Measuring the Efficiency of Commercial Banks in Bangladesh: A Stochastic Frontier Approach

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Bank Efficiency

- Bank's performance measurement is one of the most important agendas in today's business world
- Because, Failure to do some satisfactory performance may damage the bank's reputation
- That is why, banks not only need to be profitable but also efficient

Reasons of Choosing Bangladeshi Bank Efficiency

- Efficiency of commercial banks in Bangladesh is important
- Because, their efficiency affect the whole country's economics, operation and wealth

Objective of the Study

- To examine cost efficiency of commercial banks in Bangladesh during the period of 2009-2014
- To compare cost efficiency performance among different types of commercial banks in Bangladesh during the period under review
- To find out determinants of efficiency that make differences in efficiencies among commercial banks in Bangladesh
- To provide suggestions for improvement in efficiency performance of commercial banks aiming at reaping fuller potentials of the banking industry in Bangladesh

Why Stochastic Frontier Analysis (SFA)

- SFA deals with stochastic noise (Kasman and Turgutlu, 2007)
- DEA does not take into account random error (Herrero and Pascoe, 2002)

Software used: FRONTIER Version 4.1(Coelli,1996)

Data Sources

- A sample of 19 commercial banks out of 56 commercial banks in Bangladesh is used
- The sample includes 4 state-owned commercial banks, 10 domestic private conventional commercial banks and 5 Islamic commercial banks.
- The 19 banks in the sample cover over 65% assets of the entire banking industry in Bangladesh.
- Study period 2009-2014
- Data are collected from annual reports of the specific banks

Approach: Intermediation approach is used

Variables Construction

Input Variables

(1) deposits, (2) fixed assets and (3) labor

Output Variables

(1) total loans, (2) other earning assets and (3) off-balance sheet activities

We select some environmental variables that may influence the cost efficiency of commercial banks in Bangladesh.

Four bank specific variables: size, capital, risk, liquidity, expenses,

One industry specific variable: market share

Two macroeconomic variables: GDP growth and inflation.

Measure and Method of Technical Efficiency

We have adopted an output-oriented measure in our study

We have used the method which was proposed by Battese and Coellli (1995)

Theoretical Stochastic Frontier Model

The stochastic frontier model can be written as:

$$\ln TC_{it} = f(Q_{it}, W_{it}, Z_{it}; \beta) + v_{it} + u_{it} \quad i = 1,2,\ldots\ldots,N \quad t = 1,2,\ldots\ldots,T \quad (1)$$

$\ln TC_{it}$ is the logarithm of the observed total costs for i-th bank in the t-th time, Q_{it} is the output produced, W_{it} is the input prices, Z_{it} are control variables, β is a vector of technology parameters to be estimated,

V_{it} is a two-sided normal disturbance term with zero mean and variance σ_v^2 and represents the effects of statistical noise,

and U_{it} is a non-negative random disturbance term capturing the effects of cost inefficiency.

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The random disturbance terms U_{it} , capturing the effects of cost inefficiency are modeled in terms of a set of environmental variables E_{it} as follows:

$$u_{it} = \partial E_{it} + w_{it} \qquad (2)$$

W_{it} captures the effect of the 'unobserved' factors and is defined by a truncated normal distribution with zero mean and constant variance σ_u^2 and δ is a vector of estimated parameters. The inefficiency term U_{it} is independently but not identically distributed and takes the form $U_{it} \sim \mathrm{N}(\delta E_{it}, \sigma_u)$

Empirical Stochastic Frontier Model

Empirical version of stochastic frontier model (1) expressed:

$$\ln C_{it}=\beta_0+\beta_1\ln(LON_{it})+\beta_2\ln(OEA_{it})+\beta_3\ln(OBI_{it})+\beta_4\ln(POD_{it})+\beta_5\ln(PFA_{it})+\beta_6\ln(POS_{it})+1/2[\beta_{11}\ln(LON_{it}^2)+\beta_{22}\ln(OEA_{it}^2)+\beta_{33}\ln(OBI_{it}^2)+\beta_{44}\ln(POD_{it}^2)+\beta_{55}\ln(PFA_{it}^2)+\beta_{66}\ln(POS_{it}^2)]+\beta_{12}\ln(LON_{it})*\ln(OEA_{it})+\beta_{13}\ln(LON_{it})*\ln(OBI_{it})+\beta_{14}\ln(LON_{it})*\ln(POD_{it})+\beta_{15}\ln(LON_{it})*\ln(PFA_{it})+\beta_{16}\ln(LON_{it})*\ln(POS_{it})+\beta_{23}\ln(OEA_{it})*\ln(OBI_{it})+\beta_{24}\ln(OEA_{it})*\ln(POD_{it})+\beta_{25}\ln(OEA_{it})*\ln(PFA_{it})+\beta_{26}\ln(OEA_{it})*\ln(POS_{it})+\beta_{34}\ln(OBI_{it})*\ln(POD_{it})+\beta_{35}\ln(OBI_{it})*\ln(PFA_{it})+\beta_{36}\ln(OBI_{it})*\ln(POS_{it})+\beta_{45}\ln(POD_{it})*\ln(PFA_{it})+\beta_{46}\ln(POD_{it})*\ln(POS_{it})+\beta_{56}\ln(PFA_{it})*\ln(POS_{it})+u_{it}+v_{it}$$

(i=1,2,3……19, t=1,2,3……6). Here, C_{it} is defined as the total cost; LON_{it} is the loans/advance of bank i in period t; OEA_{it} is the other earning assets of bank i in period t ; OBI_{it} is the off-balance sheet items of bank i in period t; POD_t is the price of deposits of bank i in period t; PFA_{it} is the price of fixed assets of bank i in period t; POS_{it} is the price of staff of bank i in period t. The unknown parameter β's are to be estimated.

Results and Discussion

Maximum-Likelihood Estimates (MLE) of Main Variables

Variables	Parameters	Coefficients	S.E.	t-value
Constant	β_0	28.1218***	1.0016	28.0776
Total loans	β_1	-4.6446***	0.6146	-7.5575
Other earning assets	β_2	0.3247@	0.3900	0.8327
Off-balance sheet activities	β_3	1.1751@	0.7590	1.5482
Price of deposits	β_4	-0.5585@	0.6704	-0.8331
Price of physical assets	β_5	0.7587*	0.4457	1.7024
Price of staff	β_6	7.7239***	0.9969	7.7477

*, **, *** Significance level at 10%, 5%, 1% consecutively
and @ = insignificant

Results and Discussion

MLE of the Parameters of Inefficiency Effects Model

Type of Variable	Variables	Parameters	Coefficients	S.E.	t-value
	Constant	δ_0	-2.9291***	1.1084	-2.6427
Bank Specific	Bank size	δ_1	0.2751***	0.1019	2.7002
	Capitalization	δ_2	0.0000@	0.0000	0.9081
	Risk	δ_3	-1.2498**	0.5243	-2.3840
	Liquidity	δ_4	-0.0340***	0.0019	-17.7724
	Expenses	δ_5	-1.6143*	0.9752	-1.6554
Industry Specific	Market share	δ_6	0.0579@	0.9912	0.0585
Macroeconomic	GDP rate	δ_7	0.1738@	0.1241	1.3997
	Inflation rate	δ_8	-0.0850@	0.0712	-1.1933

*, **, *** Significance level at 10%, 5%, 1% consecutively
and @ = insignificant

Results and Discussion

Efficiency of State Owned Commercial Banks (SCBs)

SCBs	Mean Cost Efficiency Score	Rank
Sonali	1.7291	1
Janata	2.3825	4
Agrani	2.1651	3
Rupali	2.0456	2

Results and Discussion

Efficiency of Conventional Private Commercial Banks (CPCBs)

CPCBs	Mean Cost Efficiency Score	Rank
Pubali	1.8640	4
AB	1.7569	3
NBL	2.1049	7
City	1.6025	2
IFIC	1.4160	1
UCBL	2.3028	10
Dutch-Bangla	2.1890	9
Prime	2.1533	8
Southeast	2.0597	6
BRAC	1.9540	5

Results and Discussion

Efficiency of Islamic Private Commercial Banks (PICBs)

PICBs	Mean Cost Efficiency Score	Rank
Islami Bank Bangladesh Limited	2.4274	5
Al Arafah Islami Bank Limited	1.7902	3
Social Islami Bank Limited	1.5638	2
EXIM Bank Limited	2.0860	4
Shahjalal Bank Limited	1.5081	1

Results and Discussion

Relative Efficiency of State-owned, Conventional Private and Islamic Banks

Banks	**Mean Cost Efficiency Score**
State-owned, Commercial Banks (SCBs)	2.08
Conventional Commercial Banks (CPCBs)	1.94
Islamic Private Commercial Banks (IPCBs)	1.95

Conclusions

- Among output variables, bank's loan is found highly significant at 1% level and other two output variables namely other earning assets and off-balance sheet items are found insignificant.
- Among input price variables, price of staff is found positive and highly significant at 1% level and other two input variables namely physical assets input costs is positive and significant at 10% level and price of deposits is found negative and insignificant.
- In the inefficiency effects model, Size is found to be significant with positive coefficient. Risk, liquidity and expenses are found to be significant with negative coefficient. The effect of capital, market share, GDP rate and inflation on cost inefficiency are found insignificant.

Conclusions

- Sonali Bank is the most efficient bank among state-owned commercial banks, IFIC bank is the most efficient bank among private conventional commercial banks and Shahjalal Bank is the most efficient bank among Islamic commercial banks during the study period.

- The state-owned commercial banks show less cost efficiency (mean) as compared to conventional private commercial banks and Islamic commercial banks.

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