Cost and Profit Efficiency of the Malaysian Commercial Banks:

A Comparison between Domestic and Foreign Banks

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Abstract

This study examines the relative efficiency levels of domestic and foreign commercial banks in Malaysia between 2000 and 2006, using accounting-based ratio, stochastic cost and profit frontier approach. Using accounting-based ratio, the results suggest that interest margin and operating cost are slightly higher for domestic banks than for foreign banks. Further, the results also suggest that profit ratios are slightly higher for foreign banks relative to domestic banks. Using the stochastic frontier approach, the results indicate that domestic banks are found to be more cost-efficient but less profit - efficient relative to foreign banks.

Keywords: Efficiency, Accounting-based ratios, Stochastic cost and profit frontier approach, Malaysia

1. Introduction

The purpose of this paper is to investigate the efficiency levels of commercial banks in Malaysia by comparing the use of basic accounting ratios and the stochastic frontier analysis (SFA): cost and profit frontier approach. The estimates of the level of efficiency were performed using basic accounting ratios and the stochastic cost and profit frontier approach. The results of the study suggest that foreign banks are more cost and profit efficient than domestic banks. Consistent with previous studies, we find that the managerial inefficiencies for the Malaysian commercial banks are found to be significant with the average cost efficiency level of 80.6 percent. The cost efficiency level for domestic banks is 88.2 percent and 75.5 percent for foreign banks, therefore, domestic banks are found to be more cost efficient relative to their foreign counterparts. The results of our study also indicate that the overall profit efficiency level for the commercial banks is 71.7 percent. The profit efficiency level for domestic banks is 63.8 percent and 76.9 percent for foreign banks. Thus, foreign banks are more profit efficient than domestic banks.

This study differs from previous studies in that it covers more recent data, from 2000 to 2006 compared to the study undertaken by Sufian (2004) where he focussed on the period from 1998 to 2003. Second, it examines both the efficiency of domestic and foreign banks. Third, three different measures were used to measure efficiency, accounting-based ratios, and stochastic frontier approach: cost and profit frontier approach.

The structure of the Malaysian financial institutions has changed dramatically over the last twenty years. The global trend towards liberalization in banking has led to the blurring of demarcation lines separating activities of the different groups of financial institutions and the removal of artificial barriers to competition. Similarly, deposit taking, credit

granting, investment, insurance and financial advisory services are being bundled into one financial conglomerate of financial supermarkets. The integration of financial markets within and across borders as well as mergers among banks, reflect attempts to increase financial industry efficiency. The Malaysian experience on the merger exercise is a good example. From 58 financial institutions, the number has to reduce to 10 anchor banks, this was completed in December 2000. This was the result of the financial crisis which weakened the domestic banking sector and the move towards consolidation is hoped to improve the efficiency of the banking sector.

The commercial banks have undergone a tremendous development with the merger exercise. Theoretically, bank mergers could broaden the product mix and reduce cost. Definitely, large size capital and assets are crucial for a bank to become an efficient, competitive and powerful bank. These elements with good quality service will enable banks to compete with foreign banks at the local as well as at the international levels.

This article is organized as follows: Section 2 overviews the efficiency measurement in banking followed by data and methodology. Section 4 discusses the results and followed by conclusion.

2. Efficiency Measurement in Banking

In the previous literature on banking studies both parametric and non-parametric approach has been used. There is no consensus of which method is superior to the other. Accounting-based ratios, though is a crude measure, is easy to use. However, results obtained by this method must be interpreted with caution.

2.1 Accounting-based Ratios

Early research in the banking industry was mainly concerned with estimating the average productivity, using some sort of indices and with cost comparison (Farrell, 1957). Subsequently, researchers tended to proxy efficiency by market share, the assumption being that banks with large market shares may be expected to earn higher profits because they have lower unit costs than banks with smaller market shares (See for example, Smirlock 1985 and Evanoff & Fortier 1988). In other words, banks with lower cost structures could maximize profits either by maintaining the current level of prices and size or reducing the price levels and expanding, a positive relationship between firms' profits and market structures being attributed to the gains made by more efficient firms.

Accounting ratios are a crude measure used by bank analysts to measure efficiency and performance of banks. These ratios are easy to use since they are provided in the financial statements of each bank under consideration. Despite its contradictory issues, the use of simple financial indicators of operating performance, such as operating costs divided by total assets or the return on equity or assets, have also been used to compare efficiencies, as in studies of bank efficiency before and after mergers by Rhoades (1986), Cornett & Tehranian (1992) and Srinivisan & Wall (1992).

However, the use of financial ratios has its limitations. According to Berger, Hunter & Timme (1993), the first problem is that financial ratios are regarded as misleading indicators of efficiency because they do not control for product mix or input prices. Secondly, using the cost-to-asset ratio assumes that all assets are equally costly to produce and all locations have equal costs of doing business. Finally, the use of simple ratios cannot distinguish between X-efficiency gains and scale and scope efficiency gains.

2.2 Stochastic Frontier Approach

The stochastic frontier approach (SFA), sometimes also referred to as the econometric frontier approach (EFA), was developed by Aigner, Lovell & Schmidt (1977), and Meeusen & Van den Broeck (1977). In this approach, the SFA specifies a functional form for the cost, profit or the production frontier and allows for random error. The SFA modifies a standard cost (production) function to allow inefficiencies to be included in the error term. The predicted standard cost function is assumed to characterize the frontier while any inefficiency is captured in the error term, which is by construction orthogonal to the predicted frontier. This assumption forces any measured inefficiencies to be uncorrelated with the regressors and any scale or product mix economies derived linearly from these explanatory variables (Ferrier & Lovell, 1990).

Another assumption needed in the SFA is to distinguish the inefficiencies from random components of the error terms. The random components include short term luck which place individual banks in relatively high or low cost positions and measurement error from excluded explanatory variables, misspecification etc. These two components are separated by assuming that inefficiencies are drawn from asymmetric half-normal distribution, and that random errors are drawn from a symmetric normal distribution. However, it is not possible to decompose individuals' residuals into inefficiency or random variation; therefore, estimating technical inefficiency by observation is impossible. Okuda, Hashimoto & Murakami (2003) used SFA to estimate the cost function of the Malaysian commercial banks from 1991-1997 and its impact on bank restructuring. The study observed economies of scale but not economies of scope and suggested that Malaysian domestic banks were making unproductive capital investments. Yildrim & Philippatos (2007) used both SFA and DFA to examine the cost and profit efficiency of banking sectors in twelve countries in Europe and found that the average cost efficiency level was 72 percent by DFA and 77 percent by SFA.

3. Data and Methodology

The banks in our sample include all 9 domestic and 13 foreign commercial banks in Malaysia over the period 2000-2006. The list of banks is presented in Table 1. Income and Balance Sheet data taken was obtained from IBCA's BANKSCOPE data set. Altogether there were 147 observations but due to the log-linear specification in the estimated model, observations that had negative values were dropped from the sample. The selection process yielded an unbalanced panel with 147 for the cost function and 142 samples for the alternative profit function. This study will use the intermediation approach. Under the intermediation approach, banks are treated as financial intermediaries that combine deposits, labour and capital to produce loans and investments. The values of loans and investments are treated as output measures; labour, deposits and capital are inputs; and operating costs and financial expenses comprise total cost.

3.1 Accounting Ratios

In this study, three main accounting ratios will be used (See Table 2).

For each ratio, a comparison is made. For both interest margin ratios and operating cost ratios, the smaller the margin the more efficient the bank, the smaller the cost the more efficient the bank. For the profit ratios, the larger the profit the more efficient the bank is. Table 3 presents the mean accounting ratios for 2000 to 2006.

3.2 A Stochastic Cost Frontier (SCF)

Cost efficiency measures the performance of banks relative to the best-practice banks that produces the same output under the same exogenous conditions. The stochastic cost frontier (SCF) approach is based on a cost equation that relates a bank's cost to variables that incur those expenses, such as output levels and input prices.

The SCF cost equation contains a composite error structure that distinguishes random cost fluctuations from cost inefficiencies. To put it simply, the cost function describes the relationship between the cost with quantities of output and input variables plus the inefficiency and random error. The following cost equation:

$$C = f(y, w, z) + u + v \tag{1}$$

where C measures the total costs of a bank, including both operating and financial costs; y is a vector of outputs; w is a vector of input prices; z represents the quantities of fixed bank parameters; u is the inefficiency term that captures the difference between the efficient level of cost for given output levels and input prices and the actual level of cost; and v is the random error term.

The cost efficiency of the bank can be written in a natural logarithm form as follows:

$$InTC = f(y, w, z) + \ln u_t - \ln v_t \tag{2}$$

where f denotes a functional form. After estimating a particular cost function, the cost efficiency for bank i is measured as the ratio between the minimum cost (C_{min}) necessary to produce that bank's output and the actual cost (C_i):

$$\tag{3}$$

$$COSTEFF_i = \frac{C_{min}}{C_i} = \frac{\exp[f(y,w,z)] x \exp(\ln u_{min})}{\exp[f(y,w,z)] x \exp(\ln u_i)} = \frac{u_{min}}{u_i}$$

where u_{min} is the minimum u_i across all banks in the sample. Under this formulation, an efficiency score of 0.95 for example, implies that the bank would have incurred only 95 percent of its actual costs had it operated in the frontier.

3.3 A Stochastic Profit Frontier (SPF)

Profit efficiency on the other hand measures how close a bank is to attaining the maximum possible profit as a best-practice bank on the frontier for a given level of inputs and output prices (quantities) and other exogenous variables. In this study we use the alternative profit specification thus avoiding the problems of having to measure output prices which are basically not available in our study.

The alternative profit specification employs the same set of exogenous variables as the cost function in Equation (1) but the profit replaces total cost as the dependent variable. Therefore the profit frontier is derived as follows:

$$P = f(y, w, z) + u + v \tag{4}$$

where P measures the profits of a bank, including both interest and fee income, less total costs C used in the cost function.

The profit function of the bank can be written in a natural logarithm form as follows:

$$\ln P = f(y, w, z) + \ln u_t - \ln v_t \tag{5}$$

Profit efficiency is measured by the ratio between the actual profit of a bank and the maximum possible profit that is achievable by the most efficient bank.

$$PROEFF_i = \frac{P_i}{P_{max}} = \frac{\exp[f(y,w,z)]x \exp(\ln u_i)}{\exp[f(y,w,z)]x \exp(\ln u_{max})} \tag{6}$$

where u_{max} is the maximum u_i across all banks in the sample. For example, if the profit efficiency score of a bank is 90 percent, it means that the bank is losing about 10 percent of its potential profits to managerial failure in choosing optimum output quantities and input prices.

The variables used in this study and the descriptive statistics are presented in Tables 4 and 5.

These two models are simultaneously estimated using the maximum likelihood parameter estimation (Battese & Coelli, 1995). The computer programme, FRONTIER Version 4.1 developed by Coelli (1995) has been used to obtain the maximum likelihood estimates of parameters in estimating the technical efficiency. The programme can accommodate cross sectional and panel data; cost and production function; half-normal and truncated normal distributions; time-varying and invariant efficiency; and functional forms which have a dependent variable in logged or original units.

4. Empirical Findings

4.1 Accounting ratios

Table 6 shows the findings using accounting ratios. Operating asset ratios indicate that interest margin and operating costs on average are slightly higher for domestic banks compared to foreign banks. Similar findings are shown with operating income ratios and operating equity ratios. These ratios indicate that foreign banks are more cost efficient than their domestic counterparts. The opposite is the case with the profit ratios; they are on average slightly higher for foreign banks compared to domestic banks. This indicates that foreign banks are more profit efficient than the domestic banks.

For individual bank, it is found that PUB and HLB have the lowest operating costs. For profit ratios, PUB has the highest profit ratio followed by HLB and MBB, while CIMB has the lowest profit efficiency followed by RHB and ALB. AFB on the other hand experienced negative efficiency because this bank was making losses during these periods. For foreign banks, RBS has the lowest interest margin followed by DB and BNS. BOT and MCB have the highest profit efficiency. Overall, the results indicate that foreign banks are more cost and profit efficient than domestic banks.

However, accounting ratios are crude measures of bank performance and they need to be interpreted with caution (De Young, 1997). For example, higher operating costs would mean higher costs to support extensive branches, technology and better service quality to customers.

4.2 Stochastic Cost Frontier Analysis

The results using cost frontier approach are presented in Table 9. According to the results, the average cost efficiency level for 9 domestic banks under examination is 88.2 percent. This suggests that, on average, about 12.8 percent of bank resources are wasted during the provision of banking services. Whereas the average cost efficiency level for 13 foreign banks is 75.5 percent. This implies that on average 24.5 percent of the resources are wasted.

Overall, the results show that the cost efficiency level for all commercial banks in Malaysia is 80.6 percent. This means that 19.4 percent of the resources are wasted during the period. The results of this study are much lower than found in the previous studies of developed banking markets, in the range of 20 percent to 30 percent. Cost efficiency level has increased over the period for both domestic and foreign banks.

Based on the results, AMB has the highest average efficiency level (98.8 percent) and AFB has the lowest (83 percent) for domestic banks. For foreign banks, UOB has the highest efficiency level (89.4 percent) while BBB has the lowest cost efficiency level (54.4 percent). However, all these banks have improved their cost efficiency since 2000.

Fig. 1 depicts the mean cost efficiency levels for both domestic and foreign banks.

4.3 Stochastic Profit Frontier Analysis

The results of the alternative profit efficiency estimation are presented in Table 10. As in many previous studies, the alternative profit estimates are lower than those of cost efficiency levels (Berger & Mester, 1997 for US banks). Based on the results, the alternative profit estimates for domestic banks are lower than foreign banks (63.8 percent against 76.9 percent). From the results we can conclude that approximately one-third of banks' profits were lost to inefficiency during the period under study. All banks however, have increased their profit efficiency levels significantly since 2000.

The most profit efficient domestic banks are MBB (88.4 percent) and PUB (87.9 percent) whilst AFB, CIMB and RHB are the least profit efficient (19.9 percent, 40.4 percent and 47.3 percent respectively). The most profit efficient foreign banks are MCB (91.7 percent followed by CTB (91.6 percent) and HSBS (88.8 percent). The least efficient banks are RBS (52.4 percent), SCB (54.8 percent) and BOC (57.1 percent).

Overall, all banks have improved their profit efficiency over the seven-year period. Fig. 2 depicts the mean profit

efficiency levels for domestic and foreign banks.

The maximum likelihood parameter estimates for both the cost and profit efficiency are presented in Appendix 1 and Appendix 2.

5. Conclusions

The Malaysian financial system has undergone a tremendous change during the last decade. Globalisation and technological advancement has changed the way banks are operating; emphasising the importance of minimising costs and maximising profits. This study examines the efficiency of Malaysian commercial banks using accounting-based ratios and the stochastic frontier approach: cost and profit frontier approach.

Our results suggest that interest margin and operating costs on average are slightly higher for domestic banks compared to foreign banks. These indicate that foreign banks are more cost efficient than domestic banks. This is perhaps due to the fact that domestic banks have numerous branches all over the country. In the case with the profit ratios; they are on average slightly higher for foreign banks compared to domestic banks. This indicate that foreign banks are more profit efficient than the domestic banks.

The cost and alternative profit efficiency is estimated using the stochastic cost and profit frontier approach. As in most previous studies on bank efficiency, we find that the average bank deviates substantially from the best-practice frontier. The managerial inefficiencies for the Malaysian commercial banks were found to be significant, with the average cost efficiency level for 22 banks at 80.6 percent. This suggests that an average bank would have incurred 19.4 percent less actual costs had it matched its performance with the best-practice bank. According to our results, domestic banks are more cost efficient relative to their foreign counterparts (80.6 percent against 75.5 percent).

The alternative profit efficiency levels are found to be significantly lower relative to cost efficiency. According to the profit efficiency estimation, the alternative profit estimates for domestic banks are lower than foreign banks. From the results we can conclude that approximately one-third of banks' profits were lost to inefficiency during the period under study. All banks however, have increased their profit efficiency levels significantly since 2000.

As a caveat, the results should be interpreted with great caution since previous research differs substantially across different estimation procedures. Further studies should use different estimation approaches allowing results to be compared.

References

Aigner, D. A., Lovell, A.K., & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production models. *Journal of Econometrics* 6:21-37

Bank Negara Malaysia at www.bnm.gov.my

Battese G. E. & Coeli T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics* 20:325-3332.

Berger, A. N. (1993). "Distribution-free" estimates of efficiency in the US banking industry and tests of the standard distributional assumptions. *The Journal of Productivity Analysis* 4:261-92

Berger, A. N., Hunter, W. C. & Timme, S. G. (1993). The efficiency of financial Institutions: A review and preview of past, present, and future. *Journal of Banking and Finance* 17:221-49

Coelli, T. J. (1996). A Guide to FRONTIER Version 4.1: A Computer Programme for Stochastic Frontier Production and Cost Function Estimation, CEPA Working Papers no.7/96

Cornett, M. M. & Tehranian, H. (1992). Changes in corporate performance associated with bank acquisition. *Journal of Financial Economics*. 31:211-234

De Young, R. (1997). Measuring Bank Cost Efficiency: Don't Count on Accounting Ratios. Financial Practice and Education. pp. 20-31

Evanoff, D.D. & Fortier, D. L. (1988). Re-evaluation of the Structure-Conduct-Performance Paradigm in Banking. *Journal of Financial Services Research* 1:277-94

Farell, M. J. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society* 120, Part 111, Series A: 253-81

Ferrier, G. D., & Lovell, C. K. (1990). Measuring cost efficiency in banking: Econometrics and linear programming evidence. *Journal of Econometrics*. 46:229-245

Meesun, W. & Broeck, J.V.D. (1977). Efficiency estimation from Cobb-Douglas production functions with composed error. *International Economic Review*, 18 (2): 435-44

Okuda, H., Hashimoto, H. & Murakami, M. (2003). The estimation of stochastic cost functions of Malaysian

commercial banks and its policy implications to bank restructuring, Centre for Economic Institutions Working Paper Series No. 2003-2

Rhoades S. A. (1986). The operating performance of acquired firms in banking before and after acquisition. Staff Study no. 149, Federal Reserve Board.

Smirlock, M. (1985). Evidence on the (non) relationship between concentration and profitability in banking. *Journal of Money, Credit and Banking* 17:69-83

Srinivasan, A., & Wall, L. D. (1992). Cost savings associated with bank mergers. Working Paper 92-2, *Federal Reserve Bank of Atlanta*. Vol. 32:1251-1266

Sufian, F. (2004). The efficiency effects of bank mergers and acquisitions in developing economy: Evidence from Malaysia, *International Journal of Applied Econometrics and Quantitative Studies* Vol. 1-4: 53-74

Yildrim, H. S. & Philippatos, G. C. (2007). Efficiency of banks: recent evidence from the transition economies of Europe, 1993-2000. *The European Journal of Finance,* 13(2) :123-143

Table 1. List of Malaysian Commercial Banks

Domestic banks	Foreign Banks
Affin Bank Berhad (AFB)	The Royal Bank of Scotland (RBS)
Alliance Bank Malaysia Berhad (ALB)	Bangkok Bank Berhad (BBB)
AmBank Malaysia Berhad (AMB)	Bank of America (BOA)
CIMB Bank Berhad (CIMB)	The Bank of Nova Scotia (BNS)
EON Bank Berhad (EON)	Bank of China (Malaysia) Berhad (BOC)
Hong Leong Bank Berhad (HLB)	Bank of Tokyo-Mitsubishi UFJ (Malaysia) Berhad (BOT)
Malayan Banking Berhad (MBB)	Citibank Berhad (CTB)
RHB Bank Berhad (RHB)	HSBC Bank Malaysia Berhad HSBC)
Public Bank Berhad (PUB)	United Overseas Bank (Malaysia) Bhd (UOB).
	Standard Chartered Bank Malaysia Berhad (SCB)
	JP Morgan Chase Bank Berhad (MCB)
	OCBC Bank (Malaysia) Berhad (OCBC)
	Deutsch Bank (DB)

Note: Abbreviations in parentheses
Source: Bank Negara Malaysia

Table 2. Accounting Ratios

1. Operating asset ratios	i)	Interest margin to assets (interest received –interest expenses)/asset
	ii)	Operating cost to assets
	iii)	Pre-tax profit to assets
2. Operating income ratios	i)	Interest margin to income
	ii)	Operating cost to income
	iii)	Pre-tax profit to income
3. Operating equity ratios	i)	Interest margin to equity
	ii)	Operating cost to equity
	iii)	Pre-tax profit to equity

Table 3. Accounting Ratios Mean Values (RM MILLION), 2000-2006

	Total Assets	Equity	Gross Income	Interest Margin	Overheads	PBT
Domestic Banks						
AFB	20988.40	1561.47	1272.90	462.23	391.50	-26.13
ALB	18328.47	1571.85	1127.72	477.15	264.40	133.67
AMB	39344.78	2554.20	2559.28	1077.40	607.30	390.20
CIMB	76412.23	5330.23	4344.96	1814.87	1201.60	510.90
EON	24233.10	2223.86	1310.10	710.23	353.06	407.19
HLB	35418.59	3271.84	1921.34	889.84	379.03	718.03
MBB	138524.34	11668.04	7056.86	3925.23	1860.44	2699.79
RHB	62658.81	5109.67	3493.19	1412.36	917.19	441.93
PUB	72583.54	6287.60	3386.00	1927.23	743.56	1501.00
Foreign Banks						
RBS	3314.11	350.87	190.09	41.94	69.76	34.36
BB	844.26	227.47	52.17	20.14	9.44	21.36
BOA	1351.71	327.99	60.89	25.24	16.07	21.09
BNS	2649.00	358.54	129.10	45.47	15.39	37.70
BOC	837.82	319.78	37.10	18.28	10.16	12.46
BOT	3721.97	764.64	187.19	74.96	38.43	87.87
CTB	29728.01	1664.39	1932.09	820.10	555.51	572.90
HSBC	30346.16	1883.59	1954.96	725.14	646.24	602.53
UOB	23061.73	1769.53	1351.97	501.13	258.93	419.90
SCB	28164.77	1482.42	1714.27	710.60	476.73	412.68
MCB	1654.56	371.03	93.94	34.76	20.76	45.33
OCBC	26332.90	1887.77	1477.16	601.36	283.80	396.34
DB	4708.84	417.84	353.10	67.26	72.10	77.26

Note: PBT=Profit before tax

Source: Author's own estimates. Data taken from Bankscope.

Table 4. Variables Used in the Measurement for Cost and Profit Equations

Dependent Variables		
TC	Total cost	Operating + interest + personnel + overheads
π	Profit	Pre tax profits
Independent variables		
Q	Total Earning Assets	Loans, investment and other earning assets
X_1	Price of Labour and Capital	personnel and other overhead expenses divided by the total assets
X_2	Price of Deposits	income paid to depositors divided by total deposits

Table 5. Descriptive Statistics for Input and Output Variables, 2000-2006 (In RM Million)

	Variable	N	Mean	Median	Minimum	Maximum	Std. Dev.
All	TC	147	1073.91	825.20	13.20	6632.70	1212.98
	π	142	465.2092	267.80	6.60	5318.20	728.181
	Q	147	28300.14	19669.00	508.90	189518.10	34256.54
	X_1	147	24477.63	17172.50	190.10	164392.60	29819.88
	X_2	147	420.11	291.60	6.60	2784.00	490.79
Domestic banks							
	TC	59	1973.378	1552.10	342.20	6632.70	1390.863
	π	56	843.258	472.00	13.40	5318.20	1014.115
	Q	59	53196.17	38644.60	8826.00	189518.10	40747.25
	X_1	59	46037.12	33733.30	6955.90	164392.60	35478.75
	X_2	59	761.70	571.90	124.20	2784.00	572.60
Foreign Banks							
	TC	88	470.855	158.85	13.20	1648.40	512.785
	π	86	219.037	78.60	6.60	949.10	242.199
	Q	88	11608.48	3124.30	508.90	39324.00	12660.97
	X_1	88	10022.98	2614.20	190.10	35417.30	11249.28
	X_2	88	191.09	63.25	6.60	875.10	231.24

Note: TC = Total costs, π = profits, Q = Total earning assets, X_1 = Price of labour and capital, X_2 = Price of deposits

Table 6. Operating Ratios (Average of 2000-2006 in %)

	Operating asset ratios			Operating income ratios			Operating equity ratios		
	IMA	OCA	PA	IMI	OCI	PI	IME	OCE	PE
Domestic banks									
Affin Bank Berhad	2.2	1.9	-0.2	36.6	30.9	-1.5	30.5	27.0	-6.3
Alliance Bank Malaysia Berhad	2.7	1.4	0.8	42.3	23.3	12.2	32.1	17.2	9.7
AmBank Malaysia Berhad	2.8	1.6	1.1	42.5	23.5	15.7	43.1	23.6	15.9
CIMB Bank Berhad	2.4	1.6	0.6	41.6	27.5	10.9	35.5	23.4	9.1
EON Bank	2.8	1.5	1.5	55.1	26.5	31.4	29.7	15.6	15.9
Hong Leong Bank Berhad	2.8	1.1	2.1	51.0	20.4	37.5	28.2	11.6	21.6
Malayan Banking Berhad	2.8	1.3	1.9	54.5	26.1	36.5	33.3	15.7	22.0
RHB Bank	2.3	1.5	0.7	40.5	25.9	12.6	27.5	17.7	8.6
Public Bank	2.7	1.1	2.0	57.0	23.4	43.6	29.1	11.7	22.5
Mean	**2.6**	**1.4**	**1.2**	**46.8**	**25.3**	**22.1**	**32.1**	**18.2**	**13.2**
Foreign Banks									
The Royal Bank of Scotland	1.3	2.1	1.0	22.8	36.9	19.0	12.7	21.1	9.1
Bangkok Bank Berhad	2.4	1.2	2.7	39.0	18.6	38.6	13.1	6.5	13.2
Bank of America	1.9	1.3	1.5	47.1	29.4	37.1	7.7	5.0	6.4
The Bank of Nova Scotia	1.7	0.6	1.4	35.6	11.9	29.5	13.0	4.3	10.9
Bank of China	2.2	1.3	1.4	52.2	30.7	31.4	5.7	3.2	3.8
Bank of Tokyo-Mitsubishi UFJ	2.1	1.1	2.4	41.2	21.6	46.0	9.8	5.0	11.3
Citibank Berhad	2.8	1.9	2.0	42.4	28.7	29.7	50.3	33.9	35.7
HSBC Bank	2.4	2.1	2.0	37.2	33.0	30.4	39.0	34.3	31.6
United Overseas Bank	2.2	1.2	1.9	37.2	19.3	30.9	27.9	14.5	23.4
Standard Chartered Bank	2.6	1.8	1.4	42.0	28.3	23.8	48	32.3	27.5
JP Morgan Chase Bank	2.2	1.4	2.8	42.1	25.8	48.3	9.5	5.7	12.3
OCBC Bank	2.3	1.1	1.5	41.2	18.9	26.2	32.0	14.9	20.8
Deutsch Bank	1.5	1.7	1.9	19.4	20.8	21.6	16.5	18.4	18.5
Mean	**2.1**	**1.4**	**1.8**	**38.4**	**24.9**	**31.7**	**21.9**	**15.3**	**17.3**

Table 7. Cost Efficiency Measures, 2000-2006

Banks	2000	2001	2002	2003	2004	2005	2006	Average
Domestic banks								
Affin Bank Berhad	0.802	0.812	0.822	0.831	0.84	0.848	0.856	0.830
Alliance Bank Malaysia Berhad	NA	0.812	0.821	0.83	0.839	0.847	0.855	0.834
AmBank Malaysia Berhad	NA	NA	NA	0.988	0.988	0.989	0.989	0.988
CIMB Bank Berhad	0.862	0.869	0.875	0.881	0.887	0.893	0.898	0.881
EON Bank	0.807	0.817	0.827	0.835	0.844	0.852	0.859	0.834
Hong Leong Bank Berhad	0.859	0.866	0.872	0.879	0.885	0.891	0.896	0.878
Malayan Banking Berhad	0.909	0.914	0.918	0.922	0.926	0.930	0.933	0.922
RHB Bank	0.901	0.906	0.911	0.915	0.919	0.923	0.927	0.915
Public Bank	0.874	0.88	0.886	0.892	0.897	0.902	0.907	0.891
Mean	*0.859*	*0.859*	*0.867*	*0.886*	*0.892*	*0.897*	*0.902*	*0.882*
Foreign Banks								
The Royal Bank of Scotland	0.597	0.619	0.640	0.660	0.678	0.696	0.712	0.657
Bangkok Bank Berhad	0.460	0.491	0.521	0.548	0.573	0.597	0.620	0.544
Bank of America	0.613	0.634	0.654	0.673	0.691	0.707	0.723	0.671
The Bank of Nova Scotia	0.529	0.556	0.581	0.604	0.626	0.647	0.666	0.601
Bank of China	NA	NA	0.750	0.764	0.776	0.788	0.799	0.775
Bank of Tokyo-Mitsubishi UFJ	0.819	0.828	0.837	0.845	0.853	0.860	0.868	0.844
Citibank Berhad	0.846	0.854	0.861	0.868	0.875	0.881	0.887	0.868
HSBC Bank	0.800	0.811	0.820	0.830	0.838	0.847	0.854	0.829
United Overseas Bank	0.877	0.883	0.889	0.894	0.900	0.905	0.909	0.894
Standard Chartered Bank	NA	0.825	0.834	0.842	0.85	0.858	0.865	0.846
JP Morgan Chase Bank	0.661	0.68	0.697	0.713	0.729	0.743	0.757	0.711
OCBC Bank	0.871	0.878	0.884	0.890	0.895	0.900	0.905	0.889
Deutch Bank	0.647	0.666	0.684	0.701	0.717	0.733	0.747	0.699
Overall Mean	*0.702*	*0.727*	*0.743*	*0.756*	*0.769*	*0.782*	*0.793*	*0.755*
Overall N = 147	*0.763*	*0.780*	*0.790*	*0.809*	*0.819*	*0.829*	*0.838*	*0.806*

Note: NA, Data was not available from Bankscope

Table 8. Profit Efficiency Measures, 2000-2006

Banks	2000	2001	2002	2003	2004	2005	2006	Average
Domestic banks								
Affin Bank Berhad	NA	NA	0.113	0.151	0.195	0.242	0.293	0.199
Alliance Bank Malaysia Berhad	NA	0.578	0.620	0.660	0.696	0.730	NA	0.657
AmBank Malaysia Berhad	NA	NA	NA	0.631	0.669	0.705	0.738	0.686
CIMB Bank Berhad	0.250	0.300	0.352	0.405	0.457	0.507	0.556	0.404
EON Bank	0.456	0.505	0.552	0.597	0.640	0.679	0.715	0.592
Hong Leong Bank Berhad	0.811	0.833	0.853	0.871	0.887	0.901	0.913	0.867
Malayan Banking Berhad	0.834	0.854	0.871	0.887	0.901	0.914	0.925	0.884
RHB Bank	0.321	0.373	0.425	0.476	0.526	0.573	0.617	0.473
Public Bank	0.827	0.848	0.866	0.883	0.897	0.910	0.921	0.879
Overall Mean	**0.583**	**0.613**	**0.582**	**0.618**	**0.652**	**0.685**	**0.710**	**0.638**
Foreign Banks								
The Royal Bank of Scotland	NA	0.402	0.453	0.503	0.550	0.596	0.638	0.524
Bangkok Bank Berhad	0.730	0.760	0.787	0.812	0.834	0.855	0.872	0.807
Bank of America	0.518	0.565	0.608	0.649	0.687	0.722	0.754	0.644
The Bank of Nova Scotia	0.626	0.665	0.701	0.734	0.765	0.792	0.817	0.729
Bank of China	NA	NA	0.480	0.528	0.574	0.617	0.658	0.571
Bank of Tokyo-Mitsubishi UFJ	0.820	0.841	0.860	0.877	0.892	0.906	0.918	0.873
Citibank Berhad	0.879	0.894	0.907	0.919	0.929	0.938	0.946	0.916
HSBC Bank	0.839	0.859	0.876	0.891	0.905	0.917	0.927	0.888
United Overseas Bank	0.815	0.837	0.856	0.874	0.889	0.903	0.915	0.870
Standard Chartered Bank	NA	0.429	0.479	0.528	0.574	0.618	0.659	0.548
JP Morgan Chase Bank	0.880	0.895	0.908	0.920	0.930	0.939	0.947	0.917
OCBC Bank	0.675	0.710	0.742	0.771	0.798	0.822	0.843	0.766
Deutch Bank	0.773	0.799	0.822	NA	0.862	0.879	0.894	0.838
Overall Mean	**0.755**	**0.721**	**0.729**	**0.750**	**0.784**	**0.808**	**0.830**	**0.769**
Overall N = 142	*0.691*	*0.681*	*0.673*	*0.694*	*0.730*	*0.757*	*0.784*	*0.717*

Note: NA, Data was not available from Bankscope
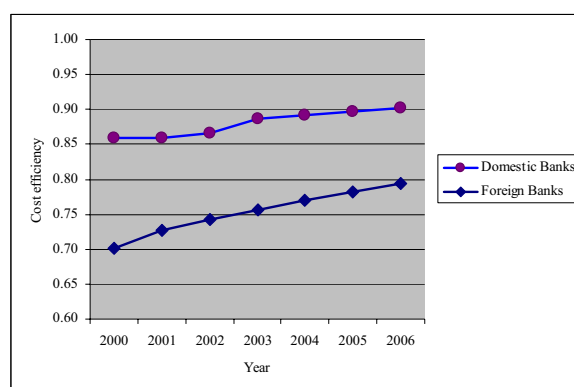
Figure 1. Cost Efficiency for Domestic and Foreign Banks
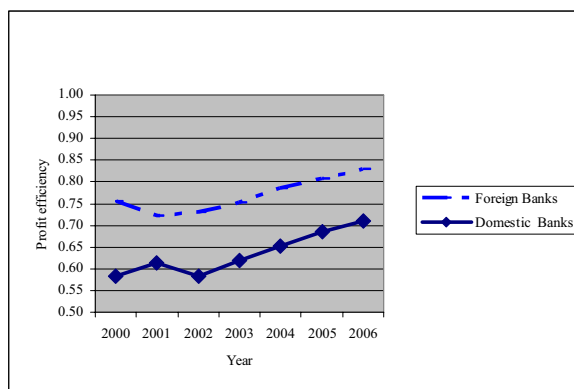
Figure 2. Profit Efficiency for Domestic and Foreign Banks

Appendix 1: Cost Function Maximum Likelihood Parameter Estimates

Dependent Variable : $In(\pi)$*

Parameter	Variable	Coefficient	Standard Error	T-Ratio
β_0	Constant	-1.947	0.922	-2.111
β_1	Total Earning Assets	1.273	0.113	11.236
β_2	Price of Labour and Capital	0.522	0.319	1.635
β_3	Price of Deposits	0.064	0.122	0.525
β_4	(T. Earning Assets)^2	-0.013	0.005	-2.427
β_5	T. E. Assets X P. Labour and Capital	-0.020	0.013	-1.511
β_6	T. E. Assets X P. Of Deposits	0.012	0.008	1.423
β_7	(P. of Deposits)^2	0.101	0.035	2.842
β_8	P. Labour and Capital X P. of Deposits	-0.251	0.035	-7.125
β_9	(Price of Deposits)^2	0.093	0.014	6.566
Sigma-square	$\sigma^2 = \sigma^2_v + \sigma^2_u$	1.106	0.317	3.481
Gamma	$\gamma = \sigma^2_u /(\sigma^2_v + \sigma^2_u)$	0.999	0.0002	4142.701
Mu		-2.102	0.358	5.863
Eta		0.048	0.009	5.515
Log likelihood Function			237.664	

Note: N = 147

Appendix 2: Profit Function Maximum Likelihood Parameter Estimates

Dependent Variable : In(π)*

Parameter	Variable	Coefficient	Standard Error	T-Ratio
β_0	Constant	-2.4687	2.0193	-1.2225
β_1	Total Earning Assets	-0.2780	0.5793	-0.4799
β_2	Price of Labour and Capital	-4.0892	1.6165	-2.5296
β_3	Price of Deposits	2.4393	1.3964	1.7468
β_4	(T. Earning Assets)^2	-0.0145	0.0296	-0.4906
β_5	T. E. Assets X P. Labour and Capital	-0.0530	0.0943	-0.5618
β_6	T. E. Assets X P. Of Deposits	-0.3358	0.1080	-3.1093
β_7	(P. of Deposits)^2	-0.3422	0.2627	-1.3025
β_8	P. Labour and Capital X P. of Deposits	-0.4309	0.4115	-1.0473
β_9	(Price of Deposits)^2	0.2086	0.1673	1.2469
Sigma-square	$\sigma^2 = \sigma^2_v + \sigma^2_u$	0.8132	0.3913	2.0782
Gamma	$\gamma = \sigma^2_u / (\sigma^2_v + \sigma^2_u)$	0.7432	0.1465	5.0723
Mu		-1.5548	1.0553	-1.4734
Eta		0.1451	0.0496	2.9277
Log likelihood Function			-109.5221	

Note: N = 142