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OPENING A SEA OF OPPORTUNITIES IN THE FINANCIAL SECTOR: Assessing ASEAN Banks' Profitability, Risk, and Efficiency

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Abstract: The study focuses on assessing and identifying factors affecting bank performance by viewing profitability, risk, efficiency, and capital through Data Envelopment Analysis (DEA), and simultaneous equations model (2SLS and 3SLS). The researchers believe that there is an increasing relevance of understanding and awareness on how well financial institutions, particularly banks, perform in the ASEAN region, especially in the light of the upcoming ASEAN integration. The study includes 103 banks in the ASEAN region from the Philippines, Indonesia, Malaysia, Singapore, and Thailand, covering a period of five years from 2011-2015. The five-year panel data was used in the DEA, while CAGR of internal, external, and macroeconomic variables, were used in the simultaneous equations. The researchers used various financial ratios in measuring profitability (ROA), risk (loan loss provisions, and risk weighted assets), and capital (tier 1 and tier 2 capital adequacy ratios), while DEA technical efficiency scores were used in measuring efficiency. Prior studies have provided evidences for endogeneity between risk, efficiency, and capital, where 2SLS and 3SLS were used in order to capture their endogeneity. The results provided evidence of inherent endogeneity and simultaneity among and between risk, capital and efficiency. Additionally, it was determined that risk has a significant negative relationship with profitability. Although efficiency does not have a significant relationship with profitability, it significantly affects risk and capital. Capital also has a significant direct relationship with profitability.

Keywords: ASEAN Banking Integration, BASEL, CAMELS, Simultaneous Equations Model, Data Envelopment Analysis

1. INTRODUCTION

1.1 Introduction/Problem Statement

Banks plays an essential role in economic development and macroprudential regulation. Banks follow a distinct business model in which they facilitate transactions and act as an intermediary between lenders and borrowers of capital. In line with this, banks can be exposed to different risks, and be subject to stringent regulations and standards. The primary source of income of banks come from the spread of the rates of lending and borrowing as well as service charges. However, there are some banks that are subject to religious constraints and follow certain rules. Islamic banks, for one, follow a different business model as compared to conventional banks because Islamic banks are prohibited from charging interest and are only allowed to trade and sell products in conformance with the Islamic rulings' principles. Due to the systemic significance of financial institutions, specifically banks, Basel Committee has been formed as the global standard-setting body for prudent bank regulations and providing a forum for cooperation on banking supervisory matters. The Basel Committee has already started implementing Basel III, a voluntary framework for banks which focuses on capital adequacy, stress testing, and market liquidity risk. Basel III is the third implementation of comprehensive set of reform measures, developed by the Basel Committee on Banking Supervision, to strengthen the regulation, supervision and risk management of the banking sector. The ASEAN Banking Integration Framework (ABIF) is designed to enable ASEAN banks to enter and operate in banking markets in other ASEAN member states, to eliminate discrimination against foreign banks, and to create a more consistent banking environment throughout the region. The framework presents a plan for liberalization in each of the three dimensions of the single market. The three dimensions are Equal Access, Equal Treatment, and Equal Environment (Asian Development Bank, 2013). By Equal Access, ASEAN based banks must have an ease of entry by meeting capital adequacy, improving transparency, restricting exposure, and raising supervision. The liberalization of market access should be implemented appropriately for market entry and cross-border banking activities. Equal treatment means that all ASEAN banks are to be treated equally, with their risk profile as the basis for assessment. Equal Environment pertains to the landscape of banks in the ASEAN and its regulations (Asian Development Bank, 2013).

The researchers were interested in analyzing the ASEAN banks' performances throughout the relevant recent years. Performance captures the bank's profitability, its risk and also its efficiency. Determining what mostly affects a bank's profitability, risk, and efficiency would help find a new perspective on what the bank must focus on. By having a view on what truly affects performance, a bank could then improve its performance by either cutting down on overhead costs or raising fee-based activities which might improve overall performance. By improving its profitability, efficiency, and minimizing its risk, it could help all the participants

involved reduce the cost of capital, improving margins and participation among the borrowers, and lessening risk for investors, and the financial system as a whole.

1.2 Literature Review

A study of Asian Development Bank (2013) discussed the assessment of the financial landscape of the ASEAN Region as well as formulating milestones for monetary and financial integration. According to the study, diversity has been one of the major characteristics of countries included in the ASEAN region, with member states differing in size, development stage, and industrial structure. Members of the ASEAN region sustains rapid growth rate averaging almost twice as much as the average GDP growth rate of the world economy in addition to relative reasonable price stability and large accumulated current account surpluses.

1.2.1 Determinants and Interdependency of Profitability, Risk, Capital, and Efficiency

In the light of the economic and financial integration, as well as growing business complexities, various researches and studies tackling the relation between bank capital, profitability, risk and efficiency are extended. As evidenced from prior literature (Eisenbeis & Kwan, 1996; Mongid et al., 2012; Shrieves & Dahl, 1992; Witowschi & Luca, 2016), apparent interdependency and simultaneity can be observed from profitability, risk, efficiency, and capital. According to Witowshci and Luca (2016), there has been a positive relationship between capital and profitability, which can be traced to profits as a source of capital. It has also been observed that a positive relation exists between profitability and risk, and efficiency of banks and their risks, while there has been generally, a negative relationship between profitability and cost efficiency (Witowshci & Luca, 2016). They argued that poor cost management is the main reason for poor profitability. Witowshci and Luca's (2016) results generally show that capital, profitability, and efficiency are significant determinants of risk for a bank within the same country. Witowshci and Luca (2016) stated that banks increases capital and allocation of risky assets as capital regulation becomes stricter, according to the moral hazard theory.

1.2.2 Performance of ASEAN Banks

Previous literature also discussed determinants of profitability, riskiness, and efficiency of banks within ASEAN region. Among others, notable literature includes the study of Jatuporn Sanmontrikul in 2013, entitled, *"Determinants Of Bank Performance On Asian Commercial Banks"*, Abdul Mongid, Izah Mohd Tahir, and Sudin Haron in 2012 entitled *"The Relationship between Inefficiency, Risk and Capital: Evidence from Commercial Banks in ASEAN"*. According to Jatuporn (2013), equity to total assets has a positive significant impact on bank performances. In contrast, loans to total assets, non-performing loans to gross loans and logarithm of total assets have negative significant impact on bank performances. Nevertheless, liquid asset to customer deposits and short term funding do not have a significant effect on bank performances. Gross domestic product growth has a positive significant impact on bank performances, but inflation rate has a negative significant impact on bank performances.

1.3 Hypothesis

The studies of Witowschi and Luca (2016) and Mongid et al. (2012) also identified significant internal factors affecting bank risk. These factors include capital, efficiency, and other various factors that can be internally controlled by the banks (e.g. financial ratios and operating figures). According to the study of Witowschi and Luca (2016), interdependencies can be observed among capital, risk and profitability. Additionally, Eisenbeis (1995) provides evidences of interdependencies between bank risk, inefficiency, and capital. Furthermore, according to Mongid et al. (2012) and Rahman (2015), risk and efficiency both influence each other, requiring simultaneous estimation of both variables. At the same time, both factors affect bank profitability. The studies of Eisenbeis (1995), Mongid (2012), Shrieves and Dahl (1992), and Witowschi and Luca (2016) employed the simultaneous equations model (2SLS/3SLS) in estimating their respective dependent variables. They argued that there is a need for simultaneous estimation in order to address simultaneity bias, where some explanatory variables are endogenous. Taking this into consideration, it is instrumental for this study to assess interdependencies between and among profitability, risk and efficiency.

Hypotheses:

(1) *Bank internal and external factors affects bank performance (profitability, risk, and efficiency).*

(2) *There is an inherent interdependency among and between profitability, risk, capital, and efficiency.*

1.4 Framework

In measuring the efficiency of the banks included in the sample, the DEA methodology has been used by the researchers. The DEA methodology is a non-parametric approach in measuring efficiency by utilizing mathematical programming in constructing efficient production frontiers to quantity the relative efficiency of a set of comparable decision making units (Spaho, 2015). Various models, approaches and orientation of the DEA make it flexible and popular in studies concerning bank efficiency (Titko et al., 2014), which was discussed in detail in Chapter 2 of this paper.

The researchers have employed a variable-returns-to-scale assumption and an input-oriented DEA model in this study. On the other hand, the selection of variables, inputs, and outputs were done under the intermediation and profitability approach, similar to what was done by Titko et al. (2014).

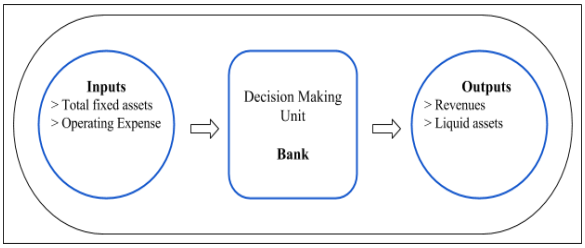

Figure 1 Schematic Diagram of the Operational Framework for DEA

The need for simultaneous equations model stems from the problem of endogeneity resulting to simultaneity bias. Endogeneity was a problem wherein an explanatory variable is correlated with the error term arising from measurement error, simultaneity, and omitted variables, whereas simultaneity bias stems from simultaneous causality or interdependency (Antonakis et al., 2014).

As evidenced from prior literature (Eisenbeis & Kwan, 1996; Mongid et al., 2012; Shrieves & Dahl, 1992; Witowschi & Luca, 2016), apparent interdependency and simultaneity can be observed from profitability, risk, efficiency, and capital. Hence, customary regression analysis, such as ordinary least squares, will be unable to capture the relationship between these variables, and the estimates shall be biased (Antonakis et al., 2014). Previous literature has provided a solution to this conundrum in the form of simultaneous equations, such as two-stage-least-squares (2SLS) and three-stage-least-squares (3SLS) (Eisenbeis and Kwan, 1996; Mongid et al., 2012; Shrieves & Dahl, 1992; Witowschi & Luca, 2016).

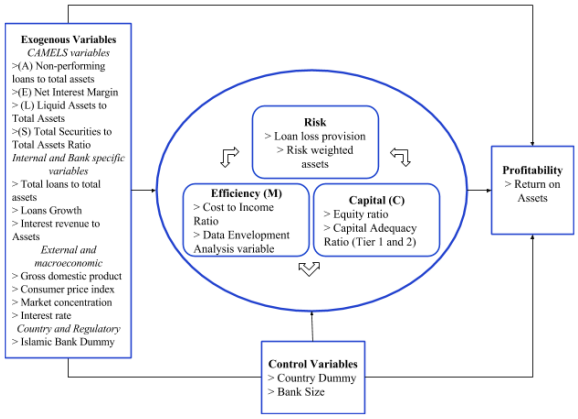

Figure 2 Schematic Diagram of the Operational Framework for SEM

2. METHODOLOGY

2.1 Research Design

The researchers have observed the effects of several bank accounting information as well as other internal and external indicators of the bank's performance. In this study, the design of the research was a causal design or an explanatory research. Causal research was conducted in order to identify the extent and nature of cause-and-effect relationships. The researchers have utilized the following equations in conducting this causal research.

$$ProfROA_{it} = \alpha_{it} + \beta_1 Risk_{it} + \beta_2 Eff_{it} + \beta_3 Cap_{it} + \beta_4 IntBS_{it} + \beta_7 ExtGDP_{it} + \beta_8 ExtInt_{it} + \beta_9 ExtMC_{it} + \beta_{10} ExtCPI_{it} + \beta_{11} CountryDu_{it} + \beta_{12} IslamDu_{it} + u_{it}$$

Eq. 1

$$Risk_{it} = \alpha_{it} + \beta_2 Eff_{it} + \beta_3 Cap_{it} + \beta_4 IntBS_{it} + \beta_5 CamelsA_{it} + \beta_6 CamelsS_{it} + \beta_7 IntTLTA_{it} + \beta_8 CountryDu_{it} + \beta_9 IslamDu_{it} + u_{it}$$

Eq. 2

$$Eff_{it} = \alpha_{it} + \beta_1 Risk_{it} + \beta_3 Cap_{it} + \beta_4 IntBS_{it} + \beta_5 CamelsE_{it} + \beta_6 CamelsL_{it} + \beta_7 IntIntTA_{it} + \beta_8 CountryDu_{it} + \beta_9 IslamDu_{it} + u_{it}$$

Eq. 3

$$Cap_{it} = \alpha_{it} + \beta_1 Risk_{it} + \beta_2 Eff_{it} + \beta_4 IntBS_{it} + \beta_5 CapER_{it} + \beta_8 RiskRWATA_{it} + \beta_9 IntLCAGR_{it} + \beta_{10} CPI_{it} + \beta_{11} MC_{it} + \beta_{12} IR_{it} + \beta_{13} MCR_{it} + \beta_{14} EMCR_{it} + \beta_8 CountryDu_{it} + \beta_9 IslamDu_{it} + u_{it}$$

Eq. 4

2.2 Research Procedures

In order to accomplish the objectives of this study, the researchers have chosen to employ a two-step procedure in estimating banks profitability, risk, and efficiency. First was to use Data Envelopment Analysis (DEA) on the selected inputs and outputs for banks. After arriving with efficiency scores, which was bounded by 0 and 1, DEA results could then be used as a binary response variable where 1 pertains to efficiency, and 0 pertains to inefficiency. Selected inputs include total funds (deposits and short-term funding), total fixed assets, and labor or number of employees or personnel expenses, while output variables include revenues, net loans, and liquid assets. This approach has been similar with Le (2016) in his study of Vietnamese Banks.

Second step was to estimate profitability, risk, and efficiency with the independent variables. Dependent (endogenous) variables for the system of equations include measures of profitability: return on asset, return on equity, and net interest margin; measures of risk: non-performing loans to total assets, loan loss provision to total assets, and risk weighted assets to total assets; measures of efficiency: cost to income ratio, cost to assets ratio, and DEA technical efficiency measures arrived from the first step. Independent variables include variable representing internal factors, macroeconomic conditions, and capital and regulatory environment. Internal factors include capital adequacy ratio, equity ratio, bank size, off-balance sheet activities divided by total assets, total loans to total assets, loan growth, and interest revenue to total assets. Macroeconomic and external indicators include GDP, consumer price index (CPI), interest rate, and market concentration.

3. RESULTS AND DISCUSSION

3.1 CAMELS Variables Analysis

Country	CAR1	CAR2	Camel sA	Camel sE	Camel sL	CamelsS	EffDEA1
PH	17.2	2.5	1.4	70.3	30.8	14.81	0.50
ID	14.5	2.5	2.5	-1.3	21.0	12.24	0.61
TH	11.9	3.4	4.2	57.6	8.1	6.41	0.45
MY	12.5	3.2	2.8	52.3	17.8	10.00	0.61
SG	13.9	2.5	0.3	66.1	21.8	11.97	0.80

Table 1: Summary of CAMELS ratio

Looking at a per country 5-year analysis shows that tier 1 capital ratio is highest in the Philippines while the weakest is Thailand. Thailand also showed that it has the highest tier ratio. Equity ratio is highest in Indonesia. Most highly levered banks come from Singapore. It highly shows however that Singaporean banks have only a little non-performing loans as a percentage of its assets in its balance sheet. The Philippines has the greatest interest spread among other countries. Indonesia has alarming negative earnings in a span of 5 years. The Philippines has the most liquid ratio and Thailand has the least liquidity ratio. Being the least liquid of the countries, Thailand has also the least sensitivity to market risk. The most efficient banks come from Singapore and the least efficient banks come from Thailand.

3.2 Data Envelopment Analysis

Country	Banks	5yr Mean	CR%
Philippines	15	0.5085	0.362
Malaysia	14	0.6164	9.0916
Thailand	10	0.4519	4.3816
Indonesia	63	0.6201	3.1994
Singapore	3	0.8091	-6.6175
Total	105		

Table 2: Summary of DEA results

Overall, Philippines has the least value for catch up rate, or the degree to which the bank in question was able to reduce the distance between its efficiency score and the efficiency score of the most efficient bank, while Malaysia has the greatest improvement in its efficiency score, relative to other banks. It is important to note however, while Singaporean banks has negative catch up rate, it does not imply that Singaporean banks has become less efficient; the results only show that the distance between Singaporean banks efficiency, which is highest in the region, and other banks within ASEAN included in the DEA, has decreased. Singaporean banks have the highest percentage of its banks breaching the country mean and ASEAN mean of banks' technical efficiency. This implies that Singaporean banks follow the best practices for banking operations as compared to their ASEAN counterparts. Philippines has the next highest proportion of total banks that breached the ASEAN mean and country mean. This indicates that most of Philippine banks have the next best practices in banking operations as compared to their ASEAN counterparts, accompanied with modest technical efficiency mean. Malaysia and Thailand have about a third of their banks which has breached the country, and ASEAN mean, which shows that some of their banks outperforms their ASEAN counterparts. Lastly, Thai banks have produced the least number of banks that breached the country and ASEAN technical efficiency score means. This can imply that Thai banks follow banking operations practices, which are not that efficient as compared with their ASEAN counterparts. Other countries have different lending practices which helps make them more efficient compared to others.

3.3 Three-Stage Least Squares

Endog	profroa	riskllp	effdea1	capcar2
riskllp	-/Yes		-/Yes	-/Yes
effdea1	-/No	-/Yes		-/Yes
capcar2	+/No	-/Yes	-/Yes	
capcar1	+/Yes			
intbs	-/No	-/No	-/No	-/Yes
extgdp	-/No			
islamdu	-/No	+/Yes	+/Yes	+/No
inttlta		+/No		
camelsa		-/No		
camelss		-/No		
camelse			-/No	
camelsl			-/No	
intintta			-/No	
intlcagr				+/No
caper				-/No
riskrwata				-/No

Table 3: Summary of 3SLS results

Profitability. The profitability variable is computed by calculating the CAGR of return on assets per bank. Risk have a negative relationship with profitability, indicating that the riskier a bank is, the more its profitability suffers, which can be attributed to the measurement limitations of the variables (profitability measured as return on assets while risk is measured as loan loss provisions). On the other hand, Capital, or tier 1 capital, seems to have a positive relationship with profitability. This means that banks with more retained earnings and shareholder's equity tend to be more profitable. The degree of risk exposure of a bank adversely affects its profitability due to bank practices of taking additional risk by lending to individuals with no capacity to repay the loan, hence increasing default risk and loan loss provisions, which in turn decreases the bank's profitability (Berrios, 2013). Capital, specifically tier 1 capital, and profitability shows strong relationship. This can be attributed to core earnings of the bank being reinvested in the firm, resulting to greater profitability (Witowshi and Luca, 2016).

Risk. Risk has been identified to have a significant relationship with efficiency (technical efficiency using DEA), capital (tier 2 capital), and being an Islamic bank. There is a negative relationship between technical efficiency as measured by DEA and bank risk, meaning that banks which are more efficient are less risky. On the other hand, tier 2 capital which is supplemental capital composed of subordinated term debt, general loan-loss reserves, and undisclosed reserves, also has a negative relationship with risk. Finally, the Islamic bank dummy shows that being an Islamic bank is positively related with risk, indicating that being an Islamic bank is riskier than being a conventional bank. This is also supported by the study of Al-Gazzar (2014) in his study of Pakistan banks. Risk and efficiency has shown negative relationship; this can be attributed to bad management of the banks. According to Fiordelisi (2010), inefficient banks tend to have low levels of profitability due to inadequate credit monitoring and inefficient cost controls. This can induce bank managers to take on additional risk, and increase bank risk in terms of credit, operational, market and reputational problems. Risk and capital has shown negative relationship, which can be attributed to the 'moral hazard theory' wherein bank managers have incentives to take on additional risk in the case of low level of bank capital (or banks are more inefficient).

Efficiency. Efficiency is measured by the average technical efficiency of banks using DEA through a two-input and two-output model. It has been identified that efficiency has a significant relationship with risk, capital (tier 2 capital), and being an Islamic bank. Risk and efficiency have negative relationship as discussed above. Capital and efficiency appears to have a negative relationship, which connotes that banks with more supplementary capital are less efficient than those with less tier 2 capital. Lastly, it has been observed that Islamic banks are more efficient than conventional banks. This can be seen in the study of Johnes (2014) where higher efficiency is seen in Islamic banks due to high managerial capability. Efficiency and risk has shown a negative relationship, which can be attributed to the "bad luck" hypothesis, where in the additional risk taken on by banks have adverse effect on efficiency levels, for instance, external shocks which can induce increases in problem loans for the bank shall result to additional costs and managerial effort. This shows that increases in bank risk result to cost and revenue inefficiency (Fiordelisi, 2010).

Capital. Capital, as measured by the CAGR of Tier 2 capital or supplemental capital, has been observed to have a significant relationship with risk, efficiency and islamic banking characteristics. The relationships of capital between capital risk and efficiency have been discussed above. Capital and risk has shown a negative relationship, this can be attributed to increased risk resulting to losses, hence lower income, and eventually, lower capital. Capital and efficiency has shown a negative relationship, this can be attributed to moral hazard theory and agency problem, which indicates that higher capitalized banks tend to be less efficient (Deelchand and Padgett, 2009).

Most of the variables included in this study have resulted to statistically insignificant coefficients with p-values greater than 0.05 level of significance. Hence, it can be inferred that there are no significant relationship between these variables and the dependent variable. These results are not in conformity with the researchers' expectations. However, these results have been consistent with that of Mongid et al. (2012), and Witowschi and Luca (2016), in which a number of variables included in the 3SLS regression have statistically insignificant coefficients. This research, however, has been able to affirm the existence of interdependency and simultaneity among and between, risk, efficiency, and capital in the ASEAN region, which Mongid et al. (2012) failed to prove in their study. Furthermore, this study has determined that there is a significant relationship between Islamic bank characteristics, and risk, along with efficiency.

3.4 Discussion of Results

Business Implications In the determination of relationship and interdependencies between and among various factors affecting bank performance, in terms of profitability, risk, efficiency, and capital, it is important to give attention to these key aspects in order to appropriately measure and gauge how well a bank is performing. Managers and executives of banks should focus on all of these factors. For instance, developing the bank's efficiency may bring about significant influence with regards to the bank's risk exposure and capital adequacy. Hence, a holistic approach in strategizing and decision making is important to address unwanted repercussions of those decisions. It is also important to monitor such relationships due to nature of the industry of the banks, being highly regulated and susceptible to different shocks. A new regulatory framework affecting capital may adversely affect a bank's efficiency, wherein more inputs are required to produce the same output, or the same amount of inputs yields fewer outputs.

Regulatory Implications While regulators among ASEAN countries have their own different policies for regulating their own perspective banks, looking at the results of the study would serve as good guidelines for future policies for them to implement. With the result concluding that profitability, risk, efficiency, and capital are interdependent, regulators can not only have general capital requirements to impose, but also it can implement policies that enhances efficiency as to improve all the other factors. Regulators could also measure the performance of their respective banks with respect to the current policy and adjust such policies to further improve performance and have a more holistic and interconnected approach to these factors. Implementing policies that have multidimensional aspects to the operations of the banks would improve overall factors with a probable lower cost rather than focusing on one dimension redundantly.

4.0 CONCLUSION AND RECOMMENDATIONS

The first part of the study pertains to the Data Envelopment Analysis. There is a need to determine the relative efficiency of ASEAN banks. In order to arrive with the technical efficiency scores for each bank included

in the DEA, the banks are ranked on an aggregate basis. The countries that have the most proportion of their banks above the mean technical efficiency score are Singapore and Philippines. In contrast, Thai banks has consistently been underperforming in terms of efficiency as compared to their ASEAN counterparts. The second part of the study is the simultaneous estimation of simultaneous equations. The researchers have estimated numerous combinations and iterations of model specifications containing variables in order to arrive at the optimum model. After running the regressions, the researchers have been able to prove and affirm the interdependence of risk, efficiency, and capital in the ASEAN banks, and their relationship with the bank's profitability.

Given the existence of relationship between profitability, risk, efficiency, and capital; banks should work on these core variables in order to facilitate a more effective management over their operations. As for Singapore showing good results for efficiency, ASEAN banks may wish to implement the same banking practices as implemented by Singapore banks. Some banks may consider diversifying some of their products and services since diversifying would entail lesser risk for the company, and concurrently a higher profitability. Philippines has exhibited greater risk management due to additional buffers made by its central bank. This can be a signal that banks may use additional buffers and tighter capital regulations to further improve its risk management.

In addition, in order to facilitate macroprudential policies without adversely affecting the banking operations and profitability of banks in the ASEAN region, it is important to determine how the factors of banks performance are interrelated with each other. As according to the results from the previous chapter, macroeconomic, external, and regulatory factors do not significantly affect the performance of banks. This is good in the way that banks can still perform well despite many regulations. However, the insignificant effect of regulations also shows a weakness on the part of government and regulatory agencies to control banks. It is therefore recommended that they regulate banks by using those variables that have significant relationship with the intended aspect of banks they want to regulate. A good example of how the government and regulatory agencies might use this study is to specifically target what is lacking in their respective banks. Indonesia for example as a population has a large variation in its efficiency scores. This would entail that its efficiency is not implemented nation-level, but only at a firm-level. Regulatory agencies could then address this weakness exhibited in the country by implementing policies that improves efficiency as Singapore has done. Philippines has also exhibited strong capital ratios which helps it manage risks.

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