. Output oriented model is applied under the technique of Malmquist DEA analysis. That Indian MFIs must improve their efficiency at a greater level for outreaching and sustainability is the conclusion derived from the study.

Key words: Microfinance, MFI, DEA, Efficiency.

1.Introduction

MFIs play a significant role in providing financial services, as they are exclusively established targeting the rural poor. Financial services are offered in the form of provision of loans, operation of savings accounts, and other basic financial services like insurance. MFIs' prime motive is of social nature because they serve the poor people. However, they have to drive with minimum profit to outreach their performance.

There are several legal entities of MFIs in India. The following table shows the institutional framework of MFIs in India.

Table 1: Institutional Framework of MFIs in India

Type of Financial Institutions	Institutional Ownership	Regulated by	No. of Institutions	Profit orientation
Non-Bank Finance Company (NBFC)	Private-Indian, partly or wholly foreign	RBI	50	For Profit
Section 25 companies	Private-Indian	Central Govt.	10	Not-for Profit
Co-operatives	Individuals	State Govt.	100	Commercial MFIs
Societies/Trusts	No ownership structure	Central/State Govt.	500	Not-for Profit

Source: M-CRIL 2010 Review

2. Need for the study

1. In recent year, Growth and outreach of MFIs in India as a whole are increasing on one hand but the crisis of microcredit in the southern Indian state of Andhra Pradesh which began October 2010 with a rush of client suicides on the other hand.
2. MFIs must tradeoff between crisis and sustainability.

Therefore, it is important to study the efficiency of Indian MFIs to prevent such crisis in other parts of the country.

3. Objectives of the Study

1. To measure the change in efficiency of MFIs in India during 2008 to 2010
2. To identify efficient MFIs and ranking of Indian MFIs based on their change in efficiency**.**

4. Review of Literature

Only a handful of research works on the efficiency of microfinance institutions have been conducted so far. Some of the studies and their findings are detailed below.

Table 2: Review of Literature

N	Author	Title	Objectives	Country & period	Analysis technique	Findings
1	Abdul Qayyum	Efficiency and sustainability of Microfinance Institutions in South Asia	Identify the most efficient/best practice MFI -to improve functioning of other MFI	South Asia (2006 MIX market)	DEA (constant returns to scale and variable returns to scale - input and output methods	1. Individual efficiency PAK-8 BAG-6, IND-5 efficient frontier VRS 2.Combine efficiency - BAG-3 IND-2 3. sustainability - PAK-10 , BAG - 9, IND-0
2	Tariq Masood, 2010	Technical Efficiency of Microfinance Institutions in India- A Stochastic Frontier Approach	To benchmark the best practice MFIs by assigning them ranks in order of their efficiency level. To identify the factors for efficiency level.	India 2005 - 08 MIX Market	SFA (Intermediation and Production approach) and Inefficiency model	Mean efficiency level is 0.34 - low only 18 MFIs' are above the mean efficiency. Age of the MFIs is the important determinant than its size. No tradeoff outreach and efficiency. MFIs in Southern states are more efficient.
3	Nadiya, Ramanan 2009	Probing on the Efficiency and sustainability status of Indian Micro financing Institutions: DEA application	To measure efficiency and sustainability of such efficient MFI's	India (2009 Mix Market)	DEA (input and output orientation Charnes and Rhodes Model (CCR) and Banker Charnes and Cooper Model (BCC)model. Scale parameter	14 MFIs appeared efficient across all the models. 12 MFI's are sustainable out of 14 MFIs
4	Varman, Mahendra 2008	Benchmarking Micro Finance Institutions in India and determinants of their technical efficiency	Assessing MFI's performance (outreach, Institutiononal and Financial Structure)	India (2005-2007 Mix market)	SFA	Satin Credit care and IASC are the most efficient (best practice in India)
5	Pankaj Agarwal, sinha, 2009	Financial performance of Microfinance Institutions of India	To measure overall Financial Performance	India (2008 Mix market)	Multivariate Analysis	Best Performing firms are following different business models
6	Sanjay Sinha	Efficiency with Growth, the emerging face of Indian Microfinance	To find the factors that contributes the efficiency gains in Indian Microfinance and to relate to the substantial growth in outreach.	India (2004-2005	Productivity and Unit cost analysis, Regional Analysis of Productivity	Most efficient MFIs are for-profit nonbank finance companies operate in an urban area, south India, and operations more than 5 years.

The above findings of the studies reveal the efficiency measures of MFI. They identify a number of accounting variables such as administrative expenses, operating expenses, Loan loss provision expenses, number of loans per loan officer and loan officers to total staff, Financial expenses, portfolio size, loan size, lending methodology, services offered, staffing and structure, funding, Management systems, clients, Monitoring and evaluation, constraints, source of funds and salary structure as the efficiency and effectiveness drivers.

The parametric technique of stochastic frontier analysis (SFA) and non-parametric technique of CCR and BCC models are used widely in the above studies. None of the above studies used Malmquist approach to evaluate the production efficiency factor of MFIs. Profit maximization is not the ultimate goal of MFIs; it should tradeoff between risk and outreach. Therefore, the analysis of measuring production efficiency is important and of vital usage to the Regulators and policy makers. Hence, the result of productivity per employee directly relates to the high level of efficiency of MFIs. The relationship between efficiency and productivity can be found in the study of Baumann (2005). High productivity may accomplish the economies of scale through the extensive use of group lending.

5. Data and Methodology

The data for this study is collected from secondary sources and extracted exclusively from Mix (Microfinance Information Exchange) market database. The study period taken is for 3 years from 2007-08 to 2009-10 for 51 Microfinance Institutions in India. There were 189 Indian MFIs which had reported their financial data to Microfinance Information Exchange as on June 2012. All MFIs had not furnished full-fledged financial data to Mix market database. Therefore, MFIs for this study is filtered by two criteria such as (i) those having more than 5000 borrowers and (ii) 3& above stars diamond indicator. After such filtration, there were 71 MFIs in the year 2008, 85 MFIs in the year 2009 and 89 MFIs in the year 2010. The 51 MFIs taken for study existed during the period of 3 years covered by the study. The sample DMU (Decision making Unit) must be the same to measure the productivity change among different periods.

Malmquist Index Model is used in this study to measure the productivity change. There are other models also such as Fisher index and Tornquist index to measure productivity change. Malmquist Index model is widely accepted and used as it has more merits than those of the other models. Also, this model alone allows panel data and does not require profit maximization, cost minimization and input and output prices. It gives productivity changes in two components such as technical efficiency change and technical change. DEA (Data Envelopment Analysis 2.1 version) technique is used to measure the Malmquist productivity index. DEA helps to compute the distance function i.e. is productivity change of Decision Making Units between two time periods. Malmquist Productivity Index shows result of change in productivity efficiency between two time periods. An MFI's productivity change could be due to either change in technical efficiency or change in the technology, technological progress in the industry– or both.

The total factor productivity change is the product of technical efficiency change and technological change. Technical efficiency change is decomposed into pure technical efficiency and scale efficiency change. The Malmquist index measures total factor productivity (TFP) change between two data points by calculating the ratio of the distances of each data point relative to a common technology and it requires the inputs and outputs from one time period to be mixed with the technology of another time period. This study takes up output-oriented Malmquist productivity change index. The prominence of output orientation is that within the given level of input, the output may increase equi-proportionately. Three output variables are taken to this study such as Gross Loan Portfolio, Number of Loans (ie., No.of active

borrowers) and Return on Assets. The input specification in this model has two variables – Personnel (No.of Employees) and operating expense/Loan portfolio.

The output-oriented Malmquist productivity change index can be expressed as follows:

$$M_O(x^{t+1}, y^{t+1}, x^t, y^t) = \frac{D_T^{t+1}(x^{t+1}, y^{t+1})}{D_O^t(x^t, y^t)} \left[\frac{D_O^{t+1}(x^{t+1}, y^{t+1})}{D_O^{t+1}(x^{t+1}, y^{t+1})} \frac{D_O^t(x^t, y^t)}{D_O^{t+1}(x^t, y^t)} \right]^{1/2} \quad (1)$$

Where the ratio outside the brackets is equal to the change of technical efficiency between time t and t+1, representing the change in the relative distance of the observed production from the maximum potential production; while the component inside the brackets is the geometric mean of the two productivity indexes, representing the shift in production technologies (technical change) between time t and t+1. The product of the two components (efficiency change and technical change) is the Malmquist productivity change (total factor productivity change). In addition, technical efficiency change can be further decomposed into pure technical efficiency change and scale efficiency change.

Therefore, the two terms in equation (1) are:

Efficiency change

$$= \frac{D_o^{t+1}(x^{t+1}, y^{t+1})}{D_o^t(x^t, y^t)} \quad (2)$$

Technical change

$$= \left[\frac{D_o^t(x^{t+1}, y^{t+1})}{D_o^{t+1}(x^{t+1}, y^{t+1})} \frac{D_o^t(x^t, y^t)}{D_o^{t+1}(x^t, y^t)} \right]^{1/2} \quad (3)$$

The Malmquist productivity index can be interpreted as a measure of total factor productivity (TFP) growth. Improvement in productivity, as well as improvement in efficiency and technology, is indicated by values greater than one, whereas value less than one indicate regress.

6.**Analysis Results and Discussions**

DEA technique is used for this study to measure the Malmquist Index summar.Output orientedmodel is applied. Gross Loan Portfolio, No. of active borrowers and Return on Assets are takenasoutput variables. The input specification in this model has two variables – Personnel (No.of Employees) and operating expense/Loan portfolio. The results are given in the following tables.

Table -3: Malmquist Index Summary of Annual Means

Year	Effch	Techch	Pech	Sech	Tfpch
2008-09	0.802	1.371	0.803	0.999	1.1
2009-2010	1.106	0.877	0.978	1.13	0.97
Mean	**0.942**	**1.097**	**0.886**	**1.063**	**1.033**

Table – 4: Malmquist Index Summary of Firm Means

Firm	Effch	Techch	Pech	Sech	Tfpch
Mahasemam	1.811	1.089	1.409	1.286	1.973
RGVN	1.019	1.018	0.801	1.272	1.037
Pustikar	0.602	0.981	0.7	0.86	0.591
KBSLAB	1.226	1.159	0.994	1.233	1.42
SHARE	1.046	1.297	1.016	1.03	1.357
SCNL	1.189	1.167	1.181	1.007	1.388
Sarvodaya Nano Finance	1.693	1.171	1.647	1.028	1.983
Cashpor MC	0.93	1.118	0.943	0.987	1.04
Spandana	0.465	1.054	0.473	0.982	0.49
Sanghamithra	0.666	1.143	0.714	0.932	0.761
GramaVidiyal Microfinance Ltd.	1.599	1.103	1.276	1.253	1.763
VFS	1.647	1.116	1.311	1.255	1.838
GFSPL	0.973	1.192	0.967	1.005	1.159
SKS	0.763	1.099	0.757	1.008	0.839
Bandhan	0.605	1.11	0.606	0.999	0.671
PWMACS	1.499	1.152	1.56	0.961	1.727
Janodaya	1.493	1.112	1.214	1.23	1.66
BASIX	0.782	1.098	0.737	1.061	0.859
SMSS	0.337	1.058	0.318	1.06	0.356
BISWA	0.589	0.838	0.669	0.88	0.494
RASS	0.607	1.013	0.632	0.96	0.614
ESAF	1.186	1.344	1.499	0.791	1.595
SKDRDP	1.134	1.21	1.126	1.008	1.373
Ujjivan	1.126	1.079	1.012	1.113	1.216
BSS	1.228	1.144	0.906	1.355	1.404
SEWA Bank	1.097	1.151	0.968	1.133	1.263
GU	0.907	1.06	1.015	0.894	0.962
Saadhana	0.811	1.084	0.729	1.112	0.878
AML	0.563	1.036	0.595	0.945	0.583
SWAWS	1.293	1.111	1.093	1.183	1.436
ABCRDM	1.27	1.116	1.12	1.134	1.418
CReSA	0.934	1.27	0.962	0.972	1.187
MMFL	0.29	0.916	0.302	0.958	0.265
HiH	2.021	1.003	2.222	0.909	2.027
Arohan	0.777	1.066	0.77	1.009	0.829
Sonata	1.472	0.97	0.871	1.689	1.428
BWDA Finance	0.529	1.051	0.612	0.865	0.556
Mimo Finance	1.983	1.296	1.808	1.097	2.57
NBJK	0.504	1.006	0.582	0.866	0.507
Adhikar	0.925	1.039	0.83	1.115	0.961
Asomi	1.243	1.153	0.505	2.459	1.432
Mahashakti	0.655	1.063	0.691	0.948	0.696

GOF	0.884	1.149	0.848	1.043	1.016
SU	0.863	1.065	0.739	1.167	0.919
NEED	1.003	1.15	1.063	0.944	1.153
Sarala	1.257	1.042	1.119	1.123	1.309
Equitas	0.51	1.149	0.537	0.949	0.585
Indur MACS	1.256	1.03	1.238	1.015	1.294
Trident Microfinance	1.188	1.165	1.051	1.13	1.383
SMILE	1.027	1.059	1.175	0.874	1.088
Asirvad	0.879	1.062	0.769	1.143	0.933
Mean	**0.942**	**1.097**	**0.886**	**1.063**	**1.033**

Effch – Technical Efficiency Change (TEC)
Techch - Technological Change (TC)
Pech - Pure Technical Efficiency Change
Sech - Scale Efficiency Change
Tfpch - Total Factor Productivity Change (Malmquist)
Firm – Microfinance Instituions

Table - 3 shows the changes in productivity over the period of study. It may be noted that the total factor productivity (TFP) is greater than 1 in the study period of 2008-09, which indicates progress in efficiency. But in the next period (2009-10) the value of total factor productivity is less than 1 which indicates regress. On the whole, the average productivity change is 3.3% per year. The annual rate of technological change is 9.7% and the technical change is in negative value of - .58%. It may be inferred that MFIs performance is inadequate and it should increase its efficiency level.

Table – 4 shows the changes in productivity of 51 MFIs during the study period. The performance efficiency is good (i.e., greater than 1) 30% of MFIs i.e., 30 out of 51 sample MFIs. Only 21 MFIs (i.e. 40% of the sample) performance is regress. Mimo Finance and HiH (Hand in Hand) MFIs have greater change (ie. more than 100% efficiency level). MMFL and SMSS MFIs are very poor in the efficiency change.

Table -5: Ranking based on change in Efficiency

Efficient MFIs in India			**Inefficient MFIs in India**		
Mimo Finance	2.57	1	GU	0.962	31
HiH	2.027	2	Adhikar	0.961	32
Sarvodaya Nano Finance	1.983	3	Asirvad	0.933	33
Mahasemam	1.973	4	SU	0.919	34
VFS	1.838	5	Saadhana	0.878	35
Grama Vidiyal Microfinance Ltd.	1.763	6	BASIX	0.859	36
PWMACS	1.727	7	SKS	0.839	37
Janodaya	1.66	8	Arohan	0.829	38
ESAF	1.595	9	Sanghamithra	0.761	39
SWAWS	1.436	10	Mahashakti	0.696	40
Asomi	1.432	11	Bandhan	0.671	41
Sonata	1.428	12	RASS	0.614	42
KBSLAB	1.42	13	Pustikar	0.591	43
ABCRDM	1.418	14	Equitas	0.585	44

BSS	1.404	15	AML	0.583	45
SCNL	1.388	16	BWDA Finance	0.556	46
Trident Microfinance	1.383	17	NBJK	0.507	47
SKDRDP	1.373	18	BISWA	0.494	48
SHARE	1.357	19	Spandana	0.49	49
Sarala	1.309	20	SMSS	0.356	50
Indur MACS	1.294	21	MMFL	0.265	51
SEWA Bank	1.263	22			
Ujjivan	1.216	23			
CReSA	1.187	24			
GFSPL	1.159	25			
NEED	1.153	26			
SMILE	1.088	27			
Cashpor MC	1.04	28			
RGVN	1.037	29			
GOF	1.016	30			

7. Conclusion

The panel dataset of 765 observations are used from 51 Indian MFIs over the period of 2008-10 to measure the Malmquist productivity index. On the whole average scale efficiency change rather than the pure technical efficiency is efficient. That means the management practices of Indian MFIs should improve for its sustainability.