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Stochastic Frontier Analysis (SFA) Of Production Function Of Micro Finance Institutions' (Mfis) In South Asia

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Abstract

This study aims to measure Technical Efficiency and to identify the determinants of technical efficiency of MFIs in South Asia. Technical Efficiency means efficiency of MFIs in utilizing input to generate output. Methodologically, Efficiency of MFIs are measured under Stochastic Frontier Analysis (SFA) of Production Function and the determinants are identified under SFA Production inefficiency model. Five years balanced panel data of MFIs were taken from Mix Market database. Maximum Likelihood Estimates of MFIs in the region of South Asia are obtained under SFA Production function. The researchers have taken two inputs variables, one output variables i.e., Personnel, Cost per Borrower, Gross Loan Portfolio and thirteen explanatory variables. The likely-hood Ratio is significant and positive in Region of South Asia based on the critical value of Kodde and Palm. The five years Annual Mean Technical Efficiency of MFIs in the region of South Asia are 31%, 34%, 37%, 40% & 43%. In the region of South Asia, only seven MFIs are identified as Highly Efficient (TE scores ≥ 70%) out of 150 MFIs.

Keywords: Microfinance Institutions, Technical Efficiency, SFA, South Asia, Determinants, Production inefficiency model.

Part I- Introduction

According to Robinson (2001), the Government subsidies and donor funds are inadequate for Global microfinance demand. Hence, self-sufficiency of MFIs is the only option to meet out the demand for lower-income people worldwide. Only efficient MFIs can accomplish their social objectives in a sustainable way in the long run. Therefore, efficiency, outreach and sustainability are the souls of MFIs. This study aims to measure Technical Efficiency and deliberates to identify determinants of Production Efficiency of MFIs in South Asia. Technical Efficiency means efficiency of MFIs in utilizing input to generate output. Methodologically, Efficiency of MFIs are

measured under Stochastic Frontier Analysis (SFA) of Production Function and the determinants of production efficiency are identified under SFA Inefficiency Effect Model

Part II - Review of Literature

Farhana Ferdousi (2013) study aimed to benchmark the best practice MFIs in three Asian countries namely Bangladesh, India and China. DEA model was used to measure the Technical Efficiency. MFIs in Bangladesh were more efficient under VRS technology. **Tahir and Tahrim (2014)** study examined the efficiency and productivity of MFIs in Cambodia for the period of 2008 to 2011 and DEA model and the MFIs' scores were 92% overall efficiency. **Lebovics et al. (2014):** The study measured Technical Efficiency of 28 MFI in Vietnam using DEA technique. **Bereket Zerai Gebremichael Hailemichael Tesfay Gessesse (2016):** The study measured the Technical Efficiency of 134 MFIs in Africa using both SFA and DEA (VRS) model for the year 2011. **Phares Ochola (2016):** The study evaluated the Efficiency of MFIs in Kenya using DEA technique. Total operating expenses & total assets (inputs variables) and financial revenue & GLP (output variables) were taken for the analysis. **Muhammad Mohsin et al. (2019):** This study aims to measure only financial and social efficiency of 22 MFIs in Pakistan for the period of 2010-2016. **Oikawa Cordeiro and Beatriz (2020):** This paper aims to understand the social practices, power relations and institutional infrastructure surrounding microfinance, taking the Global South as a starting point and focusing on Brazil. **Joyeeta Deb & Ram Pratap Sinha (2021):** The study estimated 75 MFIs' technical efficiency (TE) scores under DEA, to establish the association between the competitions of India and Bangladesh. **Nisha Bharti and Sushant Malik (2021):** – This study aims to compare the efficiency of MFIs across the various size of MFIs based on their asset, i.e. large, medium and small.

Part III - Research Methodology

Research Questions:

1. What are the measures of Technical or Production Efficiency of MFIs?
2. What are the factors influencing Technical Efficiency of MFIs?

Objectives of the Research:

- To measure Technical Efficiency of MFIs and Identify the highly efficient MFIs in the region of South Asia.
- To identify the determinants of Technical Efficiency of MFIs in South Asia.

Sample data:

The balanced panel data of 150 MFIs with 750 observations for the period of 2013 to 2017 were taken as sample from the MIX-market database.

Model Specification -I :

Frontier software version 4.1 is used to obtain the measures of Technical Efficiency and Maximum Likelihood Estimates under Frontier Production Function. The panel data are assumed to be distributed as truncated normal random variables and time factor is considered and the equation is expressed as:

$$\mathbf{Y_{it} = x_{it}\beta + (V_{it} - U_{it})\ i=1,..., N, t=1,...,T, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1).}$$

The Stochastic Frontier Production Function is specified in this study as

$$\text{Ln } \mathbf{Y(GLP)_{it} = \beta 0 + \ln \beta_1 (P)_{it} + \ln \beta_2 (CPB)_{it} + (V_{it} - U_{it})}$$

Hypothesis Testing – Model I:

H_0: Null hypothesis **(H_0:$\gamma = \mu = \eta = 0$)** specifies that Technical Efficiency is equal to zero and there is no significant changes in Technical Efficiency over the period of time.

H_1: Alternative hypothesis (**H_1:$\gamma \neq \mu \neq \eta \neq o$)** specifies that Technical Efficiency is not equal to zero and there is significant changes in Technical Efficiency over the period of time.

$\gamma = 0$ specifies that Technical Efficiency is equal to zero, **$\mu = 0$** represents no effect (+/-) on mean estimation of truncated normal distribution and Eta (**$\eta = 0$)** indicates no increase or decrease of efficiency over a period of time. Likely-hood test ratio is tested @ 5% level of significance based on the critical value table of Kodde and Palm (1986). The parameters of Maximum Likely-hood estimates are tested based on 't' test @ 5% level of significance.

Model Specification - II:

Frontier software version 4.1 is utilised for identifying the determinants of production efficiency under Frontier Production Inefficiency (SFA) model. Battese and Coelli (1995–Model-2) is applied and the equation is specified given below:

$$\text{Ln } \mathbf{Y(GLP)_{it} = \beta 0 + \beta_1 \ln (P)_{it} + \beta_2 \ln (CPB)_{it} + (V_{it} - U_{it})} \quad \mathbf{\ldots\ldots(1)}$$

- **Ln (GLP_{it}**) represents logarithm (natural log) of total Gross loan portfolio of i MFI at time 't' (5 years),
- ln **$(P)_{it}$** represents logarithm of total number of staff members (personnel) of 'i' MFI at time 't' (5 years).
- ln **$(CPB)_{it}$** represents logarithm of Cost per borrower (operating expenses/ Number of borrowers) of 'i' MFI at time 't' (5 years).
- **V_{it}** parmeters to be estimated is the random disturbance term and
- **U_{it}** is the inefficiency term.

The Production Inefficiency effect model equation is described as:

$$\mathbf{U_{it} = \delta_0 + \delta_1 z_{it} + \delta_2 z_{it} + \delta_3 z_{it} + \delta_4 z_{it} + \ldots\ldots \delta_{13} z_{it}} \quad \ldots\ldots\ldots\ldots\ldots\ldots 2$$

The Production Inefficiency Effect model specified in this study is as follows:-

$$\mathbf{u_{it} = \delta_0 + \delta_1 LO + \delta_2 NAB + \delta_3 Age + \delta_4 CLS + \delta_5 Outreach + \delta_6 Deposits + \delta_7 Assets + \delta_8 Scale + \delta_9 DER + \delta_{10} CAR + \delta_{11} BPL + \delta_{12} RS + \delta_{13} PS + v_{it}} \ldots\ldots \textbf{equation 2}$$

δ_1 to δ_{13} are explanatory variables and these are explained in selection of variables in this chapter. This model provides the Maximum Likelihood Estimates with random effects time varying production inefficiency.

Hypothesis Testing – Model II

H_0: Null hypothesis (**H0:γ=δi=0)** specifies that Production Inefficiency (**γ)** is equal to zero and there is no significant effects of determinants (**δi**) on Production Inefficiency.

H_1: Alternative hypothesis (**H_1:γ≠δi≠o)** specifies that Production Inefficiency (**γ)** is not equal to zero and there is significant effects of determinants (**δi**) on Production Inefficiency.

The explanatory variable**s (δi)** test statistics are tested **@**5% level of significance level based on t-statistic. The Likelihood ratio test is tested for the overall Maximum Likelihood Estimates of half normal distribution (one sided error). The critical value is taken from Kodde & Palm table @ 5% level of significance. The number of restrictions is considered as degrees of freedom.

Selection of Variables – Model I

The definition of input and output variables used in this study is based on the Mix market nomenclature. The researcher has taken two inputs and one output i.e., Personnel, Cost per Borrower and Gross Loan Portfolio. The input of Personnel is an important factor of production i.e., labour. The process of lending loans, accepting deposits and other services provided by MFI involves labour. Moreover, it has widely been taken as input variable in the earlier literature (Samuel Kobina Annim, 2010). Hence, No. of Employees is taken as input variable in this study. The second input variable is Cost per Borrower which indicates operating expenses of MFIs. It has been employed in several studies (Qayyum & Ahamad, 2006; Haq et al., 2010; Segun & Anjugam, 2013) as an input variable. Generally, the outcome of financial institution is mainly on profit. Even though, the MFIs nature is similar to financial institutions, it differs from their motive. The prime motive is providing loans to poor people. Hence, their primary objective is expanding loan outreach. Therefore, Gross loan portfolio is taken as output variable in this study.

Selection of Variables - Model II

Two input variables (Personnel & Cost per Borrower) and one output variable (Gross Loan Portfolio) have been taken which is already explained in model I. In addition to these, other explanatory variables are also taken in Production Inefficiency Effect Model. The explanatory variables (**δ_1 to δ_{13})** used in the Equation-2 are given below**:**

$$u_{it} = \delta_0 + \delta_1 LO + \delta_2 NAB + \delta_3 Age + \delta_4 CLS + \delta_5 Outreach + \delta_6 Deposits + \delta_7 Assets + \delta_8 Scale + \delta_9 DER + \delta_{10} CAR + \delta_{11} BPL + \delta_{12} RS + \delta_{13} PS + v_{it} \quad \text{.....equation 2}$$

- **δ_1 (**Loan Officers) – It represents the total number of field officers in disbursement of loan. Larger size of loan officers can deal with a greater number of borrowers. The size of loan officers may influence positively on Production Efficiency.

- δ_2 (No. of Active borrowers) – It represents total number of active borrowers of loan portfolio. Large size of Active Borrowers depicts more outreach. Large size of Borrowers may influence negatively on Production Efficiency
- δ_3 (Age) - The Arabic numbers 1, 2 & 3 are assigned to new, young and matured MFIs. Matured MFIs could be more efficient than young or new institutions. Hence, experience may influence positively on Production Efficiency.
- δ_4 (Current Legal status) - The Arabic numbers 1, 2, 3, 4 & 5 are assigned to Credit unions, NBFIs, NGOs, Banks & Rural Banks and others respectively. Credit Unions & Banks are organized sectors and NBFIs, NGOs & others are unorganized sectors. Organized sectors' efficiency may influence positively on their Production Efficiency while unorganized sectors' efficiency may influence negatively on Production Efficiency.
- δ_5 (Outreach) - The Arabic numbers 1, 2 & 3 are assigned to small, medium and large size of outreach (loan disbursement). MFIs are more efficient, when their outreach is smaller and efficiency is weaker, when outreach is larger in size. The social objective of MFIs is to maximize the outreach, but efficiency may reduce while expanding outreach. Hence, large size of outreach may influence negatively on Production Efficiency.
- δ_6 (Deposits) – Deposits are measured in terms of dollar. They fetch additional source of capital for granting loan, conversely acceptance of a greater number of deposits absorbs more administration cost. Hence, large size of deposits may influence negatively on Production Efficiency.
- δ_7 (Assets) - Assets are expressed in terms of dollars and it denotes size of business. Larger size of assets may influence positively on Production Efficiency.
- δ_8 (Scale) – The Arabic numbers 1, 2 & 3 are assigned to small, medium and large, size (scale) of organization. Large scale of business operation leads to enjoy economy of scale. Hence, large scale of MFIs may positively influence on Production Efficiency.
- δ_9 (Debt Equity ratio) - It represents firm's financial leverage. A high ratio denotes aggressive use of debt and it leads for more lending. Hence, high ratio of debt equity ratio may influence positively on Production Efficiency.
- δ_{10} (Capital Asset Ratio) – This ratio measures sufficiency of capital to support its assets. A high Capital Asset ratio may influence positively on Production Efficiency.
- δ_{11} (Borrower per Loan Officer) - I_t is measured as total number of active borrowers divided by the number of Loan officers. It is the indicator of staff productivity to estimate their significance on the performance of MFIs. The higher the ratio of BPL, greater is the productivity of the field officer. Hence, high ratio of BPL may influence positively on Production Efficiency.
- δ_{12} (Registration status) - The number '1' indicates that MFIs are registered and the number '0' denotes unregistered MFIs. MFIs' Registration status could gain goodwill. Hence, Registered MFIs may have positive impact on Production Efficiency.
- δ_{13} (Profit status) - The number 1 and 0 denote profitable MFIs and non-profitable MFIs respectively. Profit is an indicator of financial sustainability of MFIs. Financially sustainable

MFIs are more efficient than unsustainable MFIs. Hence, profitable MFIs may influence positively on Production Efficiency.

LIMITATIONS OF THE STUDY

- Period of the study is limited to 5 years from 2013 to 2017.
- The data is taken from only MIX market database.

Part IV - Empirical Results and Inferences

Technical Efficiency – Model I

Maximum Likelihood Estimates of MFIs in the region of South Asia are obtained under SFA Production function and they are given in **Table – I.** The parameters of the Maximum Likelihood Estimates of **β1 and β2** represents coefficient of input variables of cost per borrower and personnel respectively. Both of them are significant @ 5% level of significance. The co-efficient of β1 is -0.23 and negative which indicates that the input elasticity of personnel is Diminishing Return to Scale. The co-efficient of β2 is 1.168 and positive which indicates that the input elasticity of cost per borrower is Increasing Returns to Scale (IRS).

Table 1. The MLE Estimates

	Coeff.	SE	t-ratio
beta 0	11.400	0.162	70.263
beta 1	-0.230	0.036	6.428
beta 2	1.168	0.021	56.888
sigma-squared	0.290	0.027	10.835
gamma	0.608	0.028	22.089
mu	0.840	0.109	7.702
eta	0.089	0.013	6.990
Log likelihood function = -453.986			
Likelyhood Ratio = 454.845			

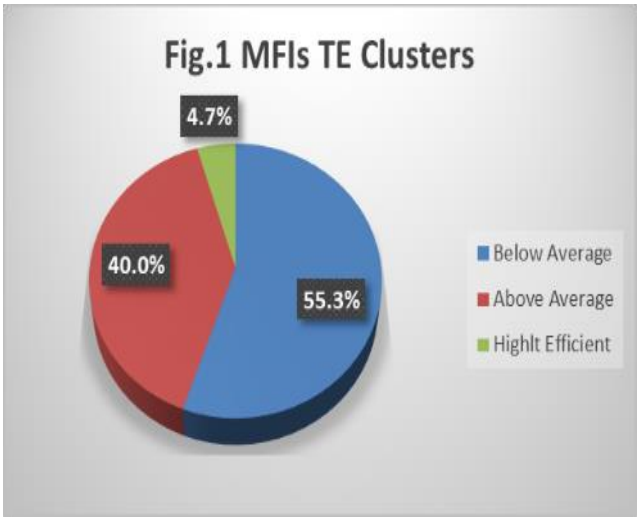
The estimation of **sigma-squared** indicates overall variance and it is significant @5% level of significance in this region. The coefficient of sigma square is 0.29 which reveals that the input variances are marginally influenced in production process. **Gamma (γ)** denotes overall variance of inefficiency term. It is statistically significant @5% level of significance. The coefficient of gamma is **60.8%** which shows that remarkable differences in output is due to the differences in inefficiency of MFIs. **Mu (μ)** statistic denotes Mean estimation of truncated normal distribution of variables and the coefficient of Mu is significant and positive in this region. **Eta (η)** statistic specifies that TE scores increases or decreases over a period of time. The positive and significant coefficient of eta shows that the average Technical Efficiency increases by 8.9% during the period of five years in the region of South Asia.

The likely-hood Ratio (454.845) is significant and positive in this Region based on the critical value (7.045) of Kodde and Palm. The null hypothesis (**H_0:γ=μ=η=0)** is specified that the Technical Efficiency is equal to zero and there is no changes in the Technical Efficiency over the period of time. The five years Annual Mean Technical Efficiency of MFIs in this region are 31%, 34%, 37%, 40% & 43%. Therefore, the alternative hypothesis (**H_1:γ≠μ≠η≠o)** is accepted that the Technical Efficiency of MFIs in South Asia is not equal to zero and there is significant changes in Technical Efficiency over the period of time.

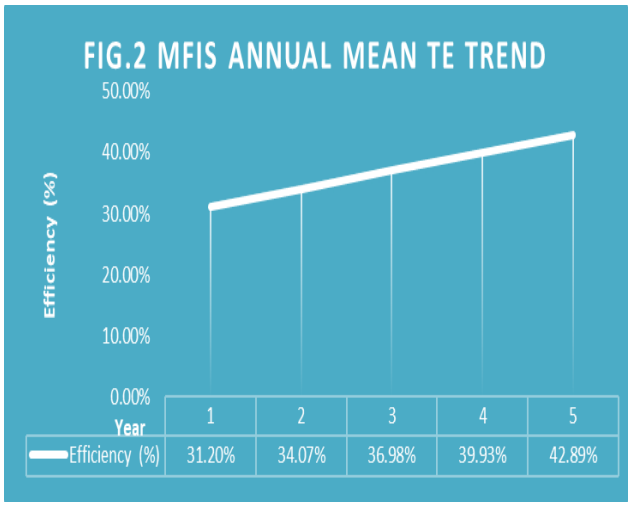
Technical Efficiency Scores

Table 2. Segmentation of TE

TE Level	Group	No.of MFIs	No.of Obs.	%
Below Average	1	83	415	55.3%
Above Average	2	60	300	40.0%
Highlt Efficient	3	7	35	4.7%
	Total	150	750	100.0%



The result of individual MFIs' Technical Efficiency scores of South Asia Region during the period from 2013 to 2017 are obtained under Production function. The Average Annual Mean TE score of MFIs in this region is 37%. Based on this Mean score, MFIs' TE scores are segmented into three Clusters namely, Below-Average, Average & Above-Average and Highly-Efficient and it is portrayed in **Table - 2 & Fig.1**. The percentage of MFIs in Below-Average cluster is too high (55.3%) than Average & Above-Average and Highly-Efficient categories (40% & 4.7% respectively). It reveals that more numbers of MFIs (83) in this region are operating under less efficient utilization of inputs, but these MFIs have scope for future progress. The trend of Annual Means of MFIs in the region of South Asia is shown in **Fig.2**. The trend line shows that the efficiency progress is upward linear and moderated degree of progress over the period of 5 years. The upward movement of trend indicates that there is progress in their production efficiency performance over the period.



Only seven MFIs in this region have higher TE Efficiency scores and their corresponding TE scores over 5 years are presented in **Table 3.** They are located in the countries of India (BSS, Future Financial, Gramalaya, RASS, Sanghamithra and Varam), and Nepal (JBS). **RASS and Varam** MFIs have above 80% Technical Efficiency scores. Hence, they are identified as Highly Efficient (best practicing) in the region of South Asia.

Table 3 Highly Efficient MFIs' Technical Efficiency Scores

MFI No.	MFI Name	Country	TE1	TE2	TE3	TE4	TE5	Average
30	BSS (101051)	India	66%	68%	71%	73%	75%	71%
54	Future Financial (114764)	India	71%	73%	75%	77%	79%	75%
57	Gramalaya Microfin (152748)	India	67%	69%	72%	74%	75%	71%
69	JBS (100148)	Nepal	76%	78%	79%	81%	82%	79%
105	**RASS (100822)**	**India**	**79%**	**80%**	**82%**	**83%**	**84%**	**82%**
116	Sanghamithra (100031)	India	74%	76%	78%	79%	81%	78%
145	**Varam (169015)**	**India**	**78%**	**80%**	**81%**	**83%**	**84%**	**81%**

Production Inefficiency Model II

In the region of South Asia, 150 MFIs with 750 observations are taken for the study of determinants of Production Efficiency for the period of five years from 2013 to 2017. **Table 4.** provides descriptive statistics of variables which are used in this study and it discloses remarkable differences between minimum and maximum statistics of all variables. **Table 5** shows the parameters of the Maximum Likelihood Estimates of the Production Inefficiency model of the South Asia region.

Table 4 Descriptive Statistics

Vars.	*N*	*Min.*	*Max.*	*Mean*	*SD*
SGLP	750	9.28	20.73	16.14	1.85
P	750	1.61	10.19	5.98	1.63
CPB	750	0.55	5.96	3.03	0.82
delta1	750	1.00	1.8E+04	9.4E+02	2.5E+03
delta2	750	382.00	6.7E+06	3.8E+05	1.1E+06
delta3	750	1.00	3.00	2.56	0.71
delta4	750	1.00	5.00	2.74	0.73
delta5	750	1.00	3.00	2.51	0.73
delta6	750	0.00	1.7E+09	2.0E+07	1.3E+08
delta7	750	1.9E+05	1.9E+09	7.1E+07	2.0E+08
delta8	750	1.00	3.00	2.34	0.79
delta9	750	-123.00	107.00	5.58	11.49
delta10	750	-1.15	0.98	0.21	0.22
delta11	750	7.86	1.08E+04	504.21	851.00
delta12	750	0.00	1.00	0.71	0.46
delta13	750	0.00	1.00	0.48	0.50

Table -5 Maximum Likelyhood Estimates

Vars.	Coeff.	SE	t-ratio	Sig
beta 0	11.4041	0.9374	12.1652	
beta 1	0.8849	0.0742	11.9249	sig
beta 2	0.0470	0.1566	0.3004	
delta 0	0.3716	0.9794	0.3794	
delta 1	0.0002	0.0002	1.0395	
delta 2	0.0000	0.0000	-0.7334	
delta 3	0.0898	0.3024	0.2968	
delta 4	0.3787	0.2097	1.8064	sig*
delta 5	0.1705	0.5957	0.2862	
delta 6	0.0000	0.0000	0.0725	
delta 7	0.0000	0.0000	-0.4561	
delta 8	-0.5945	0.5297	-1.1223	
delta 9	-0.0140	0.0068	-2.0568	sig
delta10	0.4049	0.9280	0.4363	
delta11	-0.0006	0.0001	-6.0783	sig
delta12	0.3069	0.7054	0.4351	
delta13	-0.1025	0.9843	-0.1041	
sig.-sqd.	0.7183	0.1497	4.7986	sig
gamma	0.6001	0.0888	6.7543	sig
log likelihood function = -634.30233				
LR test of the one-sided error = 172.5738				

The parameters of Maximum Likelihood Estimates under frontier production function indicates that the parameter **β1 (**personnel**)** is positive and significant at 5% level of significance based on 't' test. The coefficient of other input variable **β2** (cost per borrower) is also positive but not significant. The coefficient of input variables personnel and cost per borrower are 88.49% & 4.7% respectively and they indicate the elasticity of input to the output differences. The parameters δ_1 to δ_{13} represent Coefficient of explanatory variables which could influence Production Inefficiency of MFIs. The 't' test result indicates that the variables Current Legal status, Debt to equity ratio and Borrower per Loan Officer (δ_4, δ_9 & δ_{11} respectively) are statistically significant @5% level of significance. They are detailed below:-

- The positive coefficient of variable δ_4 (Current Legal Status to Production Inefficiency) denotes that unorganized MFIs i.e. NBFI and NGOs are more efficient than organized sectors i.e. Banks and credit unions/co-operatives.
- The negative coefficient of variable δ_9 (Debt to equity ratio) indicates positive impact on Production Efficiency. MFIs with higher Debt-Equity ratio are more efficient.
- The negative coefficient of variable **(δ_{11})** Borrower per Loan Officer to inefficiency indicates that the inefficiency decreases, when increasing the ratio of Borrower per Loan Officer.

The Coefficient of other explanatory variables namely δ_1 – Loan Officers,δ_2 – Number of Active borrowers, δ_3 –Age, δ_5 – Outreach, δ_6 – Deposits, δ_7 – Assets, δ_8 – Scale, δ_{10} – Capital Asset Ratio, δ_{12} – Registration status, δ_{13} – Profit status are not significant @ 5% level of significance in this region. Hence, these variables are not the determinants of efficiency.

The coefficient of **sigma-squared** is significant @5% level of significance in the region of South Asia. The coefficient of sigma square (71.8%) reveals that input variances are influencing the production of output. The coefficient of '**γ**' is 60% reveals that the percentage variation in output among the MFIs is due to the differences inefficiency effect. The estimated value of the overall variance parameter **Gama** (**γ**) is statistically significant @5% level in the region of South Asia based on 't' test.

Likelihood Ratio is 172.57 and it exceeds the critical value (7.045) of Kodde & Palm at 5% with 3 degrees of freedom (number of restrictions). And also there is significant effect of the explanatory variables δ_4, δ_9 & δ_{11} on Production Inefficiency. Hence, Null hypothesis (**H0:γ=δi=0)** is rejected that Production Inefficiency (**γ**) is equal to zero and there is no significant effects of determinants (**δ_i**) on Production Inefficiency and Alternative hypothesis (**H_1:γ≠δi≠o)** is accepted that Production Inefficiency (**γ**) is not equal to zero and that there is significant effects of determinants (**δ_i**) on Production Inefficiency.

Part – V Findings

Technical Efficiency of Micro Finance Institutions is estimated under the model of Stochastic Frontier Analysis (SFA) under Production Function and the findings are mentioned hereunder:

- The Log likely-hood Ratio is significant and positive in South Asia.

- Estimated value of the parameter **Gama (γ)** is statistically significant @ 95% confidence interval in South Asia i.e. (γ) **60.8%**. The value of Gama represents the proportion of variation in output among MFIs is due to the differences in their level of inefficiency.
- The Mu (**μ)** statistic is significant @ 5% level of significance and positive. It specifies that Mean Technical Efficiency increases marginally over the period of 5 years.
- The **eta (η)** statistic is positive and significant. The positive and significant eta represents that TE increases over a period of time.
- The Coefficient of parameters of **β2** is positive and significant @95% confidence interval. The coefficient of **β2 (**Personnel) signifies that the input elasticity of personnel is Increasing Returns to Scale (IRS).
- The Coefficient of parameters of **β1** is negative and significant @95% confidence interval. The co-efficient of **β1** (Cost per Borrower) specifies that the input elasticity of Cost per Borrower is Diminishing Return to Scale.
- Estimation of **sigma-squared** is overall variance and significant @5% level of significance which reveals the influence of input variances in production process.
- The Average Annual Mean Technical Efficiency scores of MFIs in South Asia is **37%**. The Annual Mean Technical Efficiency trend lines are moving upward linear, but lower degree of progress over the period of 5 years. Increase in Production Efficiency tends to enlarge Gross Loan Portfolio (Outreach).
- Large numbers (percentage) of MFIs have fallen under the cluster of Below Average (i.e. SA-55.3%). 40% of MFIs have fallen under the cluster of Average & Above and only 4.7% of MFIs have fallen under Highly Efficient Cluster (i.e. above 70% TE scores).
- In the **region of South Asia**, six MFIs in Indian (BSS, Future Financial, Gramalaya, RASS, Sanghamithra and Varam) and one MFI in Nepal (JBS) are identified as Highly Efficient (TE scores ≥ 70%) out of 150 MFIs.
- The variables δ_4, δ_9 & δ_{11} (Legal status, Debt to equity ratio & Borrower per Loan Officer respectively) are statistically significant @5% level of significance. The negative coefficients of δ_9 & δ_{11} variables have positive effect on Production Efficiency and the positive coefficient of δ_4 variable has negative impact on Production Efficiency of MFIs in this region.

Part – VI Conclusion

According to the study of Qayyum & Ahmad (2006) – "inefficiencies in the region of south Asia is due to technical nature, which requires more managerial and technological improvements". It is observed that the reason for lower efficiency in the industry is due to poor input utilization and operating in non-productive scale size. Further, the determinant factors of efficiency are identified in the study to improve the performance of MFIs, namely Assets, Scale and ratio of Borrower per Loan offices. The determinant factors are having positive impact on Productive Efficiency of MFIs in the region of South Asia, which indicates that MFIs, gained more productive efficiency, when they enlarged their operation. This finding is also substantiated in the study of Bereket Zerai Gebremichael (2013), which states that "large MFIs are found to be the most efficient than the

small and medium sized MFIs. It is concluded that in order to enhance the efficiency of MFIs, the institutions must thrive hard to sustain and increase number of borrowers, interest on loans being one of the major sources of financing in MFIs. But at the same time, MFIs are advised to reduce the rate of interest on loan to sustain their clients as well as to avoid default risk in repayment. Furthermore, MFIs must endeavor to enhance and stabilize their capital structures in order to enhance their performance. Capital adequacy would also be positively influenced efficiency of MFIs.

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