

Profit Efficiency and Competitiveness of Commercial Banks in Malaysia

Rosita Suhaimi, Firdaus Abdullah, Chong Fen Nee and Nurhani Aba Ibrahim

Abstract—This paper attempts to identify the significance of Information and Communications Technology (ICT) and competitiveness to the profit efficiency of commercial banks in Malaysia. The profit efficiency of commercial banks in Malaysia, the dependent variable, was estimated using the Stochastic Frontier Approach (SFA) on a sample of unbalanced panel data, covering 23 commercial banks, between 1995 to 2007. Based on the empirical results, ICT was not found to exert a significant impact on profit efficiency, whereas competitiveness, non ICT stock expenditure and ownership were significant contributors. On the other hand, the size of banks was found to have significantly reduced profit efficiency, opening up for various interpretations of the interrelated role of ICT and competition.

Keywords—Competitiveness, Profit Efficiency, Stochastic Frontier Analysis

I. INTRODUCTION

WITH the advance of Information and Communications Technology (ICT), the financial sector meets with rapidly evolving tools for developing new services and raising efficiency. At the same time, ICT along with globalisation and liberalisation challenge banks with rapidly stiffening competition worldwide. With these opportunities and challenges picking up pace, will the commercial banks be able to increase their competitiveness and profit efficiency? This serves to motivate the objective of this study, that is, to find out to what extent competitiveness and ICT are affecting the profit efficiencies of the commercial banks in Malaysia.

II. LITERATURE REVIEW

Studies on bank efficiency have used parametric and non-parametric methods. In the parametric studies, SFA was often used. In terms of functions used to estimate the production, profit functions in the SFA method, the translog function was the most widely used. There were a few studies carried out in Malaysia that analysed bank efficiency. They were done [7-10-11] investigated the differences in bank efficiency across selected countries in the ASEAN region, including Malaysia. However, all these studies examined the banks' cost efficiency. There are as yet no known studies on the efficiency of collecting bank revenues, that is, the bank profit efficiency in Malaysia. The profit efficiency is able to capture both effects, that is, effects on cost when the banks do not utilise the minimum input and the effects on revenues when they do not produce the optimum output. In other words, the profit function allows the researcher to pinpoint more effectively the sources of inefficiency.

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Previous studies in the developed countries by [5-12] showed that the commercial banks were able to control cost by increasing their size. However, the same remedy was not able to help the banks generate more profits. The reason could be that stiffening competition as banks were operating in a more competitive and contestable market where they were put under more pressure to control their costs and, so they could not earn higher profits. [18] also found that the banks had to sacrifice their profits in order to secure more market share.

In the era of liberalisation and globalisation, competition is expected to increase. Previous work on financial sector efficiency and its relation to competitiveness and ICT were not found in Malaysia. In relation to ICT, most of these studies were done in US and in the developed countries with mixed empirical results. Jorgenson and Stiroh [(1999, 2000)] found that one sixth of the output growth, that is, 2.4% was due to computer output via capital deepening. However, Bailey and Gordon [1988] and Parsons et. al [1993] found otherwise. Samudram [2004] in his study in Malaysia, using 1983 – 2001 data of the service sector found that ICT did not affect productivity positively. The sign was found negatively related. However, he claimed that it could be due to insufficient data available. Mohd. Zaini Abdul Karim [2003], using commercial banks data in Malaysia from 1991 to 1996 found that ICT has significantly increase cost efficiency after a lagged period of one year. Some studies on banking market structure, such as Rosita Suhaimi [2006], Abdul Ghafar Ismail et al. [2002], and Claessens & Laeven [2003], found that Malaysia's banking industry has an imperfect market structure or is monopolistic. This implies that the banking industry in Malaysia displays some variable degree of competition.

III. MODEL SPECIFICATION AND DATA

In this study, profit efficiency scores were first estimated and these scores were then used as the dependent variable. Profit efficiency was estimated using the Translog Stochastic Profit Frontier Approach. Cobb Douglas function was also specified to compare the appropriateness of the functions used. An unbalanced panel data was used as some of the annual reports of the commercial banks was not available. The sample included all the 23 existing commercial banks in Malaysia from 1995 to 2007 and there were a total of 269 observations.

For the profit efficiency frontier estimates, this study used the Stochastic Frontier Approach as proposed by Battese and Coelli [1992]. As it had been well established and widely used by previous researches on efficiencies where the translog cost function was the most appropriate function employed in the estimation. If the banks have market power over the prices they charge, then their output markets are not perfectly competitive and, hence, an alternative profit function should be specified.

On the other hand, if the banks do not have the power to state their prices, then they are in a perfect competitive market and, therefore, a standard profit function should be estimated. In this study, an alternative profit function was specified.² Thus, the efficiency here is measured by how close a bank comes to earning maximum profits given its output levels rather than its output prices [Berger and Mester, 1997]. The alternative profit function in Cobb-Douglas and translog form are as follows:

A. *Cobb Douglas Alternative Profit Function*

$$\ln(\pi + \theta) = \alpha_0 + \sum_{k=1}^m \beta_k \ln w_{kit} + \sum_{j=1}^n \gamma_j \ln y_{jit} + \ln u_{\pi it} + \ln v_{\pi it} \quad (1)$$

Where,

- π = Total profits of the banks
- θ = A constant added to every bank's profit so that the natural log was taken of a positive number
- β = Unknown vector parameter
- v_{it} = Random variable assumed to be normal and not dependent on
- u_{it} = Random variable that represents profit inefficiency of the bank also assumed as normal
- w_1 = Price of funds purchased (RM'000)
- w_2 = price of deposits (current, savings and time deposits) (RM'000)
- w_3 = Price of labour (RM'000 per employee)
- Quantity of output (y = Output quantity vector)
- y_1 = Consumer loans (hire purchase, credit cards and related) (RM'000)
- y_2 = Commercial loans (RM'000)
- y_3 = Investment securities (RM'000)

B. *Translog alternative profit function*

$$\begin{aligned} \ln(\pi + \theta) = & \alpha_0 + \sum \beta_k \ln w_{kit} \\ & + \frac{1}{2} \sum \sum \beta_{kp} \ln w_{kit} \ln w_{pit} + \sum \gamma_j \ln y_{jit} \\ & + \frac{1}{2} \sum_{j=1}^n \sum_{l=1}^m \gamma_{jl} \ln y_j \ln y_l + \frac{1}{2} \sum_{j=1}^n \sum_{k=1}^m \eta_{jk} \ln w_{kit} \ln y_{kit} \\ & + \ln u_{\pi it} + \ln v_{\pi it} \quad (2) \end{aligned}$$

In the stochastic frontier profit function, the error term specification is ($v_{it} - u_{it}$), and hence profit function can be written as:

$$P_{it} = x_{it}\beta + (v_{it} - u_{it}), \quad i = 1, \dots, N, \quad t = 1, \dots, T \quad (3)$$

Where,

x_i = Vector $k \times 1$ input price (w_{it}) and output (y_{it}) of bank i

² The Shaffer [1982] model was employed to test the market structure of the commercial banks in Malaysia and found that the bank market structure is monopolistic as the H-statistics showed a value of 0.61 which was positive and less than unity.

If u_{it} is zero, the frontier profit function is $P_i^* = f(y_i, w_i, \beta)$ and the profit efficiency of bank i (PE) is as follows:

$$\begin{aligned} PE &= P_i^* / P_i \\ &= f(y_i, x_i, \beta) / f(y_i, x_i, \beta) \exp(u_{it}) \\ PE &= 1 / \exp(u_{it}) \end{aligned}$$

If PE is less than unity, the profit inefficiencies are present as compared to the efficient bank at the stochastic profit frontier (PE=1). Since panel data is used, firm and time effects will be considered and the log likelihood ratio test will be used to determine the appropriateness of the model. In the Frontier 4.1 software, these options can be selected.

$$\begin{aligned} Y_{it} = & e_0 + e_1 \ln INF_{it} + e_2 \ln L_{it} + e_3 \ln ICT_{it} \\ & + e_4 \ln SIZE_{it} + e_5 \ln COM_{it} + e_6 OWN_{it} + u_{it} \quad (4) \end{aligned}$$

Y_{it} = Profit efficiency
 INF_{it} = Non IT stock capital expenditure
 ICT_{it} = IT stock expenditure
 L_{it} = Number of labour
 $SIZE_{it}$ = Total Asset
 COM_{it} = Competition = Market share
 = Total loans of bank $i \div$ Total loans of the industry
 OWN_{it} = Dummy variable (1 = foreign banks, 0 = local banks)
 u_{it} = Random error

The Ordinary Least Square (OLS) method was used to estimate the fixed effect model without group effects, and the Least Square Dummy Variable (LSDV) method was used to estimate the fixed effect model either with 1-way or 2-way group effects. For random effect model, the Generalised Least Square (GLS) method was used.

IV. EMPIRICAL FINDINGS

All tests carried out for no firm effect, time effect or both effects on translog profit function failed to reject the null hypothesis, thus suggesting that the best model for the profit translog function was the model without any firm or time effects. The gamma coefficient was also found to be significant at 1% level indicating that profit efficiencies of the banks were very much affected by their inefficiency in producing optimum output. In Table 1, the profit efficiency of both local and foreign banks seems to have a down trend. In 1995, all the commercial banks were less efficient by 30.8% (Profit efficiency = 0.6916) as compared to the efficient banks. The inefficiency increased to 64.4% in 2007 (Profit efficiency = 0.3557). As both local and foreign banks faced the same down trend, the difference in ownership was not the main reason for its down trend. This may be due to the downtrend of the interest income of the banks in Malaysia.

TABLE I
 AVERAGE PROFIT EFFICIENCY OF COMMERCIAL BANK IN MALAYSIA (1995 – 2007)

Year	Local Banks	Foreign Banks	Overall
1995	0.5561	0.8271	0.6916
1996	0.6708	0.7826	0.7267
1997	0.6528	0.7708	0.7118
1998	0.6445	0.7395	0.6920
1999	0.6074	0.7053	0.6563
2000	0.6056	0.6684	0.6370
2001	0.5781	0.6290	0.6035
2002	0.5359	0.5875	0.5617
2003	0.5872	0.5445	0.5658
2004	0.5146	0.5005	0.5075
2005	0.4495	0.4562	0.4529
2006	0.3920	0.4125	0.4022
2007	0.3413	0.3701	0.3557

In U.S., Berger and Mester [1997a] found that average cost efficiency was 86% and profit efficiency was 45-55% between 1990 and 1995. According to Berger and Mester [1997a], as size increased, the banks were able to control their costs but it has difficulty in generating profit efficiently. In Spain, Lozano [1997] also found a low profit efficiency of 28% for the period of 1986- 1991. In Poland, Nikiel and Opiela [2002] discovered that the commercial banks were cost efficient but experienced profit inefficiency as they were facing stiff competition and had to sacrifice their profits to gain more market share. Yildirim and Philippatos [2002] also found the same results in the European countries. Hence, other than the economic recession, the commercial banks are also facing increasing competition as a result of liberalisation and globalisation.

TABLE II
 PROFIT EFFICIENCY MODEL

Independent Variables	Coefficient	t-Statistic
Intercept	2.223	8.642
ICT Infrastructure	0.026	1.449
Non ICT Infrastructure	0.053	3.026 ***
Market Share	0.073	3.618 ***
Ownership	0.093	3.041 ***
Size	-0.140	-6.199 ***
Labour	-0.033	-1.297
Adj. R ²	0.9071	
Log Likelihood Ratio	65.981	
Akaike Criteria	-0.515	

Note: Values in parenthesis are t-statistics values. ***1% significance level, ** 5% significance level

Since panel data was used, Hausman and Lagrange Multiplier tests were carried out to determine the best model. The Hausman test showed that the fixed effect model was appropriate for both the one-way and two-way models as the H value was significant at 1% level. To choose the best model between the one-way and two-way models, the F-statistics test and the likelihood ratio were used. The one-way model was

considered as the constrained model and the two-way model was then set as the unconstrained model. The unconstrained model (two-way model) was a better model at 1% significance level. From Table 2, the high value of Adjusted R² and log likelihood showed that all the independent variables included in the model could explain 90.71% of the variation in the dependent variable.

ICT infrastructure was found to be affecting profit efficiency positively. However, the positive relationship was insignificant. The ICT infrastructure probably had not brought any competitive edge to the banks as all the banks were forced to provide the same ICT infrastructure. Furthermore, the banks were facing stiff competition amongst themselves to promote their products and, hence, increased their revenues (findings from interviews with the local banks). The foreign banks faced constraints to open new branches and ATM facilities and they promoted electronic banking more aggressively.

Contrary to the findings of ICT expenditure, the non ICT stocks expenditure (INF) was found to have significantly affected profit efficiency at 1% significance level. When INF increased by 1%, profit efficiency increased by 5.3%. The INF that included the commercial banks' expenditure on opening new branches allowed the banks to be closer to their customers. Besides INF, the competitiveness factor (COM) which was proxied by the market share was also affecting profit efficiency at 5% significance level. When COM increased by 1%, profit efficiency increased by 7.3%. The significance of COM affecting the profit efficiency was expected especially in the era of liberalisation and globalisation.

Bank size (SIZE) was also found to be significant in affecting profit efficiency negatively. This implied that when SIZE increased, profit efficiency decreased. However, this might be due to the transition process after the banks merger exercise since 2001. Since the data used in this study were from 1990 to 2007, the process of merging could lead to the inefficiency of the banks. Ownership was also found to be influencing profit efficiency significantly. The results that showed foreign banks were more efficient than the local banks supported the findings in Table I in this paper.

V. CONCLUSIONS AND RECOMMENDATIONS

There are four main findings in this study. Firstly, ICT expenditure was not found to increase bank profit efficiency significantly. This may of course be due to the time lag factor that might delay the benefits from ICT investments or ICT infrastructure that had ceased giving the banks the competitive edge to increase their profit efficiency. Secondly, non IT stocks expenditure, which includes the expenditure to open new branches, turned out important for increasing profit efficiency. Again, future trends of massive electronic banking might be able to help the banks become more efficient and thereby increase profit efficiency. Thirdly, foreign banks had higher profit efficiency compared to local banks, with the ownership factor found to be significant. Last but not least, banks were found to be more efficient as their competitiveness or

market share increased. On the other hand, banks have lower profit efficiency as they expand size. This might be a temporary phenomenon as the commercial banks in Malaysia were still in the process of transition during their merger efforts.

There is also the possible interpretation, however, that ICT brings contradictory impacts. On the one hand, due to market imperfections there may be inefficiencies in investment, with this effect increasing in bank size, helping to explain both the absence of a significant impact of ICT on overall profit efficiency and the negative impact of bank size on profit efficiency. Alternatively, as ICT is introduced across-the-board within the financial sector, it may also be that it contributes to sharpening competition, and that it puts pressure on banks to reduce prices and lower their profit efficiency. ICT along with sharpening competition may also pressure banks to increase their size, at the cost of profit-efficiency, contributing to the negative impact of bank size. Further research is needed to clarify such dynamic effects.

REFERENCES

- [1] Abdul Ghafar, Hairunnizam Wahid, Mohd Azlan Shah Zaidi & Zulkefly Abdul Karim. 2002. Struktur dan reformasi perbankan Malaysia: Persaingan dan kebolehtandingan pasaran, *Laporan Penyelidikan 2002*, Jabatan Analisis Ekonomi dan Dasar Awam, Fakulti Ekonomi, Universiti Kebangsaan Malaysia, Bangi. Jun 2002.
- [2] Battese, G.E. & Coelli, T.J. 1992. Frontier production functions, technical efficiency and panel data: With application to paddy farmers in India'. *Journal of Productivity Analysis*, 3: 153 – 169.
- [3] Bailey, M. & Gordon, R. 1988. The productivity slowdown, measurement issues and the explosion of computer power, *Brookings Papers on Economic Activities*, 19(2), 347-420.
- [4] Berger A.N. & Mester L.J. 1997. Efficiency and productivity trends in the U.S. Commercial banking industry: A comparison of the 1980's and 1990's, *CSLS Conference on Service Sector Productivity and the Productivity Paradox*.
- [5] Berger A.N. & Mester L.J. 1997a. Efficiency and productivity trends in the U.S. commercial banking industry: A comparison of the 1980's and 1990's. *CSLS Conference on service sector productivity and the productivity paradox*. Centre for the Study of Living Standards. Ottawa. 11 -12 April.
- [6] Claessens, S. & Laeven, L. 2003. *What drives bank competition? Some international evidence*, World Bank Policy Research Working Paper 3113 (online) <http://www.worldbank.org/finance/assets/images/wps3113.pdf> (20 April 2004).
- [7] Fadzlan, S. & Muhd. Zulkhilbri A. M. 2005. Post-merger banks' efficiency and risks in emerging market: Evidence from Malaysia. *The Icfai Journal of Bank Management*. 4 (4): 16-37.
- [8] Lozano, A. 1997. Profit efficiency for Spanish savings banks, *European Journal of Operational Research*, 381-394.
- [9] Mariani Abdul Majid, Nor Ghani Md. Nor and Fathin Faezah Said. 2003. Are Malaysian public owned banks less efficient? Evidence using stochastic frontier approach, *Prosiding Seminar Kebangsaan Dasar Awam dalam era globalisasi: Penilaian semula ke arah Pemantapan Strategi*. UKM.
- [10] Mohd Zaini Abd. Karim. 2001. Comparative bank efficiency across select ASEAN countries, *ASEAN Economic Bulletin* 18(3), pp.289– 304.
- [11] Mohd Zaini Abd. Karim. 2003. Information technology and cost efficiency in Malaysian banking industry. *Malaysian Management Journal* 7 (2):47 – 58.
- [12] Nikiel, E.M. & Opiela, T.P. 2002 Customer type and bank efficiency in Poland : implications for emerging market banking, *Contemporary Economic Policy*, 20(3), pp. 255 – 271.
- [13] Parson, D.J., Calvin, C.G. & Denny, M. 1993. Productivity and computers in Canadian banking, *Journal of Productivity Analysis*, 4 (Jun).
- [14] Rosita Suhaimi. 2006. Analisis Prestasi Bank Perdagangan di Malaysia, UiTM.
- [15] Samudram, M. 2004. The Impact of ICT on various sectors of Malaysian economy. Mimos Sdn. Bhd., 10 April 2004.
- [16] Stiroh, K.J. 1998. Computers, productivity, and input substitution, *Economic Inquiry* 36(April): 175 – 191.
- [17] Stiroh, K.J. 2001. Information Technology and the U.S. Productivity Revival: What do the Industry Data Say?. Federal Reserve Bank of New York, New York.
- [18] Yildirim, H.S. & Philippatos, G.C., 2002. "Efficiency of banks: Recent evidence from the transition economies of Europe (1993 – 2000)", (atas talian) <http://www.commerce.usask.ca/faculty/yildirim/efficiency>. (30 April 2003).