Performance Evaluation of SME Banking in Bangladesh using Stochastic Frontier Analysis

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Abstract

Small and Medium Enterprises (SMEs) are suitable to provide employment with lower investment in densely populated countries like Bangladesh. A stochastic frontier model is used to evaluate performance of SME Banking of the commercial banks in Bangladesh. Input (Total Deposit, Cost of Fund and Salary Expenditure) and output (Finance to SME) data are collected on 45 banks which are dealt with SME for 13 quarters from 1st quarter of 2010 to 2nd quarter of 2013. Average performance of the SME banking is 0.716 in Bangladesh. That is, banks have opportunity to increase 30% performance in SME banking from the same inputs. Bangladesh Development Bank has lowest performance (0.540) while Eastern bank has the highest performance (0.753). Highest (0.743) and lowest (0.662) performance is observed during the second quarter of 2013 and fourth quarter of 2010 respectively. Inefficient Bank might be benefited by following the rules of efficient banks.

1. Introduction

Small and Medium Enterprises (SMEs) play a vital role considered as the backbone of industrial development of a country. It is raising sector and suitable to provide employment with lower investment in densely populated countries like Bangladesh. Contribution of SME sector to GDP remained above 4% during the period from 1985-86 to 1999-00. At present, contribution of SME sector to GDP is approximately 25% and employs 25% of the total labor forces (Uddin, 2014). The participation of bank in SME is about 20% (Ahmed and Chowdhury, 2009) and act as the most cost-effective and worthwhile means of providing employment and injecting dynamism into industrial growth, both for poverty alleviation and for contribution to the GDP. At present SME sector

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is facing a lot of problems. Bangladesh government is trying to develop the SME sector through different policy measures even though the rate of development which is not up to expectations.

There are growing research works on SME financing in Bangladesh (e.g. Akterujjaman, 2010; Chowdhury et al., 2013) in abroad like (Carbó-Valverde et al., 2009; Beck and Demirguc-Kunt, 2006). In Bangladesh, there have been found some literature works by Haque and Mahmud (2003), Rabbani and Suleiman (2005), Siddiquee et al. (2006), Jesmin (2009), Halder (2012), Chowdhury (2012), Sultana (2012) and Islam et al. (2013) on SME financing. These literatures were developed from different perspectives such as performance of different banks in SME financing, effect on employment generation, demand side problems and supply side responses, problems and prospects of SME financing and access to finance for SMEs etc.

A number of studies found that SMEs are frequently faced with constraints and challenges (Bannock et al. 2002; Batra and Mahmood 2001; Batra and Tan 2003; Beck et al. 2004; Brunetti et al. 1998). For most developing and transition economies, the common challenges for SMEs typically include financing, overcoming institutional, legal and administrative barriers and accessing network support.

A few studies have been conducted on SMEs in home and abroad but no study is available on the efficiency measurement of SME banking in Bangladesh using stochastic frontier analysis. The main objective of this study is to work out efficiency of individual commercial banks in terms of SME financing. To increase in contribution of SME, the banks have to know their present performance in

SME as well as the influential factors on performance of SME banking.

2. Background of the SME

The definition of SMEs is not unique, it varies across countries and the definition differs further between sectors. Number of people employed and size of capital, sales, assets, etc. are used to classify enterprises into micro, small, and medium. In Bangladesh, small enterprises was first defined in the Industrial Policy of 1991 when they were classified as industrial undertakings engaged in manufacturing or service activities with a total fixed investment not exceeding Tk 30 million. The Industrial Policy of 1999 also considered the size of employment for defining various enterprises. According to it, small enterprises are those employing less than 50 workers and/or with a fixed capital investment of less than Tk100 million. Enterprises with 50-99 workers having a fixed capita of Tk100-300 million are to be regarded as medium-sized. Therefore, the coverage of SMEs as defined by the Industrial Policy is very broad capturing business enterprises with a fixed capital ranging from Tk 1 million to 300 million and the employment from 10 to 99. The definition of 1999 industrial policy is considered to select the target population. However, the Bangladesh Bureau of Statistics (BBS) follows a different definition of SMEs. BBS defines large enterprises as those with 50 or more employees, which is inconsistent with the definition of the SMEs as provided in the Industrial Policy.

According to Bangladesh's Small and Medium Enterprises Taskforce (SMETF) report, SMEs can be defined based on amount

of capital or number of employee (Government of Bangladesh, 2004). For manufacturing industries, the Taskforce defines

(a) An enterprise would be treated as small if the replacement cost of plant, machinery, building, structures, and other parts/components, fixtures, support utility, and associated technical services (such as turn-key consultancy), etc, were to up to Tk. 10 million;

(b) An enterprise would be treated as medium if the replacement cost of plant, machinery, building, structures, and other parts/components, fixtures, support utility, and associated technical services (such as turn-key consultancy), etc, were to up to Tk. 100 million.

For non-manufacturing activities (such as trading or other services), the Taskforce defines:

(c) An enterprise would be treated as small if it has less than 25 workers, in full-time equivalents;

(d) An enterprise would be treated as medium if it has between 25 and 100 employees;

In all the definition, land is not considered to define the size of enterprise.

3. Related Work

There is a debate whether to adopt industrialization for efficiency or encourage SMEs. But the mechanical efficiency should be distinguished from economic efficiency and as such the large factories need not be evaluated as more efficient than the small units, especially when the socio-economic cost of large-scale production taken into account (Little, Majumdar and Page, 1987). The argument of economy of scale has limited relevance to economic efficiency, due to stagnant markets with poor purchasing power, lack of operational skills, poor quality of raw materials and inefficient services resulting in long interruptions and poor output per unit of capital (Dhar, 1958), and in underdeveloped areas, the development of large-scale industries has been slow, inadequate and ineffective in tackling the unemployment problems due to lack of investible resources (Mahalonabish, 1968). A wide array of constraints faced by SMEs has been briefly discussed in the study of Hossain (1998). It is apparent that problems related to power and credits are the most significant ones. Legal barriers, poor law and order conditions, are some of the other problems that have adverse effect on SMEs development. Faruq (2009) pointed out some drawbacks of SME loans. SMEs are high risk borrowers because of their inability to meet with the collateral requirements of the banks. Bankers issue loans based on the ownership of immovable property as collateral risk. So if the SMEs are unable to repay the debt, there is a chance that the bank will take ownership of their asset. For businesses that are not performing well, owing to the repayment schemes, SME loans create a burden for them rather than helping them to grow. Interest rates of SME loans are high in comparison to general loan.

According to Lall (2000), SMEs in general tend to face three sets of competitive

challenges. These are related with their size, distortions in markets and government policy interventions. Their small size imposes disadvantages: First, SMEs are debilitated in activities where the risks are high; technology is fast-paced and relies on enormous investments. Second, SMEs face 'segmented factor markets' wherein large firms are generally favored with access to inputs including credit, labor, infrastructure, and technology and market information. Third, policies and institutions can be biased against SMEs, since large firms with resources and connections can manipulate bureaucrats 'to exploit the system'.

4. Materials and Methods

Data sources and the variables

The data related to SME financing, total deposits, cost of fund and salary expenses are collected from the annual reports and other reports of individual commercial banks.

Period: First quartile, 2010 to First quartile, 2013.

Output: Total SME Finance which is the sum of Service Finance, Trade finance and Manufacturing Finance.

Inputs: Total Deposit in SME for a Bank, Cost of Fund of a Bank, Salary Expenses of a Bank.

Theoretical framework of the model

In this study, Cobb Douglas production function in stochastic frontier analysis (SFA) is considered because inputs have the property of substitution.

The functional form of Cobb Douglas production model in SFA (Battese and Coelli, 1992) can be defined as

$$\ln(Y_{it}) = \beta_0 + \sum_{i=1}^{n} \beta_i 1 n X_{it} + v_{it} - u_{it}$$

(1)

Where Y_{it} = Output in the i-th firm in the t-th period

X_{it} = input variables in the i- th firm in the t-th period

β_0, β_i = the unknown parameter to be estimated.

The systematic error component, v_{it} follows $N(0, \delta v^2)$. And u_{it} stands for technical inefficiency.

Technical efficiency (TE) is measured as the ratio of observed output to the corresponding stochastic frontier output, shown in equation (2). It measures the difference in the observed output of the firm relative to the output produce by a fully efficient firm using the same amount of inputs. It can be predicted by the following equation,

$$TE_{it} = \frac{y_{it}}{\exp(x_{it}\beta + v_{it})} = \exp(-u_{it})$$

(2)

5. Empirical SME Stochastic Frontier Model

The empirical Cobb Douglas stochastic production model for SME banking is presented in equation (3) which is a modified version of equation (1).

$$\ln(TSF) = \beta_0 + \beta_1 1 n(TD) + \beta_2 1 n(CF) + \beta_3 1 n(SE) + \beta_4 T + v_{it} - u_{it}$$

(3)

Where, TSF represents the total SME finance, TD represents the total deposit, CF represents the cost of fund, SE represents the salary expenses, and T represents the time.

6. Tobit Regression Model for Explaining Efficiency

Since the efficiency score lies in between 0 to 1 and Tobit regression is a censored regression model, Tobit regression model is appropriate to examine the influential factors on SME banking.

The Tobit model for the efficiency may be defined as:

$$\theta_p = \begin{cases} \theta_p^*; & 0 \le \theta_p^* \le 1 \\ 0; & \theta_p^* < 0 \\ 1 & \theta_p^* > 1 \end{cases}$$

$$\theta_p^* = \text{\ss}_m w_{pm} + \varepsilon_p \; ; \; \varepsilon_p \sim N(0, \sigma^2)$$

Where, θ_p is the DEA efficiency score of *p-th* DMU.

θ_p is the unobserved efficiency of *p-th* DMU.

β is the parameter to be estimated is the w_{pm} m-th factor of *p-th* DMU.

7. Results and Discussion:

Purpose of the study is to evaluate the performance of SME banking in Bangladesh. General practice of estimation of production function is Ordinary Least Square (OLS) and Maximum Likelihood (ML) (e.g. Aiger et. al., 1977). For better estimation, it is necessary to use appropriate method of estimation. Table 1 is presenting the justification of using maximum likelihood estimation. To estimate the parameters using appropriate method of estimation the following hypotheses are set:

H01: The appropriate estimation method is OLS

H11: The appropriate estimation method is ML

At 1% level of significance, there is a significant difference of estimation of production function using maximum likelihood estimation than ordinary least square estimation. That is, maximum likelihood method is appropriate to estimate the production function of SME banking in Bangladesh for the study period.

Inefficiency of Stochastic Frontier Analysis can follow half normal distribution or truncated half normal. To test the distribution of inefficiency for the data set, the following hypotheses are set up:

H02: The distribution of inefficiency is half

Table 1. Appropriate Estimation of the Parameters of Production

	Degree of Freedom	Log Likelihood	x^2
OLS	5	-831.8	
ML	8	-685.65***	292.32

Note. *** indicates significant at 1% level of significance

Table 2. Assumption of Distribution of Inefficiency for Production Function

	Degree of Freedom	Log Likelihood	x^2
Half Normal distribution	8	-685.65	
Truncated Normal distribution	6	-687.79	4.29

Table 3. Maximum Likelihood Estimate of the Production Function

Variables	Parameters	Estimates	Std. Error	z value
Intercept	β_0	2.74***	0.53	5.15
log(Total Deposit)	β_1	0.02	0.06	0.30
log(Cost of fund)	β_2	0.43***	0.09	4.57
log(salary expenses)	β_3	0.41***	0.04	11.50
Time	T	0.01	0.01	1.92
Sigma-squared	δ^2	1.52***	0.308	4.928
Gamma	γ	0.730***	0.057	12.719

Note. *** indicates significant at 1% level of significance

normal distribution

H12: The distribution of inefficiency is truncated normal distribution

From Table 2, there is no significant difference for the assumption of half normal or truncated normal distribution of inefficiency of the data. That is why any of the distribution can be considered for the study. In this study, half normal distribution is considered in stochastic frontier analysis.

The estimated value of parameters of the Cobb Douglas production function using maximum likelihood estimation is in the Table 3. The maximum-likelihood estimate of the parameters for total deposit, salary expenses and cost of fund are 0.02, 0.41 and 0.43 respectively. Expenses on salary expenses and cost of fund are found significant at 1% level of significance. Since the ratio of specific variability to total variability (γ) is significant at 1% level of significance with positive value 0.73, thus the efficiency is important in explaining the total variability of the output. Time is observed an insignificant variant that

is; time has no effect on this production function for the data.

Performance of SME banking is ranked in the Table 4. The average performance of SME banking is 0.716, whereas eastern bank ltd. has highest performance (0.753) and Bangladesh Development Bank (BDB) has the lowest performance (0.540) in SME banking. This result indicates that all the banks have opportunity to increase at least 25% SME banking facility using the same operations cost. Only 15 banks have performance less than the average which is ranked from 31 to 45. Among the National Commercial Banks (NCB), Agrani Bank Ltd is more efficient with ranked 6 whereas Rupali Bank Ltd is in the least in terms of SME Banking. Bangladesh Krishi Bank (BKB) has the highest performance in SME Banking among the Development Financial Institutes whereas BDB is in the last position in SME Banking. The top performer of SME Banking among the 45 Bank is Eastern Bank Ltd, a Private Commercial Banks (PCB). ICB Islamic Bank is the worst Private Commercial Bank in SME

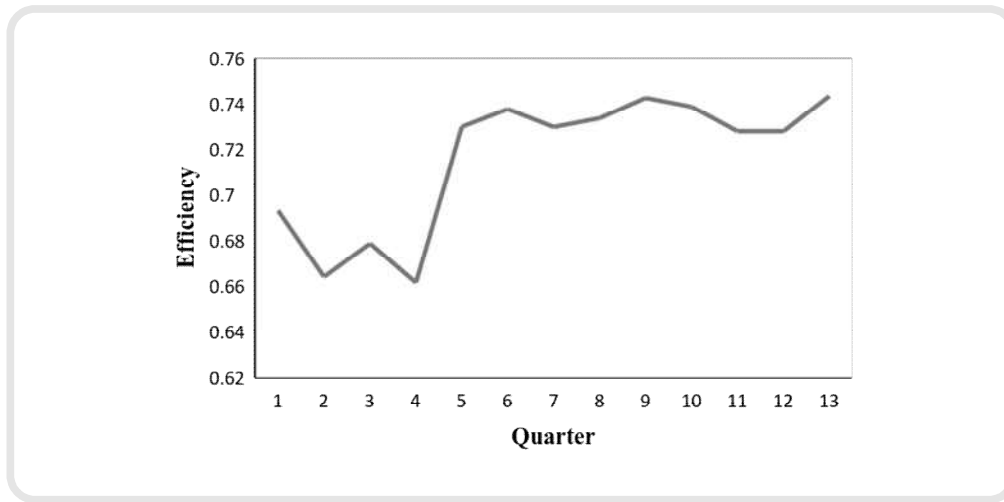**Table 4.** Ranking based on Performance of SME Banking

Bank Types	Name of Banks	Efficiency	Rank	Bank Types	Name of Banks	Efficiency	Rank
NCBs	Agrani	0.752	6		Eastern	0.753	1
	Janata	0.743	18		Exim	0.739	23
	Rupali	0.671	39		First Security	0.753	2
	Sonali	0.696	35		IFIC	0.72	30
DFIs	BASIC	0.699	34		ICB Islamic	0.593	44
	BDB	0.54	45		IBBL	0.749	11
	BKB	0.745	16		Jamuna	0.737	24
	RKUB	0.741	20		Mercantile	0.751	7
FCBs	Al-Falah	0.736	25		Mutual Trust	0.74	21
	Cylon	0.676	38		National	0.735	26
	Habib	0.752	4		NCC	0.725	28
	HSBC	0.679	37	PCBs	One	0.751	8
	NB Pakistan	0.671	40		Premier	0.687	36
	Stan.Chrt.	0.729	27		Prime	0.749	10
	St. India	0.593	43		Pubali	0.743	19
PCBs	AB	0.747	14		Shah Jalal	0.699	33
	Al-Arafa	0.752	5		Social-IBL	0.707	32
	BCBL	0.654	42		Southeast	0.655	41
	B. Asia	0.739	22		Standard	0.749	9
	BRAC	0.752	3		Trust	0.747	15
	The City	0.714	31		UCBL	0.721	29
	Dhaka	0.748	12		Uttara	0.744	17
	DBBL	0.748	13		Average	0.716	

Fig. 1. Performance according to the Types of Bank
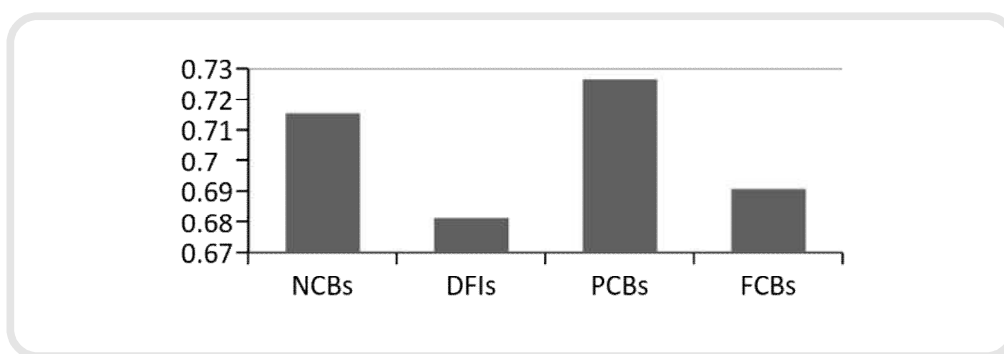
Banking. Among the Foreign Commercial Banks (FCB), Habib Bank Ltd is more efficient with ranked 4 whereas State Bank of India is in the least in terms of SME Banking in Bangladesh.

Figure 1 shows that average SME Banking performance of DFIs are lowest whereas PCBs has highest performance than other types of Bank. Islam et al (2014) also found DFIs as more vulnerable in banking performance compare to others three categories. Performance among the bank varies because

Fig. 2. Average Performance of SME Banking Overtime

Table 5. Influential Factors on Performance of SME Banking using Tobit Model

	Estimate	Std. error	t value
Intercept	0.689***	0.0076	90.545
Total Deposit	0.0000054***	0.00000089	6.076
Cost of fund	-0.0000075***	0.000002	-3.774
Salary Expenses	-0.0000033	0.000015	-0.227
No. of Entrepreneurs	-0.0000036***	0.000001	-3.499

Note. *** indicates significant at 1% level of significance

its type and related issues. Private commercial banks have several features which are keeping them ahead in performance of SME banking. One of the priority features of private commercial banks (PCBs) is a special branch for SME banking or at least a desk to support SME which is not available in other type of banks. And it is easy to get SME banking related support and loan from PCBs rather than NCBs, DFIs and FCBs.

Figure 2 shows the performance of SME banking over time. Though the study period is only 13 quartiles, after the first four quartiles the efficiency of SME banking increases and then endures almost the same level efficiency. Government of Bangladesh and central bank have taken several initiative to promote SME banking such as develop a faster system to lend money especially in rural area which was discouraging in previous.

Table 5 presents the impact of selected factors on performance of SME banking. Total deposit has positive significant impact on the performance of SME banking whereas Cost of fund and Number of entrepreneurs have negative but significant impact. The impact of salary expenses is found negative and insignificant. Total deposit, cost of fund and number of entrepreneurs of a bank are the driving force of the SME banking. When a bank will able to increase its deposit, its performance on SME banking will also be

positively moved forward. Excessive cost and number of entrepreneurs is a cause downward performance on SME banking. Expense on salary is also a cause of downward performance however, it has no significant impact.

For this study, only 13 quarter is considered and variables were are also limited. In future research, more variable can be added with longer study period.

8. Conclusion

For this study, maximum likelihood estimation is appropriate method to estimate the parameters of Cobb Douglas production function for measuring performance of SME Banking in Bangladesh. From this study, it may be concluded that all the banks which are operating SME banking have opportunity to increase finance on SME using the same expense they bearing. Development Financial Institutes are recorded lowest in the performance of SME banking. Over the time, performance of SME finance is increased. On the performance of SME banking, only deposit is observed positively significant impact. Salary expenses have negative but not significant influence on the performance of SME banking. Among the all banks, Eastern Bank Limited has highest efficiency whereas Bangladesh Development Bank which is a financial institute has lowest efficiency.

In Bangladesh, high lending rate surfaced as the biggest constraint in the growth of SMEs. Regulatory constraints related to utility and labor comes in second position. It indicates that policies should be consistent without surprises. Small firms in particular must be given an adequate moratorium' to let them

adjust to new changes and that extra attention must be paid to safeguard SMEs against 'bureaucratic discretions'. Collateral need and small domestic market size, lack of technically skilled workers, lack of physical input (Raw materials), unavailability of financing and high equipment cost, lack of protective measures and uncertainty also shows lack of government support to assist SMEs to compete in global arena.

Existing studies about SME financing problems are not adequate. Hence, a detailed study regarding the financing problems of SME sector is of great importance.

9. Acknowledgment

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