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The Effect of Earnings Management on Bank Efficiency

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ABSTRACT

A study on the effects of earnings management practices on bank cost efficiency, using banking data in five ASEAN countries, was conducted in 1989–2015. The Stochastic Frontier Analysis technique employed to gauge cost efficiency revealed that each country has different efficiency level. With panel data analysis, we further discovered that increase in earnings management practices reduces bank's efficiency significantly. It is suggested that banking supervisors and managers should formulate strategies that focus on cost efficiency–related initiatives and regulate earnings management practices. Such strategies could potentially facilitate the economic integration of ASEAN countries.

Keywords: Bank; Cost efficiency; SFA; Earnings management; ASEAN

Introduction

The practice of earnings management could disrupt bank's ability to use resource allocation optimally when offering their financial intermediary services. Earnings management in banks commonly transpires through two channels (i) discretion in loan loss provisions and (ii) discretion in loan loss reserves (Wu, Ting, Lu, Nourani & Kweh 2016). Earnings management occurs when managers use their discretion in financial reports to mislead the performance of the bank (Healy & Wahlen 1999). Due to this, banks are unable to transform inputs (capital, labour, and deposits) to produce outputs (loans and investments) in the most efficient way. When inputs are not allocated optimally, it will reduce cost efficiency of the banks. Hence, the increase in earnings management practices reduces the bank's cost efficiency.

The banking sector in ASEAN plays an important role in the integration of the association's economy. According to the ASEAN secretariat reports, the grouping's economy was the sixth largest in the world and have attracted USD120 billion worth of foreign direct investment (FDI) to the region (ASEAN Secretariat 2016). With the rise in FDI, it is crucial for banks to have a high level of cost efficiency to manage the investment. This could be hindered as each country has a different set of policies and procedures which resulted in different levels of cost efficiency. Furthermore, the effects of earnings management practices could further dampen cost efficiency level.

With the global economic situation remaining mixed between sluggish and subdued (World Bank, 2016), there is a need to increase regional economic integration with neighbouring countries. Banks in each country should increase the cost efficiency and reduce the earnings management practices to facilitate the economic integration between member countries. Furthermore, ASEAN has envisioned itself as a single market and production base, a highly competitive region, with equitable economic development, and fully integrated into the global economy as stated in the ASEAN Economic Community (AEC) blueprint in 2015. Thus, it is vital to increase the economic integration between ASEAN member countries to achieve it vision (ASEAN Economic Community 2015).

The purpose of this study is twofold. First, we examine the efficiency of ASEAN banks using cost efficiency. Second, we empirically analyse the effects of earnings management practices on cost efficiency of banks in five ASEAN countries. We use ten biggest listed banks in Indonesia, Malaysia, Philippines and Thailand and five biggest listed banks in Singapore, from 1989 until 2015, as our sample. We regress each country separately to cater for environmental differences between them. The cost efficiency is estimated using Stochastic Frontier Analysis (SFA). We use two accruals to proxy the earnings management practices; (i) the ratio of loan loss provisions to gross loans (Adams, Carow & Perry 2009) and (ii) the ratio of loan loss reserves to gross loans (Wu et al. 2016). Loan loss provisions are an income statement account showing amount added or adjusted to loan loss reserves. Whereas loan loss reserves are in balance sheet account that deducts a portion of principal loans that are expected to default. These two accruals are prone to bank manager's discretion in financial reports.

Our findings show that the Philippines has the highest cost efficiency while Singapore has the lowest. While cost efficiencies for Philippines and Thailand are high and stable throughout the sample period they are susceptible to financial crises in Indonesia, Malaysia and Singapore. The results also showed that the increase in loan loss provisions, as proxy for earnings management, reduces bank's cost efficiency. The findings suggest that banking supervisors and managers may need to focus on cost efficiency–related

initiatives and formulate policies and standards to control earnings management practices.

The rise in FDI has produced new interest in efficiency study in the ASEAN banking sector. To the best of our knowledge, this is the first study that fills the gap in the ASEAN banking literature by presenting new insights into how earnings management practices affect bank cost efficiency. This study answers to the question posited by Beatty and Liao, (2014) that bank efficiency is altered by changes in financial reports thus limiting the banks from allocating their resources optimally. In addition, we also extended the study undertaken by Wu et al. (2016) through using the SFA method instead of Data Envelopment Analysis (DEA) for estimating efficiency.

This article is structured as follows. Section 2 reviews the related literature on cost efficiency and earnings management. Section 3 explains the development of the models (cost efficiency and panel data models). Section 4 presents the data definitions, results and discussion. Section 5 concludes the paper.

Literature Review

COST EFFICIENCY IN THE BANKING SECTOR

According to Habibullah, Makmur, Azman-Saini, Radam, & Ong (2005), performance of a bank can be evaluated in three ways; (i) productivity using financial ratios, (ii) frontier analysis using parametric approach, and (iii) frontier analysis using non-parametric approach. Using a different set of ratios we can only capture a certain subset of efficiency and not the true efficiency (Coelli, Prasada Rao, O'Donnell, & Battese 2005). In contrast to using financial ratios, the frontier method, which comprised all factors, summarises banks' performance into numerical efficiency scores and ranking. The scores allow the researcher to identify and select the best-practice bank within the industry (Berger & Humphrey 1997). There are also differences between parametric frontier analysis and non-parametric frontier analysis. Berger & Humphrey (1997) found that banks with non-parametric approach gave higher inefficiency results compared to those using parametric method.

Cost efficiency measures the distance between a specific bank's actual costs to the best-practice bank's costs. It focuses on the input side of efficiency. Cost efficiency does not consider the revenue efficiency or output side of efficiency (Coelli et al. 2005). The literature review indicates that researchers prefer to use SFA cost efficiency as the parametric frontier analysis to examine the banking sectors on the basis that heavily regulated industries such as banks, have limited control on their profit margin as compared to their cost. Louati and Boujelbene (2015) examined the effects of competition on financial stability of 12 countries practicing dual banking systems. Most of the banks are from the Middle East and North Africa (MENA) and South-East Asia (SEA) regions. Using SFA cost efficiency and Z-score indicators for the 2002 to 2012 period, the authors constructed the efficiency-stability model. The findings showed that the increase in Islamic bank size contributes to the efficiency and stability of both banking systems.

There are also studies that examined the SFA cost efficiency on the regional or multi-country level. Kablan (2010) used cost efficiency to estimate the efficiency of banks in 29 sub-Saharan Africa countries over the 2000-2004 period. The objective was to find the determinants that contribute to financial development. The results revealed that cost efficiency and nonperforming loans are the contributors to the level of financial development. Using a larger sample of banks operating in 136 countries, Lensink and Meesters (2014) investigated the impact of the institution on bank efficiency and technology over the 1996-2005 period. By using cost efficiency, the results showed that well-developed institutions have significant effects on bank efficiency. The findings are also supported by Hermes and Meesters (2015). The authors sampled banks from over 61 countries for the 1996-2005 period to investigate the impact of financial reform on cost efficiency. The findings demonstrated that the increase in financial reform increases the cost efficiency as subjected to bank regulation and supervision.

EARNINGS MANAGEMENT IN THE BANKING SECTOR

Earnings management in banks are conducted under discretionary loan loss provisions and security gains and losses to manage earnings and capital levels (Cohen, Cornett, Marcus, & Tehranian 2014). Anandarajan, Hasan, & McCarthy (2007) examine the use of loan loss provisions in Australian banks for earnings management and enticing future intentions of potential higher earnings to investors. Using panel data over the period 1991-2001, the results revealed that Australian banks use loan loss provisions for earnings management but not for signalling future intentions of higher earnings. Fonseca and González (2008) conducted a similar study using panel data from banks in 40 countries and the determinants of earnings management by loan-loss provisions over the period 1995-2002. Using income smoothing to measure earnings management the authors showed that investor protection, disclosure, regulation, supervision, financial structure, and development affect earnings management.

Cornett, McNutt & Tehranian (2009)earnings management, and corporate governance are endogenously determined. Thus, OLS estimation can lead to biased coefficients and a simultaneous equations approach is used. We find that CEO pay-for-performance sensitivity (PPS examined the effects of corporate governance on earnings management using data panel from 46 large US bank holdings companies over the period 1994-2002. They established that performance, board independence, capital and CEO pay sensitivity were related to earnings management. Another study by Cohen et al. (2014) confirmed that earnings management practices increased stock market risk during financial crisis period compared

to normal period. Their results indicated that banks that practice aggressive earnings management before 2007, have higher stock market risk during financial crisis period. The literature review generally established that earnings management practices do exert impact on bank performance.

EARNINGS MANAGEMENT AND EFFICIENCY IN THE BANKING SECTOR

Studies that examined the effects of earnings management on cost efficiency are generally scarce. Earlier studies usually use non-parametric frontier method (DEA). Berger & Humphrey (1997) highlighted that the use of non-parametric approach tends to produce higher inefficiency results compared to parametric method thus leading to its overestimation.

Using panel data from 16 banks in Yemen over the period 1996-2011, Shawtari, Saiti, Abdul Razak and Ariff (2015) examined the differences in loan loss provisions between Islamic and conventional banks. They also examined the effects of efficiency using Data Envelopment Analysis (DEA) on loan loss provisions. The results indicated that there are significant efficiency effects on loan loss provisions between Islamic and conventional banks. Wu et al. (2016) studied the impacts of earnings management on the performance of ASEAN banks. The authors used the dynamic network DEA (DN-DEA) to estimates inefficiencies inside the banking process. Using nine ASEAN countries over the period 2007-2014, the findings showed that earnings management were related to banking performance.

Previous study uses DEA method instead of SFA method. The DEA includes the error terms in the estimation thus making their estimations error higher while SFA does not include the error term and less prone to the small sample error (Coelli et al. 2005). This study is the first that fills the knowledge gap for empirical approach in elucidating the effect of earnings management practices on bank cost efficiency using parametric frontier analysis. This study concludes that the practice of earnings management will limit the banks from allocating their resources optimally thus reducing efficiency.

METHODOLOGY

Banks performed the intermediation function (Fethi & Pasiouras 2010) that transform capital, labour, deposits and other liabilities as inputs to produce financial products, such as loans and investments as outputs (Sealey & Lindley 1977). Due to the intermediation function, analysing the effects of earnings management practices on the cost efficiency of banks is important because the practice can affect their ability to use the optimum resource allocation of input mix when their price is given (Healy & Wahlen 1999). We selected the biggest publicly listed financial institutions from five ASEAN countries' stock exchanges. Depending on data availability, the earliest period studied was from 1988 to 2015. This study selected ten biggest listed banks in Indonesia, Malaysia, Philippines, Thailand and five biggest listed banks in Singapore. Large banks tend to reduce the heterogeneity effects that could arise among the banks in the country. In addition, banks in each country were regressed separately to further reduce the heterogeneity effects as banks in each country behave differently due to different sets of policies and procedures. To reaffirm our findings, we also pooled all the data and run the regression panel data collectively.

The banks' financial data were collected from Bankscope database. The banks' annual reports were also used when data were unavailable or for use in cross references. The cost efficiency is estimated using SFA. Following Wu et al. (2016), we used (i) ratio of loan loss provisions to loans and (ii) ratio of loan loss reserves to loans to measure earnings management practices.

COST EFFICIENCY

Cost efficiency consists of both (i) technical efficiency (TE) and (ii) allocative efficiency (AE). TE measures the ability of banks to (i) use minimum amount of inputs to produce a certain amount of outputs or (ii) use a certain amount of inputs to produce the maximum amount of outputs while AE measures the bank's ability to use the optimum allocation of inputs mix when their price is given (Pasiouras, Tanna & Zopounidis 2009). Cost efficiency measures the distance between a specific bank's actual cost to the best-practice bank's cost with given output while facing the same environmental conditions (Isik & Hassan 2002; Ray 2016).

The cost efficiency can be obtained by estimating a cost function with a composite error term. Aigner, Lovell, & Schmidt (1977) specified a composite error term to the deterministic frontier to separate inefficiency and random error. The single equation stochastic cost function model can be written as:

$$\ln TC_i = f(y_i, w_i; \beta) + v_i + u_i \quad (1)$$

where is the logarithm of the total costs for *i*-th bank and represents the minimum cost of producing outputs with input prices . β is a vector of unknown parameters. - is a two-sided error term that captures measurement error and statistical noise with a normal distribution, and is a one-sided positive error term that capture the effects of cost inefficiency relative to the frontier with a half-normal distribution. The model incorporates the calculation of measurement error and statistical noise using maximum likelihood estimators. The total variance is , and the Gamma ratio is . The ratio has a value between 0 and 1. A hypothesis test of serves as a test of the existence of the one-sided error for the half-normal model (Kumbhakar, Wang & Horncastle 2015).

Following Fu and Heffernan, (2007), the cost efficiency SFA model takes the following form:

$$Ln\ TC = \alpha_0 + \sum_{i=1}^{m} \alpha_i \ln y_i + \beta_j \ln w_j + \frac{1}{2}$$

$$\left[\sum_{i=1}^{m}\sum_{k=1}^{m}\delta_{ik}\ln y_i \ln y_k + \sum_{j=1}^{J}\sum_{h=1}^{J}\theta_{jh}\ln w_j \ln w_h\right] +$$

$$\sum_{i=1}^{m}\sum_{j=1}^{J}\rho_{ij}\ln y_i \ln W_j + v_i + u_i \qquad (2)$$

Symmetric restrictions require $\delta_{ik} = \delta_{ki}$ and $\theta_{jh} = \theta_{hj}$, where numbering order is unimportant. Because the cost function is homogeneous with degree one in the input's prices, it must satisfy the following additional parameter restrictions:

$$\Sigma_j \beta_j = 1, \Sigma_j \theta_{jh} = 0 \ \forall\ h,\ \Sigma_j \rho_{ij} = 0$$

Following Shamsuddin and Xiang (2012), this study adopts (a) the translog form which is the commonly used functional form in the bank efficiency literature as the structure of production technology and (b) the intermediation approach. Following Srairi (2010), this study considers two outputs: (i) total loans, y1, and (ii) other earning assets, y2, (Inter-bank funds, investments securities, and other investments), and three inputs: (i) price of labour (wl) measured as personnel expenses divided by the total assets, (ii) price of physical capital (wk) measured by operating expenses minus personnel expenses divided by fixed assets, and (iii) the price of deposits (wd) measured as total interest expenses divided by total funding. To satisfy linear homogeneity at input prices, all variables are normalized by the price of deposit.

PANEL DATA MODEL

Individual bank efficiency is regressed against the independent variables for each country using yearly cross-section data, also known as panel data; i.e., a pool of observations in cross-sectional banks data on a specific country over several periods of time (Baltagi 2013). The micro panel data are in accordance with the calendar year or banks' financial year reports (Beccalli, Casu & Girardone, 2006). Following Wu et al. (2016), the proposed model is as follows:

$$Ceff_{it} = \beta_0 + \beta_1 llpl_{it} + \beta_2 llrl_{it} + \beta_3\, lnsz_{it} + \beta_4 nig_{it} + \beta_5 nlta_{it} + \varepsilon_{it},$$

$$i = 1, \ldots, N;\ t = 1989, \ldots, 2015 \qquad (3)$$

where *Ceff* = Cost efficiency, *llpl* = ratio of loan loss provisions to gross loans, *llrl* = ratio of loan loss reserves to gross loans, *ln sz* = natural log of total assets, *nig* = net income growth, *nlta* = ratio of net loans to total assets. The error term can be further broken down into: $\varepsilon_{it} = \mu_i + \lambda_t + u_{it}$: where μ_i is called the individual-specific effect, λ_t the time effect, and $u_{it} \sim N(0, \sigma_u^2)$the well-behaved error term. The natural logs are used to facilitate the explanation of the relationships between the economic variables.

There are three competing models: (i) Pooled Model, (ii) Random Effect Model, and (iii) Fixed Effects Model in panel data analysis. This study will use the Poolability F Test and the Breusch–Pagan LM test to determine whether the data are pooled in nature. If they are not, then Hausman's specification test will be used to determine whether the data are either fixed or random in nature.

We present Table 1 to summarise the variables description, expected sign and data sources for the cost efficiency and the panel data model.

DATA AND RESULTS

DATA DESCRIPTION

Table 2 summarises the variables' statistics for each country cost efficiency and panel data model.

TABLE 1. Variables description, expected sign and data sources.

Variable	Description	Expected Sign
	Efficiency (SFA) Model	
Cost	Total interest expense + Total non-interest expenses	
y1	Total loans	positive
y2	Other earning assets + Other operating income	positive
wl	Personnel expenses / Total assets	positive
wk	Other operating expenses / Fixed assets	positive
wf	Total interest expense / Deposits & Short-term funding	positive
	Panel Data Model	
Ceff	Estimates from SFA model	
llpl	Loan loss provisions / Gross loans	negative
llrl	Loan loss reserves / Gross loans	negative
ln sz	Natural log of total assets	positive / negative
nig	(Net Income t – Net Income t – 1)/ Net Income t – 1)	positive
nlta	Net loans / Total Assets	positive / negative

TABLE 2. Summary statistics for the cost efficiency and proposed model

Cost Efficiency Model				Panel Data Model			
Variable	Obs	Mean	Std	Variable	Obs	Mean	Std
			Indonesia				
Cost (Bil)	227	9741.18	10399.19	*Ceff*	220	86.78	9.70
y1 (Bil)	227	71516.86	105364.43	*llpl*	220	3.27	9.29
y2 (Bil)	227	44790.84	57017.30	*llrl*	220	6.32	8.81
wl	227	0.014	0.00710	*ln sz*	220	10.89	1.55
wk	227	1.158	0.79935	*nig*	220	-4.24	36.75
wf	227	0.095	0.070	*nlta*	220	55.29	17.87
			Malaysia				
Cost (Mil)	183	4129.12	4109.49	*Ceff*	174	91.14	6.89
y1 (Mil)	183	67037.42	84666.11	*llpl*	174	1.02	1.35
y2 (Mil)	183	25692.50	29015.66	*llrl*	174	4.38	3.13
wl	183	0.008	0.002	*ln sz*	174	11.14	0.99
wk	183	1.277	0.841	*nig*	174	0.21	2.31
wf	183	0.033	0.015	*nlta*	174	59.20	9.80
			Philippines				
Cost (Bil)	236	14.56	14.09	*Ceff*	226	97.56	1.37
y1 (Bil)	236	4.17	6.01	*llpl*	226	1.26	1.27
y2 (Bil)	236	134.20	191.24	*llrl*	226	5.65	4.24
wl	236	112.82	130.99	*ln sz*	226	5.00	1.24
wk	236	0.012	0.003	*nig*	226	0.25	0.92
wf	236	1.054	0.597	*nlta*	226	46.82	11.00
			Singapore				
Cost (Mil)	104	2543.68	2249.72	*Ceff*	95	63.15	16.79
y1 (Mil)	104	59460.19	68045.89	*llpl*	95	0.39	0.52
y2 (Mil)	104	40599.52	43870.47	*llrl*	95	3.03	1.73
wl	104	0.006	0.003	*ln sz*	95	10.48	2.06
wk	104	0.611	0.453	*nig*	95	-0.23	2.69
wf	104	0.021	0.011	*nlta*	95	60.81	13.00
			Thailand				
Cost (Bil)	239	34.67	26.05	*Ceff*	229	93.95	3.12
y1 (Bil)	239	491.92	438.21	*llpl*	229	1.34	2.40
y2 (Bil)	239	182.48	219.32	*llrl*	229	5.52	5.19
wl	239	0.009	0.002	*ln sz*	229	6.15	1.06
wk	239	1.106	1.230	*nig*	229	-0.38	24.93
wf	239	0.046	0.030	*nlta*	229	70.61	10.73

Notes:
1. All figures are denoted in the respective country's currency
2. Panel data period - Indonesia (1989 - 2015), Malaysia (1994 – 2015), Philippines (1989 – 2015), Singapore (1996 – 2015), and Thailand (1989 – 2015).

COST EFFICIENCY

Table 3 reports the results for cost efficiency model estimations for each country and pool data model. The results show that each country has different significant regressors. From 14 variables used as regressors, only *y2* (Other earning assets and other operating income) is significant for all models. It has a negative sign for Singapore and a positive sign for other models in the sample. All models have high log likelihood. Indonesia, Malaysia and Singapore have a high and significant value of log likelihood function and significant value of sigma-squared. The results indicate that these countries have highly significant parameter estimates compared to those of the Philippines and Thailand. Using the SFA method, all models were found able to generate the efficiency estimations. The efficiency estimates will be used as the dependent variable in the panel data analysis.

Figure 1 shows the average cost efficiency for five ASEAN countries (Indonesia, Malaysia, Philippines, Singapore and Thailand). After we regressed each country separately, we stack each country's results to analyse cost efficiency trend in each country. Cost efficiency measures the distance between a specific bank's actual costs to the best-practice bank's cost with given output and experiencing the same environmental conditions. Cost efficiency for the Philippines and Thailand are stable throughout the sample period while those of the other countries fluctuate heavily. This indicates that

TABLE 3. Results for the cost efficiency model estimations

Variables		Ind	Mal	Phi	Sin	Tha	All
Constant	α_0	2.808	3.692	4.637	1.388	3.823	4.052 (0.153)
		(0.652)	(0.427)	(0.203)	(1.753)	(0.451)	
ln *y*1	α_1	0.378***	0.841***	0.362***	0.673	0.401*	0.607***
		(0.129)	(0.148)	(0.095)	(0.448)	(0.225)	(0.040)
ln *y*2	α_2	0.638***	0.273*	0.642***	-1.198**	0.527***	0.321***
		(0.114)	(0.144)	(0.091)	(0.528)	(0.196)	(0.037)
ln *w1*	β_l	0.375	0.555***	1.020***	-0.240	0.348*	0.652***
		(0.306)	(0.172)	(0.140)	(1.022)	(0.189)	(0.069)
ln *wf*	β_f	0.428***	0.188	0.269***	0.585	0.700***	0.315***
		(0.154)	(0.148)	(0.101)	(0.431)	(0.117)	(0.044)
	γ_{11}	0.275***	0.049	0.245***	-0.547**	0.259***	0.198***
		(0.026)	(0.055)	(0.020)	(0.275)	(0.072)	(0.008)
	γ_{22}	0.216***	0.113***	0.256***	-0.315	0.245***	0.155***
		(0.018)	(0.024)	(0.023)	(0.208)	(0.050)	(0.008)
	γ_{33}	-0.221***	-0.094***	-0.252***	0.207	-0.290***	-0.184***
		(0.017)	(0.035)	(0.019)	(0.227)	(0.056)	(0.007)
	δ_{ll}	0.167**	0.204***	0.348***	-0.025	0.111**	0.190***
		(0.075)	(0.058)	(0.063)	(0.304)	(0.051)	(0.018)
	δ_{ff}	0.261***	0.177***	0.303***	0.091	0.252***	0.168***
		(0.052)	(0.059)	(0.043)	(0.073)	(0.037)	(0.010)
	δ_{lf}	-0.222***	-0.227***	-0.286***	-0.067	-0.156***	-0.180***
		(0.039)	(0.056)	(0.048)	(0.116)	(0.035)	(0.011)
	θ_{1l}	-0.112***	0.063	-0.034	0.244*	0.023	-0.034***
		(0.026)	(0.043)	(0.034)	(0.142)	(0.053)	(0.010)
	θ_{1f}	0.099***	-0.016	-0.017	-0.042	-0.093**	0.051***
		(0.030)	(0.039)	(0.025)	(0.102)	(0.039)	(0.007)
	θ_{2l}	0.044*	-0.016	0.023	-0.324**	0.014	0.015*
		(0.025)	(0.044)	(0.030)	(0.149)	(0.048)	(0.009)
	θ_{2f}	0.002	0.001	0.034	0.047	0.034	-0.035
		(0.019)	(0.043)	(0.023)	(0.104)	(0.032)	(0.007)
Log likelihood		93.780	161.605	260.518	-154.940	157.018	524.590
Variance components:	$\sigma^2(u)$ =	0.056***	0.021***	0.003	0.933***	0.010	0.024***
		(0.008)	(0.004)	(0.005)	(0.142)	(0.007)	(0.003)
	$\sigma^2(v)$ =	0.007***	0.002***	0.005***	0.005	0.011***	0.011***
		(0.001)	(0.001)	(0.001)	(0.009)	(0.002)	(0.001)
Gamma		0.879	0.880	0.363	0.994	0.481	0.668
LR test of the one-sided error		42.461***	14.516***	0.131	15.783***	0.843	35.647***

Notes:
1. Standard Error in parentheses
2. *** Significant level at 1%; ** Significant level at 5%, and * Significant level at 10%
3. Period Indonesia (1988 - 2015), Malaysia (1993 – 2015), Philippines (1988 – 2015), Singapore (1991 – 2015), and Thailand (1988 – 2015).

the performance of the best-practice bank together with other banks in these two countries are relatively the same throughout the period. Indonesia is heavily affected by the Asian financial crisis in 1998 with the cost efficiency scores reduced from 88% in 1997 to 68% in 1998. This signifies that there exist wider gaps in cost performance between the best-practice bank with other banks in Indonesia around that period. Singapore showed the least cost efficiency compared to other countries. Singapore displays fluctuating trend and received impacts of the financial crisis earlier than the other countries in 1997 (52%) and 2007 (50%). This could be interpreted as due to the impact of the crises which affected most banks in Singapore except for the best-practice bank. As for the Global Financial Crisis in 2008, the average cost efficiency scores in all countries are not affected except for Malaysia (82%). Malaysia, Philippines and Thailand displayed a converging upward trend for 2013 until 2015 while Indonesia and Singapore showed a reverse downward trend. The converging upward trend means that the gap in cost performance is closer between the

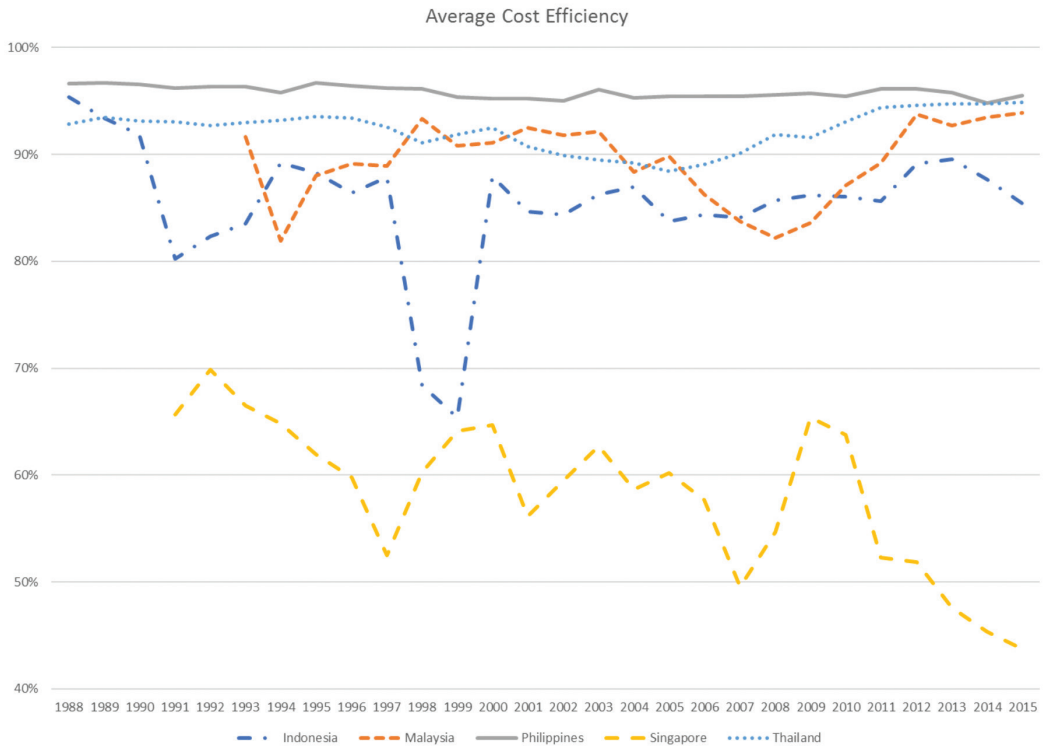

FIGURE 1. The yearly average cost efficiency for five ASEAN countries

best-practice bank and other banks. The downward trend in Indonesia and Singapore means that the gap between the best-practice bank with other banks are getting wider.

PANEL DATA MODEL

We run correlation test between the determinants in the panel data model for multicollinearity issues. Results of the five ASEAN countries showed the highest correlation detected is between *nlta* and *ln sz* (-0.764) for Singapore. This test indicates the low correlation detected in the model. We estimated for each costing using three panel data models: (i) Pooled OLS (POLS), (ii) Fixed Effects (FE), and (iii) Random Effects (RE). With three sets of tests; (i) F test, (ii) Breush–Pagan LM test, and (iii) Hausman test, we found that Indonesia, Malaysia and Thailand preferred RE model while Philippines and Singapore the FE model. We also run all the pool data to reaffirm our results. We conformed that all pool data also preferred the FE model. Table 4 shows the panel data results.

From the two proxies used for earnings management, the ratio of loan loss reserves to gross loans has negative and significant effects in Indonesia, Malaysia and Thailand while the ratio of loan loss provisions to gross loans showed no significant effects. The determinant for the ratio of net loans to total assets is significant in all countries. It shows negative value in Indonesia and Singapore a positive one in Malaysia, Philippines and Thailand. Size was negative in Malaysia, Philippines and Singapore while positive in Thailand. Net income growth was positive and significant in Singapore.

DISCUSSION

From this study we establish that the following factors affect bank cost efficiency, namely; (a) ratio of loan loss reserves to gross loans (*llrl*), (b) size (*ln sz*), (c) net income growth (*nig*), and (d) ratio of net loans to total assets (*nlta*). Results from Table 4 demonstrate that earnings management practices proxied by the ratio of loan loss reserves to gross loans affect cost efficiency while ratio of loan loss provisions to gross loans does not, except in the all pool data model. Since loan loss reserves serve as the first method banks normally use to cover losses on loans due to defaults and non-payment, it is usually the better indicator of the bank's stability on its lending base compared to non-performing loans (Abuzayed, Al-Fayoumi & Molyneux 2018). Loan loss provisions are conversely, income statement account, reflecting the amount added or adjusted to loan loss reserves. Our results identified that the ratio of loan loss reserves to gross loans could be used as proxy to earnings management practices. Our findings therefore complement those from Wu et al. (2016) who established significant relations in earnings management practices when the ratio of loan loss provisions to gross loans was used as proxy.

Variation in signs for effects of bank size on cost efficiency could be explained through the economies of scale. The negative effects on bank cost efficiency in Malaysia, Philippines and Singapore are attributed to the relatively smaller size of the banks (Saeed & Izzeldin 2016). Small-sized banks preclude the advantages of

TABLE 4. Summary of panel data results

Variables		Sign	Indonesia	Malaysia	Philippines	Singapore	Thailand	All
Constant	β_0		91.201	89.863	97.616	234.400	89.390	0.963
			(5.329)	(6.857)	(0.755)	(26.471)	(2.441)	(0.039)
llpl	β_1	-ve	-0.148	-0.061	0.048	2.475	-0.090	-0.001***
			(0.095)	(0.337)	(0.066)	(2.134)	(0.082)	(0.000)
llrl	β_2	-ve	-0.610***	-0.768***	-0.038	-0.592	-0.210***	-0.004***
			(0.116)	(0.161)	(0.026)	(0.831)	(0.045)	(0.000)
ln sz	β_3	+/-ve	0.589	-2.224***	-0.186**	-12.059***	0.507**	-0.000
			(0.394)	(0.555)	(0.080)	(2.182)	(0.225)	(0.001)
nig	β_4	+ve	-0.011	0.053	0.030	0.781**	-0.003	-0.000
			(0.018)	(0.169)	(0.086)	(0.347)	(0.007)	(0.000)
nlta	β_5	+/-ve	-0.115***	0.494***	0.022**	-0.720***	0.040*	-0.000
			(0.040)	(0.052)	(0.011)	(0.142)	(0.021)	(0.000)
R^2 - within			0.383	0.460	0.097	0.511	0.168	0.243
R^2 - between			0.012	0.234	0.004	0.519	0.494	0.023
R^2 - overall			0.344	0.396	0.030	0.483	0.212	0.196
F-test			2.85***	5.67***	11.70***	24.40***	3.43***	5.98***
LM test			5.14**	26.60***	203.24***	0.00	8.04***	282.60***
Hausman test			4.82	7.63	79.86***	-74.79	6.71	7.04

Notes:
Standard Error in parentheses
*** Significant level at 1%; ** Significant level at 5%, and * Significant level at 10%

economies of scale due to high marginal cost to product ratio when offering the same financial instruments relative to those for larger banks. Since the banking industry is heavily regulated by banking supervisors, the small banks are still required to offer the same or comparable financial products but could not increase their service rates to cover the high marginal costs. In consequence they must absorb the high costs thus reducing their cost efficiency. When bank size increases up to a certain level the economies of scale will take effect and the negative value sign will be reversed. The margin between cost to product ratio will reduce inversely with the capacity of the banks to leverage on their bigger assets. This could explain the positive effects of size in Thailand where the economies of scale play a role. As banks leverage on their assets, marginal costs are kept to minimum level. Thus with increased efficiency, banks able to offer more financial instruments.

The variation in the sign for ratio of net loans to total assets (*nlta*) could be explained by differences in *nlta* standard deviations. Higher variations will reduce cost efficiency. This condition was evident in Indonesia and Singapore which recorded 17.87 and 13.00 respectively for their standard deviations. The higher standard deviations indicate that the banks are offering more loans relative to banks assets. In comparison banks in Malaysia, Philippines and Thailand recorded lower variations in their standard deviation (9.80, 11.00 and 10.73 respectively) and therefore could only offer much lower loans. The lower standard deviations in *nlta* increase cost efficiency. Our model also shows that the increase in net income growth in Singapore increases cost efficiency. The study therefore established that as banks grow, as indicated by their rising income, cost efficiency also increases. This is consistent with the findings in Wu et al. (2016).

CONCLUSION

This study examines the efficiency of banks in five ASEAN countries using cost efficiency tests. Secondly, we empirically analyse the effects of earnings management practices on cost efficiency of banks in the five countries. The findings revealed that there is great opportunity for banks in Singapore and Indonesia to improve their cost efficiency as compared to banks in Philippines and Thailand. Since cost efficiency measures the distance between a specific bank's actual cost to that for the best-practice bank. Managers in low cost-efficient banks should exert greater initiatives to minimise costs. They could learn from management of the best-practice bank to reduce the large disparity in cost performance.

For earnings management practices, our study discovers a significant negative relationship between the ratio of loan loss reserves to gross loans and cost efficiency. The ratio of loan loss provisions to gross loans however does not have any significant relationship. The study supports earnings management practices through manager discretionary choices in loan loss reserves instead of loan loss provisions. Since loan loss reserves are susceptible to bank managers' discretion in financial reports, banking supervisors should enhance the transparency of these reports and increase the accountability of the managers.

The findings could assist banking supervisors and managers in formulating specific strategies and initiatives to increase efficiency and control of earnings management

practices. With greater efficiency and regulations incoming FDI will be distributed equally among the ASEAN countries and the economic integration between them could be achieved. In future studies other ASEAN countries should be included in the sampling to better validate currents findings. Other methods should also be used to estimate efficiencies such as advanced non-parametric method or combination between DEA and SFA methods.

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