

## The Determinants of Bank Cost Inefficiency in ASEAN Banking

(Penentu Ketidakecekapan Kos Bank dalam Perbankan di ASEAN)

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### ABSTRACT

*This study examines the determinants of cost inefficiency of banks operating in 6 member countries of the Association of Southeast Asian Nations (ASEAN): Indonesia, Malaysia, Singapore, Thailand, the Philippines, and Vietnam. First, we estimate the cost inefficiency using the Stochastic Frontier Analysis. Second, we regress the estimated cost inefficiencies on a set of bank specific variables (size, equity to total asset, loan to total asset, personnel expenses to total expenses) and environmental variables (corruption, economic growth and economic freedom) using a Tobit regression analysis. We use a panel dataset of 625 banks in the ASEAN countries for the period from 2003 to 2008. Our results show that the average cost inefficiency during the period is about 33% of the observed total costs. Banks in Singapore exhibit the lowest cost inefficiency relative to banks in the other ASEAN countries. Our second stage results suggest that bank specific variables and economic growth are important determinants of bank cost inefficiencies in ASEAN banking. The impact of corruption and economic freedom is also evident, but only to a limited extent.*

### ABSTRAK

*Kajian ini menyelidiki faktor-faktor yang menentukan ketidakecekapan kos bank di 6 buah negara ahli Persatuan Negara-negara Asia Tenggara (ASEAN); Indonesia, Malaysia, Singapura, Thailand, Filipina dan Vietnam. Pertama, ketidakecekapan kos dianggarkan menggunakan Analisis Sempadan Stokastik. Kedua, anggaran ketidakecekapan kos ini di regres ke atas beberapa pemboleh ubah spesifik bank (saiz, nisbah ekuiti kepada jumlah aset, nisbah pinjaman kepada jumlah aset, nisbah perbelanjaan staf kepada jumlah perbelanjaan) dan pemboleh ubah persekitaran (rasuah, pertumbuhan ekonomi dan kebebasan ekonomi) menggunakan analisis regresi Tobit. Data panel bagi 625 bank di ASEAN untuk tempoh masa dari 2003 hingga 2006 digunakan untuk tujuan analisis ini. Keputusan menunjukkan ketidakecekapan kos dalam tempoh ini adalah sebanyak 33 peratus. Bank-bank di Singapura menunjukkan ketidakecekapan kos yang paling rendah berbanding dengan bank-bank di negara ASEAN lain. Keputusan seterusnya menggambarkan pemboleh ubah spesifik bank dan pertumbuhan ekonomi adalah penentu penting kepada ketidakecekapan kos di ASEAN. Peranan rasuah dan kebebasan ekonomi juga diperlihatkan, namun pada tahap yang terhad.*

*Keywords: Bank Cost Inefficiency; Stochastic Frontier Analysis (SFA); Tobit Regression; ASEAN Countries; Corruption; Economic Freedom*

### INTRODUCTION

A healthy and efficient banking sector is regarded as a necessary condition to the stability of a financial system. Unhealthy and inefficient banks could weaken the capacity of a financial system to support capital formation through a higher lending rate. Low efficiency is also regarded as the seed of a high cost economy as borrowers must pay a higher interest rate. The problem can be exaggerated when lower efficiency is followed by higher profitability. When banks enjoy high profits, but lower operating efficiency, one can suspect that the banks achieve high profits by setting high interest rates on their loans. If this happens, banks' profitability may come from ripping off the

borrowers, not from operating efficiently which, in turn, dampens economic competitiveness. Lower efficiency is also regarded as an indicator of a higher probability of failure (Podpiera & Podpiera 2005).

This study empirically examines factors that may drive bank cost inefficiency among a panel of banks in the ASEAN region, specifically Indonesia, Malaysia, Singapore, Thailand, the Philippines and Vietnam, based on annual accounting data and economic data from individual banks during the period between 2003 and 2008. We are aware that the studies on inefficiency of the banking sector are of particular interest to bank managers, bank customers and governments, as well as academics. This interest is driven by increasing consolidation in the banking sector, changes

in production technology, regulation and globalisation. At the same time, pressure to increase efficiency comes from economists who argue that efficiency is the foundation for economic progress. The research gap motivates us to carry out research on the issue of bank cost efficiency and its determinants in banks within the ASEAN community.

This study attempts to shed some light on these issues by examining the effect of bank-specific characteristics (size, equity to total assets, loan to total assets, personnel expenses to total expenses) and environmental variables (corruption, economic growth and economic freedom) on the inefficiency of the banking sector in six ASEAN countries. The results of this study are crucial because prior studies that examine these relationships seem to focus on developed countries (c.f., Altunbas et al. 2007; Bonin et al. 2005), while no effort has been made to replicate such research in the context of Asian banking. This is despite the fact that the banking industry in ASEAN has become increasingly integrated and liberalized through cross border ownership, acquisition and operation. The progressive process of financial integration in the banking sector has enhanced competition and emphasized the importance of improved efficiency. Therefore, this paper is expected to contribute both to the international debate on the impact of economic development on the banking system in developing countries and on whether the governance environment is crucial for promoting more efficient banking systems.

The rest of the paper is organized as follows. Section 2 reviews the existing literature on the determinants of banks efficiency. Section 3 describes the methodology, the data and the variables. The empirical results are presented in Section 4 and Section 5 concludes the present study.

## LITERATURE REVIEW

Bank cost efficiency has received significant attention in recent years. Various studies on the determinants of bank cost inefficiencies have focused on this topic, especially in regards to European banks (e.g., Altunbas et al. 2007; Maudos et al. 2002). Maudos et al. (2002) examine both cost and profit efficiency in a sample of 11 countries in the European Union for the period between 1993 and 1996 and verify the importance of inefficiencies on the income side of the banking activity. Altunbas et al. (2007), on the other hand, analyse the relationship between capital, risk and efficiency for European banks between 1992 and 2000. The study finds a positive relationship between inefficiency and risk taking, indicating that inefficient banks hold more capital and take less risk. The results also show that risk and level of capital are positively related, indicating the regulators' preference for capital as a means to engage in risk-taking activities. In regards to the US banking system, Berger et al. (1993) focus on the inefficiency scores, rather than the determinants of inefficiency themselves.

While studies of bank cost efficiency are abundant, research in this area has only recently been observed in the case ASEAN banks. The first study on ASEAN banking (Tahir 1999) examines the relationship between market structure and bank performance; and, in particular, the role of efficiency in influencing ASEAN bank performance for the period between 1991 and 1995. Efficiency, in this study, is measured using the stochastic frontier approach (SFA). The study finds that the average efficiency score for ASEAN banks in Malaysia, Thailand, the Philippines and Indonesia is around 85 percent. The study also finds that while no strong trend is discernible between 1991 and 1995, in three countries the efficiency scores in Malaysia, Thailand and Indonesia appear decline between 1994 and 1995.

Another study (Karim 2001) later re-examines the bank efficiency in the same four ASEAN countries (Indonesia, Malaysia, the Philippines and Thailand) using a similar method utilizing the SFA. The study, however, finds significant differences in bank efficiency across the selected countries. Also, as larger banks tend to have a higher cost efficiency than smaller banks, the study concludes that, in general, ASEAN banks are enjoying increasing returns to scale.

In the Philippines, Lamberte and Desrocher (2002) find that agency costs significantly reduce the cost-efficiency of cooperative rural banks. Corporate governance is also important to increase efficiency, but less important than agency cost. Managers' compensations significantly improve cost efficiency, which is related to the theory of asymmetric information or expense preference theory. When the compensation is related to expenses or profit, managers tend to reduce expenses. The study also finds that cooperative rural banks are profit efficient because they charge higher fees to borrowers, but have the lowest average cost efficiency.

More recently, Shen et al. (2009) examine bank efficiency across ten Asian countries to determine whether differences in the inefficiency are attributed to the managerial ability of the banks in different country characteristics. The study finds that the overall cost efficiency in these Asian banks is around 59 percent, with a decreasing trend. This is despite the positive technical progress and slight economies of scale that are experienced in these countries. Further, the study finds that the cost efficiency score is higher when heterogeneity is considered. Banks in India are found to be the most efficient, followed by banks in Singapore, Malaysia and China. The study concludes that financial reform and managerial ability must be enhanced in order to be more competitive in the international arena. Shen et al. (2009) also posit that other aspects, such as geography, culture, macro-economic condition and financial regulatory requirements, are also important in increasing bank cost efficiency.

In conclusion, we find that certain variables are considered to be important determinants of bank cost inefficiency, including capital; risk; managerial

ability; bank specific variables; and specific economic factors, such as macroeconomic condition, regulatory requirements. Given that existing studies on bank cost efficiency within the ASEAN community are still scarce, our study will provide important evidence on the determinants of bank cost inefficiency in ASEAN banking. Bank specific variables (size, capital strength, lending orientation and personnel expenses) and environmental variables (economic growth, economic freedom and corruption index) are incorporated in our study.

### METHODOLOGY

In this study, we use a panel data set of commercial banks from 6 ASEAN countries (Indonesia, Malaysia, Singapore, Thailand, the Philippines and Vietnam) from the period between 2003 and 2008. Data is collected from bank's

balance sheet and income statements, which obtained from the Fitch Bankscope database, produced by the Bureau Van Dijk Corporation. Data concerning economic growth is obtained from the Asian Development Bank (ADB) database. Data relating to corruption is supplied by International Transparency (TI) Hong Kong, while data relating to economic freedom is supplied by the Heritage Foundation. The sample banks include 220 banks in Indonesia; 108 banks in Malaysia; 22 banks in Singapore; 97 banks in Thailand; 73 banks in the Philippines; and 105 banks in Vietnam. Altogether, there are 625 banks. Table 1 presents the distribution of sample banks for each country for the period between 2003 and 2008. The period is chosen because it includes the Global Financial Crisis of 2008 and, hence, enables us to examine the impact of the crisis. Furthermore, the selection criterion is based upon the availability of data for the period under consideration.

TABLE 1. Distribution of sample banks

Year	Indonesia	Malaysia	Singapore	Thailand	Philippine	Vietnam	Total
2003	34	16	0	15	2	8	75
2004	24	15	3	11	12	9	74
2005	39	17	5	17	13	16	107
2006	40	19	4	17	16	21	117
2007	40	20	5	18	15	26	124
2008	43	21	5	19	15	25	128
2003-10	220	108	22	97	73	105	625

The framework of this study is shown in Figure 1. In this study, we first estimate the inefficiency score using the stochastic frontier approach (SFA). Second, we perform

regression analysis on the estimated cost inefficiencies of a set of bank specific characteristics and environmental variables using the Tobit regression.

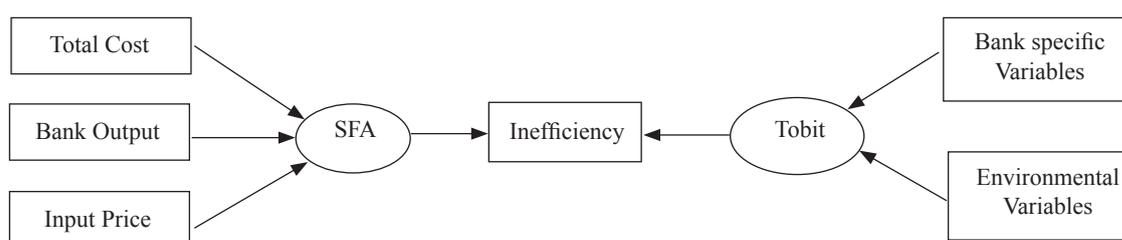


FIGURE 1. Framework of the study

#### ESTIMATION OF BANK COST INEFFICIENCY SCORE

In this study, we use the SFA developed by Aigner et al. (1977) to estimate the cost inefficiency. This technique is commonly applied in banking studies utilizing the standard translog (ln) model. To estimate inefficiency, we use the intermediation approach, which combines various inputs to produce outputs. Following Berger and Mester (1997), cost function depends on outputs and price of inputs and can be formulated as:

$$InC_i = f(In Y_{ji} Inw_{ki}) + \epsilon_i \tag{1}$$

where  $C_i$  is the total cost of production of  $i$ th bank,  $Y_{ji}$  is the  $j$ th output of the  $i$ th bank, and  $w_{ki}$  is the price of the  $k$ th input of the  $i$ th bank. Following the majority of cost-based studies on bank efficiency, the functional form chosen for the cost frontier is a translog function (ln) as follows:

$$\ln C_i = \alpha_0 + \sum_t^m \alpha_t \ln y_i + \sum_t^n \beta_t \ln w_i + \frac{1}{2} \sum_t^m \sum_j^m \delta_{ij} \ln y_i \ln y_j + \frac{1}{2} \sum_t^n \sum_j^n \gamma_{ij} \ln w_i \ln w_j + \sum_t^m \sum_j^n \rho_{ij} \ln y_i \ln w_j + \epsilon_i \tag{2}$$

The error term  $\epsilon_i$  is a two-component error term in the form of:

$$\epsilon_i = v_i u_i \tag{3}$$

where  $v_i$  represents random variables, which are assumed to be independent and normally distributed with zero mean, and variance  $\sigma^2$ , which captures the effects of the statistical noise.  $u_i$  represents non-negative random variables, which are assumed to account for technical inefficiency in cost and are assumed to be independently distributed as truncation at zero of the normal distribution. The lowest attainable production cost is  $f(\ln_{ji} \ln w_{ki}) + v_i$ , which is precisely the stochastic cost frontier of the  $i$ th bank.

In the model, the dependent variable is total cost (C), which is the total operating costs of banks. Outputs are measured by the amount of loans ( $Y_1$ ) and other earning assets ( $Y_2$ ). The unit price of interest ( $P_1$ ) is computed as the ratio of interest expenses to total deposits. The unit price of labour ( $P_2$ ) is proxied by the personnel expenses to total assets. The unit price of capital ( $P_3$ ) is derived as the ratio of operating expenses to fixed assets. As financial data are published in respective countries' currency, we adjust the data using the US dollar without making any dollar adjustment (deflation adjustment).

DETERMINANTS OF BANK COST INEFFICIENCY

To estimate the determinants of bank cost inefficiency, the calculated results using Equation (2) are regressed utilizing a Tobit regression technique. The Tobit model, also called a censored regression model, is designed to estimate linear relationships between variables when there is either left- or right-censoring in the dependent variable (also known as censoring from below and above, respectively). Censoring from above takes place when in cases with a value at or above some threshold, all take on the value of that threshold. In such cases, the true value might be equal to the threshold, but it might also be higher. In the case of censoring from below, values that fall at or below some threshold are censored.

The Tobit model is an econometric technique proposed by Tobin (1958) to describe the relationship between a non-negative dependent variable ( $Y_i$ ) and an independent variable (or vector) ( $X_i$ ). The model proposes that there is a latent (i.e. unobservable) variable that linearly depends on  $X_i$  via a parameter (vector) ( $\beta$ ), which determines the relationship between the independent variable (vector)  $X_i$  and the latent variable (just as in a linear model). In addition, there is a normally distributed error term ( $u_i$ ) to capture random influences on this relationship. Takeshi (1973) explains that this model is feasible for estimation and proven to provide consistent results if it is estimated

using the maximum likelihood estimator as suggested by Tobin (1958).

The observable variable  $Y_i$  is defined to be equal to the latent variable whenever the latent variable is above zero or it is zero otherwise.

$$Y_i = \beta X_i + \mu_i, \mu_i \sim N(0, \delta^2) \tag{4}$$

where,

$$Y_i = \begin{cases} Y_i & \text{if } Y_i > 0 \\ 0 & \text{if } Y_i \leq 0 \end{cases}$$

Once the cost inefficiencies (*INEFF*) are estimated, their relationships with bank characteristics and environmental variables are tested using the following regression:

$$\begin{aligned} INEFF_{ij} = & \beta_0 + \beta_1 \log(TA_{ij}) + \beta_2 ETA_{ij} + \\ & \beta_3 NLTA_{ij} + \beta_4 PERSTEX_{ij} + \beta_5 CORINDEX_j + \\ & \beta_6 EGRW_j + \beta_7 EFREE_j + f(e_{ij}) \end{aligned} \tag{5}$$

where TA is total assets, ETA is ratio of equity to total assets, NLTA is ratio of net loans to total assets, PERSTEX is ratio of personnel expenses to total expenses, CORINDEX is index for corruption, EGRW is index of economic growth, EFREE is index for economic freedom and  $e$  is a white noise. Total assets are used to proxy bank size. The ratios of equity to total assets and net loans to total assets capture banks' capital strength and loan orientation, respectively. PERSTEX captures banks' allocation on personnel expenses, while CORINDEX, EGRW and EFREE represent the environmental variables, i.e., corruption index, economic growth and economic freedom, respectively. Except for CORINDEX, the sign of the estimation estimates on the economic variables should be positive since banks operating in good economic conditions are likely to be more efficient. CORINDEX should have a negative relationship with bank efficiency since economic conditions should be in a better position when corruption is low.

RESULTS

DESCRIPTIVE STATISTICS OF VARIABLES USED FOR INEFFICIENCY ESTIMATES

Table 2 presents the descriptive statistics for the variables used to estimate the inefficiency scores according to country. On average, banks in Singapore have the highest total cost (TC), loans ( $Y_1$ ) and other earning assets ( $Y_2$ ), while banks in Vietnam have the lowest TC,  $Y_1$  and  $Y_2$ . In term of the price of interest ( $P_1$ ), banks in Indonesia are the most expensive, while banks in Malaysia and Thailand are among the cheapest. In regards to the price of labour ( $P_2$ ) and the price of capital ( $P_3$ ), the results show that banks in Indonesia have relatively higher  $P_2$  and  $P_3$  than their ASEAN counterparts in this study.

TABLE 2. Descriptive statistics of variables for efficiency estimates

Country	TC	Y <sub>1</sub>	Y <sub>2</sub>	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>
Indonesia	10.32302	13.16749	12.67878	.066902	.0139851	.0169748
Malaysia	10.9567	14.08219	13.584	.0282424	.0070578	.0084238
Singapore	12.55738	16.32556	15.61853	.044404	.0059474	.0054868
Thailand	12.00281	15.13159	13.94097	.028188	.0097691	.0143208
Philippines	11.60412	13.90034	14.04465	.0401778	.0121327	.0207385
Vietnam	9.092344	12.53693	11.87194	.0609376	.0061563	.0077462
All	10.71475	13.72121	13.15856	.0492979	.0103192	.0135701

Note: TC = Total cost, Y<sub>1</sub> = loans, Y<sub>2</sub> = other earning assets, P<sub>1</sub> = price of interest, P<sub>2</sub> = price of labour, P<sub>3</sub> = price of capital

## RESULTS FOR INEFFICIENCY SCORE

Table 3 shows the relative inefficiency scores among banks in the selected countries. Note that in this study, a lower score means a higher efficiency. On average, the score is 1.33 which means that the inefficiency level is around 33 percent. Banks in Singapore have the highest efficiency (80%), followed by banks in the Philippines (79%), Indonesia (73%) and closely by Thailand (72%), Vietnam (60%) and lastly Malaysia (45%). Our findings confirm

the conclusions reached by Shen et al. (2009) that relative to the other ASEAN countries, Singapore still has the most efficient banking system. Further investigation shows that banking industry in ASEAN is considered efficient after 2004, but the global economic crisis in 2008 has resulted in higher inefficiency score. From 2004 to 2006, the average efficiency score increased from 60 percent to 72 percent. However in 2008, the score drops to 64 percent, most likely as the result of the global financial crisis.

TABLE 3. Comparative inefficiency scores by country, 2003-2008

Country	Inefficiency Score	Inefficiency	Efficiency	Ranking
Indonesia	1.272211	0.272211	0.727789	3
Malaysia	1.546141	0.546141	0.453859	6
Singapore	1.199420	0.19942	0.800580	1
Thailand	1.278264	0.278264	0.721736	4
The Philippines	1.208622	0.208622	0.791378	2
Vietnam	1.395867	0.395867	0.604133	5
All	1.333224	0.333224	0.666776	

Notes: Inefficiency = inefficiency score - 1 and efficiency = 1 - inefficiency

## DESCRIPTIVE STATISTICS OF VARIABLES IN TOBIT REGRESSION

Table 4 presents the variables employed in the Tobit regression model. On average, the inefficiency score has a mean value of 1.33 (equivalent to an inefficiency of 33%) with a standard deviation of 0.36. The size of the banking firm, as measured using the logarithm of total assets, has a mean value of 14.46 and a standard deviation of 1.78. Equity to total assets (ETA) ratio, which measures capital strength, has a mean value of 13 percent and a standard deviation of 9 percent. The net loans to total assets (NLTA) ratio is used to measure the basic operation of banking firm. A higher NLTA indicates a higher impetus on loans. The mean value for NLTA is 53 percent and its standard deviation is 18 percent. The impact of personnel expenses is measured using the ratio of personnel expenses to total

expenses (PERSTEX). On average, 18 percent of total bank operating expenses are spent on personnel.

Corruption (CORINDEX) is expected to have an impact on the efficiency of banks. To achieve a more linear measure of corruption, we subtract the index to 100. A lower index indicates low corruption and vice versa. The mean value is 68% and the standard deviation is 15%. The minimum value for CORINDEX is 6% and the maximum value is 81%.

In general, the ASEAN countries are enjoying a good economic growth with an average EGRW of 5.8 percent and a standard deviation of 1.3 percent. Higher economic growth in ASEAN is mostly supported by manufacturing and extraction of natural resources. For economic freedom (EFREE), a country that has a higher ratio is more likely to have greater business freedom leading towards increased competitiveness. On average, the index is 57 with a standard deviation of 7.9.

TABLE 4. Descriptive statistics of variables used for Tobit regression

Variable	Mean	Std. Deviation	Minimum	Maximum
INEFF	1.333224	.3578567	1	4.652381
LASSET	14.45694	1.78343	10.28807	18.9994
ETA	.1316797	.0888971	.0034557	.7412313
NLTA	.528432	.1830697	.01	.900
PERSTEX	.1795398	.0740346	.0052513	.5632049
CORINDEX	67.4976	15.46803	6	81
EGRW	5.77904	1.322146	1.1	9.3
EFREE	57.308	7.885159	46.1	89

## PANEL DATA TOBIT REGRESSION RESULTS

Next, we conduct two estimations to examine the determinants of bank inefficiency. Referring to Table 5, Model 1 is the estimation using a country dummy variable, whereas Model 2 does not utilize the dummy variable. In Model 1, the log likelihood is -56.9 and LR chi-square (12) is 181. This is a measure similar to F-test (ANOVA)

and it is significant at 1 percent. The Pseudo R-squared is 61 percent. In Model 2, the log likelihood value shows better results with a value of -91.57, which is almost twice compared to that of Model 1. However, the LR chi-square in Model 2 is lower than Model 1 even though it is still significant at 1 percent. Pseudo R-squared for Model 2 is lower (0.38) due to less predictors. Note that in both models, the dependent variable is the inefficiency score.

TABLE 5. Panel data Tobit regression results

INEFF	Model 1		Model 2	
	Coeff.	Std. Err.	Coeff.	Std. Err.
LASSET	-.0367143	.0081392 **	-.0310498	.0084115 **
ETA	-.4559411	.1413333**	-.4099181	.1482641**
NLTA	-.4188793	.0618005**	-.3726436	.0592265 **
PERTEX	-.5515159	.1656281**	-.5104174	.164144 **
CORINDEX	-.0072865	.0048712	-.0059326	.0014543 **
EGRW	.0171239	.0078862*	.0202157	.0082943 **
EFREE	.0188304	.0076915*	-.0047562	.0031515
D(Indonesia)	1.112026	.4479335 *		
D(Malaysia)	.9974824	.2979949 **		
D(Thailand)	.9805403	.3616924 **		
D(Philippines)	.9514245	.4205885 *		
D(Vietnam)	1.216802	.4561598 **		
Constant	.5148898	.67966	2.669128	.2670508
Sigma	.2531104	.00733	.2677176	.0077552
Statistics	Log likelihood = -56.922034 LR chi <sup>2</sup> (12) = 181.00 (0.00) Pseudo R <sup>2</sup> = 0.6139 Number of observation = 625		Log likelihood = -91.570137 LR chi <sup>2</sup> (7) = 111.71 (0.00) Pseudo R <sup>2</sup> = 0.3789 Number of observations = 625	

Notes: \*\* denotes 1% significant, \* denotes 5% significant. In interpreting the results, a negative coefficient with inefficiency here translates into a positive relationship between IVs and efficiency

The coefficients for size (LASET) are negative and significant at 1 percent in both models, indicating that large banks are enjoying better cost efficiency benefits. The result suggests the importance of size for bank efficiency, indicating the presence of economies of scale in the ASEAN banking. It implies that efficiency from size is stronger than from other sources, such as innovation. The equity to total assets (ETA) ratio, as a measure of capital strength, provides significant results in both models as expected. Since a higher ETA means that the bank has more capital, the results imply that the capital strength is an important factor in generating an efficient banking system.

The net loans to total assets (NLTA) ratio is an indicator of whether or not the bank is lending-oriented. The coefficients are -0.42 for Model 1 and -0.37 for Model 2 and both are significant at 1 percent. These results indicate that lending-oriented banks are more likely to be efficient. The results so far suggest that most ASEAN banks are efficient because they are oriented toward optimizing their capital for lending purposes and they have been enjoying the economies of scale. These more efficient banks seem to achieve their efficiency by providing good compensation and other benefits for their personnel. Note that personnel expenses to total expenses (PERTEX) ratios have significant negative coefficients in both Model 1 (-0.55) and Model 2 (-.51), suggesting that banks that allocate more expenses to their personnel end up being more efficient than those that spend less. This finding suggests that the wellbeing of the personnel is still one of the most important factors if banks are aiming for better efficiency.

The results for the environmental variables are less conclusive when compared to the bank specific variables. The corruption index (CORINDEX) gives a mixed result. In Model 1, the coefficient is negative but insignificant, whereas it is negative and significant at 5% in Model 2. This is an unexpected but interesting result to note as it implies that a highly corrupted environment leads to a higher efficiency. Since, in this study, cost efficiency is a function of input price and total costs, one possible explanation that we can offer is that banks in ASEAN countries are more able to achieve cost efficiency by practicing unfair practices, such as recruiting their staff from outsourcing companies that pay lower salaries.

The impact of economic growth on bank inefficiency is significantly positive (coefficients are 0.017 for Model 1 and 0.02 for Model 2). This result suggests that higher economic growth increases the demand for bank loans. In offering these loans, banks might be less concerned about the costs of capital (which is higher consistent with market rates) as these costs can be easily compensated for by increasing revenue from the loans. This behaviour might explain why economic growth has a positive impact on cost inefficiency. The results for economic freedom (EREE) are mixed. In Model 1, the coefficient is positive (0.019) and significant (at 5%). It means in countries where the economic freedom index is high, banks incur a higher cost. In contrast, a lower EFREE index means the government still plays a dominant role and its intervention curbs costs.

In Model 2, EFREE is negative but it is not significant. In the meantime, the country dummy coefficients are positive and significant, at least at a 5 percent level, indicating the importance of specific country conditions in determining the level of bank cost inefficiency.

Based on the results, we can conclude that in general, bank inefficiency is influenced by bank specific characteristics and environmental factors. The study by Wong et al. (2006) also confirms the importance of size, suggesting that large banks are normally more efficient than smaller ones. Banks that focus on lending are more cost efficient. A strong capital position is also beneficial for cost efficiency. The findings regarding economic growth are consistent with Sufian (2010), who notes the importance of the stability of economic growth on efficiency. The results on corruption index and economic freedom are mixed, indicating that these two factors do play a role in influencing inefficiency, but only to a limited extent.

## CONCLUSIONS

In this paper, we use the stochastic frontier approach for a panel data set of banks to assess the cost inefficiency of the banking sector in six ASEAN countries; Indonesia, Malaysia, Singapore, Thailand, the Philippines and Vietnam. The average cost efficiency during the period between 2003 and 2008 is found to be about 67 percent of observed total costs. This is lower than the 87 percent score reported by Tahir (1999).

Using Tobit regression, the results demonstrate that cost inefficiency is negatively correlated with bank size (TA), indicating that larger banks are on average more efficient than smaller banks. Efficiency is also found to be influenced by banks' capital strength, lending orientation and spending on personnel. These results indicate that banks which are backed by a higher equity to total assets ratio are more likely to achieve higher cost efficiency. Banks which emphasise on lending, as expected, are likely to be more efficient than banks that do not. Surprisingly, but logically, banks that are willing to spend more on their personnel exhibit higher levels of efficiency than banks that spend less.

Our empirical results also indicate that cost inefficiency is positively correlated with economic growth, indicating that an economic growth contributes to lower cost efficiency. We offer one possible explanation. When economic growth increases, the demand for bank loans from businesses and households increases to finance investment and consumption. Banks will have to raise more capital to fulfil this demand. Although the new capital is likely to be more costly during a period of high economic growth, banks can afford these costs because the costs can be easily offset by increasing revenue from the loans. In short, the bank behaviour drives the costs and increases the bank cost inefficiency. The results relating to corruption and economic freedom are mixed, indicating

that these two factors do play a role in influencing inefficiency, but only to a limited extent.

The empirical findings of this study are of relevance to policy makers/regulators, as well as bank managers and owners. A banker can use these findings as a reference when responding to issues such as capital requirement, risk-taking activities and human resource plans to achieve higher cost efficiency. For instance, the costs incurred for employees, such as training, compensation, and/or hiring quality individuals, are worthwhile because well-trained and highly qualified employees are the key factor to generate innovative and productive outputs. To the regulators, these results suggest that in order to enhance ASEAN banking efficiency, they need to encourage merger for economies of scale; impose better remuneration plans for bank employees; innovate lending products that suit current needs; and require more capital from bank owners.

#### REFERENCES

- Aigner, D., Lovell, C. A. K. & Schmidt, P. 1977. Formulation and Estimation of Stochastic Frontier Production Function Models. *Journal of Econometrics* 6: 21-37.
- Altunbas Y., Carbo, S., Gardener, E.P.M. & Molyneux, P. 2007. Examining the relationships between capital, risk and efficiency in European Banking. *European Financial Management* 13(1): 49-70.
- Berger A. N., Hancock D. & Humphrey, D. B. 1993. Bank Efficiency derived from the profit function. *Journal of Banking and Finance* 17: 317-347.
- Berger, A. N. & Mester, L. J. 1997. Efficiency and productivity change in the U.S. commercial banking industry: a comparison of the 1980s and 1990s. *Working Papers* 97-5. Federal Reserve Bank of Philadelphia.
- Bonin, J. P., Hasan, I. & Wachtel, P. 2005. Bank performance, efficiency and ownership in transition countries. *Journal of Banking and Finance* 29: 31-53.
- Lamberte, M. & Desrochers, M. 2002. Efficiency and Expense Preference in the Philippines' Cooperative Rural Banks. Philippine Institute of Development Studies. *Discussion Paper Series* 2002-12: 1-23.
- Karim, M. Z. A. 2001. Comparative Bank Efficiency across Select ASEAN countries. *ASEAN Economic Bulletin* 18(3): 289-304.
- Maudos, J., Pastor, J. M., Pe'rez, F. & Quesada, J. 2002. Cost and profit efficiency in European Banking. *Journal of International Financial Markets, Institutions and Money* 12: 33-58.
- Podpiera, A. & Podpiera J. 2005. Deteriorating Cost Efficiency in Commercial Banks Signals an Increasing Risk of Failure. *Working Papers*. Czech National Bank Research Department, 6/2005.
- Shen, Z., Liao, H. & Weyman-Jones, T. 2009. Cost Efficiency Analysis in Banking Industries of Ten Asian Countries and Regions. *Journal of Chinese Economics and Business Studies* 7(2): 199-218.
- Sufian, F. 2010. The Impact of the Asian Financial Crisis on Bank Efficiency: The 1997 Experience of Malaysia and Thailand. *Journal of International Development* 22(7): 866-889.
- Tahir I. M. 1999. Market Structure and Efficiency in ASEAN Banking. Unpublished Ph.D Diss., The University of Wales, UK.
- Takeshi, A. 1973. Regression analysis when the dependent variable is truncated normal. *Econometrica (The Econometric Society)* 41(6): 997-1016.
- Tobin, J. 1958. Estimation of relationships for limited dependent variables. *Econometrica (The Econometric Society)* 26(1): 24-36.
- Wong, J., Fong, T., Wong, E. & Choi, Ka-fai. 2006. The Cost Efficiency of Commercial Banks in Hong Kong. *Research Memorandum* 12/2006, Hong Kong Monetary Authority.

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