

# Impact of Corporate Governance on Firm Efficiency: A Study of Thai Banking Companies

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## Abstract

Corporate governance refers to the system by which organizations are directed and controlled. The need for and the relative importance of corporate governance arose in the 1980s due to poor corporate governance, which led to a loss in the value of firms, a downturn in economies, trust deficit in businesses, and corporate responsibility scandals. Good corporate governance will help in reassuring the stakeholders that an organization's Board of directors (BOD) and top management are acting as worthy agents of their principal (the shareholders). Firm efficiency is the effective utilization of a firm's resources to generate more revenues. The present paper addresses whether a positive relationship exists between corporate governance and firm efficiency in Thai Banking companies. It analyzes whether good corporate governance leads to better firm efficiency and helps users' decision-making. For this purpose, the corporate governance scores (CG scores) of eleven (11) Thai banking companies (Public Companies Limited) have been compared and evaluated with their firm efficiency for each of the five years from 2015 to 2019. Data Envelopment Analysis (DEA) has been performed on essential financial items to determine firm efficiency. These financial items relate to the ones used in DuPont analysis. They have been obtained from the banks' financial statements. The findings report the change in CG scores and DEA firm efficiency of Thai banking companies and the impact of corporate governance on the efficiency of these firms. There is a clear and positive relationship between corporate governance and firm efficiency for most Thai banking companies but not for all of them.

**Keywords:** Corporate governance; firm efficiency; DEA; CG scores; Thai banking companies

## Introduction

Corporate governance refers to how an organization is directed and controlled by its Board of directors (BOD) and senior management. The Stock Exchange of Thailand (SET) defines corporate governance as a relationship between the Board of directors, its management team, shareholders, and other stakeholders in controlling its direction and monitoring its operations and administration. Claessens and Yurtoglu (2006) suggest that corporate governance considers matters like how the Board of directors operates, the roles of shareholders and stakeholders, executive compensation in determining the performance of a firm, and the relationship between labor policies and firm performance.

Mekong Capital (2003) mentioned the benefits of good governance, which are as follows:

- Higher valuation: The study indicated a high correlation between corporate governance and a company's performance.
- Capital efficiency: Companies with good governance are more likely to make better decisions and generate higher returns on their spending towards growing the revenue.
- Higher returns for shareholders: Good governance offers higher returns to the shareholders
- Mitigation of risks: Good governance, including transparency, transparent procedures, and responsibility for important decisions, could empower the company's Board to have better control and sound risk management that aids in mitigating the risks.
- Improved vision: Corporate governance helps improve an organization's vision through effective leadership by its Board and top managers.
- Transparency and social accountability: It enhances transparency and accountability in an organization, bolsters public confidence.

One of the causes of the financial crisis in Thailand in 1997 was poor corporate governance. Poor governance was responsible for frivolous lending by financial institutions, overusing short-term foreign currency-denominated loans to finance long-term investments, expropriation of company funds by managers and owners, risky business deals, and poor audits. The main factors contributing to weak corporate governance in Thailand were: ineffectiveness of regulatory framework, lack of transparency and adequate disclosure, and family-based corporate ownership structure (Limpaphayom, 2001). Weak corporate governance may cause various risk factors to stakeholders of the company such as loans to related parties, loans from related parties, asset sales to shareholders, asset purchases from shareholders, contracts with related parties, share sales to shareholders, share purchases from shareholders, fraudulent asset transfers, poor transparency, and unclear procedures. Each of these risk factors would harm shareholders and stakeholders. It may lead to poor transparency, and the investors would not make sound decisions (Mekong Capital, 2003).

Firm efficiency refers to how well the company utilizes its resources to generate revenues. Although the scope of firm efficiency can differ, depending on the type of research conducted and the economic situation in which a firm operates, its underlying import lies in the effective utilization of scarce resources that an organization has. Koh and Nawalkha (2020) define firm efficiency as an organization or a manager's ability to use its resources to maximize output based on a selection of input variables. Processes used in production, manufacturing, and service industries have become more efficient due to the increasing use of technology. Examples include data analytics, robotics, and enhanced processing power.

For this research, corporate governance (CG) scores are used to determine the quality of corporate governance in Thai banking companies. CG scores were obtained from the Thai Institute of Directors (IOD) website for the sample of banking companies. These scores will assist in knowing how well the corporate governance performance for the sample of these companies has been. Data envelopment analysis (DEA) is effective in measuring firm efficiency comparison. It is a non-parametric linear programming technique that converts input and output variables to an aggregate score relative to the best-in-class observations. Sherman and Zhu (2013) mentioned that DEA helps companies benchmark and identify best practices that are not easy to achieve using management techniques. DEA can be used to determine service organizations' efficiency and performance evaluation.

Lin et al. (2009) suggested that the corporate governance indicators like the proportion of outside directors and number of board meetings are positively associated with the firm efficiency in Chinese manufacturing firms. They provide credible signals to minority

investors of firms with an insider-dominated or small board. The authors also mentioned that firm efficiency was positively related to public and employee share ownership while negatively related to state ownership. In a sample of manufacturing firms from sixteen countries, Nanka-Bruce (2011) mentioned that corporate governance could contribute towards better technical efficiency of firms by increasing the large external shareholders. The author also suggested that a firm should increase the size of non-executive directors when the firm has widely dispersed directors or the executive directors are underperforming.

Nguyen and Vo (2020) examined the impact of corporate governance on the efficiency of ASEAN banks. They suggested that government-owned banks were more cost-efficient, but private and foreign banks were more efficient. They also mentioned that CEO duality, board independence, and foreign ownership showed no significant effect on bank efficiency levels. Another paper by Hsu and Petchsakulwong (2010) also studied the effect of corporate governance on efficiency, but it was done for Thai non-life insurance industry. There is still a lack of studies about the impact of corporate governance on the efficiency of Thai banking companies. There has also been a lack of studies on determining the efficiency of the firms by using the DEA technique on the Thai banks. Thus, more study and evidence are required to expand knowledge in this area and assist the managers, investors, and other users in better decision-making.

As an attempt to fill this research gap, the objective of this study is to address whether corporate governance in an organization is positively related to its efficiency or not. The point here is to analyze if good corporate governance will lead to better firm efficiency for a sample of Thai Banking companies and therefore help users' decision-making by analyzing the relationship between CG and firm efficiency. Results from this study will provide a further contribution to existing literature that still needs more evidence regarding the effect of corporate governance on firm efficiency in Thai banks. In addition, the results will also provide implications to the stakeholders like managers about which companies demonstrate a positive relationship between good corporate governance and efficiency and which ones do not. This may help the managers of banks, for instance, identify and analyze the causes or factors responsible for lower firm efficiency despite having good corporate governance.

## **Literature Review**

### **History of Corporate Governance**

Corporate governance has been referred to as creating an environment that stimulates trust within an organization. In the capital markets, the word trust has been associated as an essential factor for buying shares. It is so because without trust, investors will not buy shares, and without access to adequate funding sources, companies cannot prosper quickly. Corporate governance has also been a significant consideration among foreign investors looking at Thai capital markets. However, corporate governance was not deliberated upon in the professional or academic literature before 1980.

Corporate governance was primarily brought to focus in 1987 by the Treadway Commission in the United States, which issued a report on fraudulent financial reporting and asserted the role and status of audit committees. Afterward, in May 1991 in the UK, the Cadbury Committee was set up by Financial Reporting Council (FRC), the London Stock Exchange, and the accountancy profession to look into the low level of confidence of stakeholders in financial reporting and inadequacy in the work of auditors who audit the financial reports. In addition, the responsibilities of the Committee were to report on the financial aspects of corporate governance, consider the responsibilities of executive and non-

executive directors, the case for the audit committee, the principal responsibilities of auditors, the extent and value of the audit, and the links between shareholders, boards, and auditors. This Committee recommended three principles of the Code of Best Practice to be the guidelines for the companies, which are:

- Openness: subject to corporate confidentiality
- Integrity: honest, balanced, and complete financial reporting
- Accountability: requirement for directors to provide quality information and for shareholders to exercise their powers as owners' responsibility

### **Significance of corporate governance in modern times**

Jo and Harjato (2011) suggested that corporate governance manages the interest of shareholders and non-investing stakeholders and helps resolve the conflict between the two. Accelerated corporate governance in the last decade has also led to the growth of Corporate Social Responsibility (CSR), ensuring the firm's sustainability through transparency and accountability (Jo and Harjato, 2011). In other words, CSR is an extension of an organization's efforts to provide better corporate governance and enhance its sustainability. Good corporate governance promotes investor confidence. Therefore, it is crucial to raise capital from potential investors. The companies should focus on a holistic and informative explanation of their corporate governance framework to their stakeholders.

The role of the Board of Directors (or Board) is crucial to good corporate governance. Denis and McConnell (2003) mentioned that the Board exists mainly to recruit, disengage a senior employee from service, monitor and compensate management with the significant objective of maximizing the shareholders' value. In theory, it is an effective mechanism but may not be so in practice. In the US, the Board of Directors includes some of the very insiders to be monitored (Denis & McConnell, 2003). There is also a possibility that the Chief Executive Officer (CEO) is the chairperson of the Board. In other words, it raises some questions on whether good corporate governance is possible in such situations or not.

### **Corporate Governance in Thailand**

Initial interest and concern concerning corporate governance in Thailand started in the 1980s by Siam Cement Plc., Thailand's most significant conglomerate in building and construction materials. This company adopted a code of best practice by following the governance model of IBM. Despite this, there was generally a lack of development and interest towards corporate governance until the financial crisis in 1997. At that time, The Stock Exchange of Thailand (SET) realized the significance of corporate governance in developing the capital markets after the banks and many other financial institutions collapsed. Since then, corporate governance practices have been studied and taken seriously.

The SET has continuously supported listed firms to establish their CG systems. In 2002, the SET supported listed firms' good CG by proposing the 15 Principles of Good Corporate Governance as preliminary guidelines to implement. In 2006, the principles were revised to be comprehensive and comparable to the Principles of Corporate Governance of the Organization for Economic Co-operation and Development (OECD). Also, it includes recommendations made by the World Bank in its Report on the Observance of Standards and Codes related to Thai CG (CG-ROSC).

The Stock Exchange of Thailand (SET) and the Securities and Exchange Commission (SEC), Thailand have cited four factors to promote good corporate governance. These factors are:

- Fairness: To treat shareholders and creditors fairly and protect them against fraud and misconduct
- Transparency: To disclose accurate and timely information of both financial and non-financial aspects of a company
- Accountability: To set up a structure of accountability for the Board of directors and executives and make them accountable towards the interest of shareholders and creditors
- Responsibility: Management should take responsibility regarding the interests of the organizations' shareholders and stakeholders.

Prommin et al. (2014) studied the effect of corporate governance on stock liquidity in Thailand. The authors suggested that effective corporate governance provided better operational and financial transparency in firms and that this led to a significant improvement in the stock liquidity. They have claimed that a rise in governance quality by one standard deviation improves the stock liquidity ratio by 26.19%.

Hoontrakul and Karnchanasai (2010) suggested that the majority of the privately owned banks in Thailand are efficient and have better corporate governance. The authors mentioned that the Bank of Thailand (BoT) has continuously updated its bank functioning and corporate governance regulations. The Thai banks can do better with a clear strategic direction.

According to the Institute of Directors (IOD) in Thailand, the Thai banking sector has consistently been the best performing in corporate governance over the years compared to other sectors. The Thai SEC requires Thai companies to disclose their CG practices in the 56-1 business report and the annual Report. For instance, Thai banks scored highest on the IOD 2019 and 2018 CG ratings. All the banks scored an excellent or very good CG rating in both years. In general, the companies with high market capitalization from different sectors have exhibited a better corporate governance performance in Thailand.

### **Corporate Governance parameters**

Ifitikhar et al. (2017) studied the relationship between corporate governance and Pakistani listed commercial banks' technical efficiency from 2005 to 2014. The study found a statistically significant positive relationship between a corporate governance index and the technical efficiency observed in the banks. The corporate governance index used in the study was subdivided into the following five areas: Board of directors, audit committee, disclosure and transparency, remuneration committee, and shareholder's rights.

Like the CG scores in Thailand, corporate governance benchmarking benefits the shareholders, creditors, management, employees, directors, policymakers, academics, analysts, customers, and regulators. CG score for a firm may help in investment screening, pricing the new capital issues, and guiding regulation and policy. It helps the various stakeholders evaluate a firm's corporate governance practice and compare the firms. It also supports comparing corporate governance practices from one country to another.

The Thai Institute of Directors (Thai IOD) compiles annual corporate governance scores for nearly all listed Thai companies. The IOD evaluates corporate governance using five categories, namely: Rights of Shareholders (15%), Equitable Treatment of Shareholders (10%), Role of Stakeholders (20%), Disclosure, and Transparency (20%), Board Responsibilities (35%). Each category's weightings to the firm's corporate governance score have been included in parentheses. The Thai IOD calculates a weighted average score by checking a list of criteria related to each corporate governance category. The individual scores of each company are not made publicly available, but the Thai IOD reports company performance by categorizing performance; the following categories are used: Excellent

(\*\*\*\*\*) for CG scores greater than 90, Very Good (\*\*\*\*) for scores between 80 and 89, Good (\*\*\*) for scores between 70 and 79. If a listed firm is not included in one of the above categories, it can be assumed to achieve a score of lower than 70.

### **Firm Efficiency**

Different scholars have also used different techniques to determine firm efficiency. One such technique is known as the modified form of the technique for order preference by similarity to ideal solution (TOPSIS). Deng et al. (2000) pioneered the new method to analyze and rank the firms based on their overall performance on multiple financial ratios. It can also be considered as a multiple-criteria analysis for inter-firm comparison using financial ratios. Scholars have also used Tobin's Q ratio to measure firm performance.

Another technique that industry practitioners and research scholars use to value a firm is the Data Envelopment Analysis (DEA). Sharma (2018) has defined DEA as a usual non-parametric method that uses linear programming to measure the relative performance of similar units of a firm or between the firms. This technique uses multiple input and output variables to generate an overall score. Anadol et al. (2014) mentioned that DEA could play an important role in firm valuation as it is a relatively advanced technique. Anadol et al. (2014) used this method to determine the efficient and inefficient American companies.

DEA has not been used in financial analysis, although its use has grown since 2000 and onwards. One of the significant advantages of using this technique is that multiple input and output factors can be used to generate the relative efficiency of the firms. The use of DEA contrasts to ratio analysis which typically compares one financial item with another to derive information. For instance, the Return on Assets ratio expresses the relationship between net profit and the average total assets of a firm to throw light on the asset efficiency. Since DEA can use multiple inputs and outputs simultaneously, it provides a holistic view and a pragmatic relative efficiency and performance of a firm. Another advantage of using DEA is that it provides a relative measure of a firm's efficiency vis-a-vis other firms. However, it does not indicate an average efficiency or median efficiency. So, it becomes easier and straightforward to analyze and compare the firms and helps investors in their decision-making process.

Zhu et al. (2021) conducted an efficiency and productivity analysis of Pakistan's banking industry using the DEA approach. They used interest and non-interest expense as input variables and interest income and non-interest income as the output variables. They selected these variables based on past studies done by Zhu and Shah (2019) and Avkiran (1999). Rodríguez-Pérez et al. (2011) researched 85 Spanish insurance companies and considered total expenses, financial investments in associated and group companies, other financial investments, land and buildings, and other assets as input variables while considering total revenues as output variable. These variables were used to determine firm efficiency by using DEA analysis. They considered these input variables because they form a significant chunk of a financial (insurance) company and will therefore affect the generation of revenue (the output variable). They also considered the changes in the historical cost basis to fair value basis. They advocated that some of these input variables will show significant differences between the two valuation bases and, therefore, help determine and compare the firm efficiency by using each valuation basis. Different authors and scholars have used different variables based on the nature and scope of their studies and the variables used in the past studies for related research.

## Research Hypothesis

**H1:** High corporate governance score leads to the high efficiency of the Thai banking companies.

**H2:** Ranking of Thai banking companies based on their corporate governance scores will concur with the ranking based on their efficiency.

## Research Methodology

### Sample and data collection

The annual reports of a sample of eleven (11) Thai banking public companies limited (PCL) were obtained. All the financial information related to the variables chosen, like total expenses, available for sale securities, annual revenue, etc., were obtained from the financial statements or notes to the financial statements. This was done in order to test the hypothesis and analyze the findings. The present research is based on secondary data, which is the annual reports/financial statements of the Thai banking PCL. The main reason for selecting banking companies is that they are critical to developing the Thai economy and contribute a substantial portion to Thailand's Gross Domestic Product (GDP). Finance (including banking) and the insurance industry contributed Thai Baht 1.27 trillion towards the country's GDP in 2019.

The annual reports and related financial information were obtained from these companies' websites, the settrade.com website, and the Stock Exchange of Thailand (SET) website. The information on available-for-sale securities, securities-held-to-maturity and land & buildings was collected from the balance sheet of the sample of companies. The information for revenues and expenses was taken from the income statement of these companies. Expenses, available-for-sale securities, securities-held-to-maturity, and land & buildings have been taken as input variables. In contrast, the revenue is considered as an output variable for this research.

The first word in capital letters of these banking companies mentioned below refer to their stock symbol or ticker, and these symbols will be used more often in this research. The list of these companies is as follows:

KBANK – Kasikorn Bank Public Company Limited; TTB - TMBThanachart Bank Public Company Limited; BBL - Bangkok Bank Public Company Limited; KTB - Krung Thai Bank Public Company Limited; BAY - Bank of Ayudhya Public Company Limited; KKP - Kiatnakin Phatra Bank Public Company Limited; CIMBT - CIMB Thai Bank Public Company Limited; SCB - The Siam Commercial Bank Public Company Limited; TCAP - Thanachart Capital Public Company Limited; TISCO - Tisco Financial Group Public Company Limited; LHFG - LH Financial Group Public Company Limited

The information regarding the corporate governance scores (CG score) of the sample of companies has been taken from the Thai Institute of Directors (IOD) website. The Institute of Directors is a leading organization for improving corporate governance and director professionalism in Thailand. The organization's guidelines on corporate governance are considered reliable and effective, nationally and globally.

The assessment of the corporate governance practices of Thai listed companies is done by the IOD in collaboration with the Stock Exchange of Thailand (SET). The assessment criteria are developed based on the Thai Corporate Governance Code for Listed Companies and the Organization for Economic Cooperation and Development (OECD). It is then

published in a comprehensive report, "Corporate Governance Report of Thai Listed Companies (GCR)".

### Measures

a. Focus was placed on the financial items likely to affect banking companies' efficiency. They included the annual revenues as the output and expenses, available-for-sale securities, securities-held-to-maturity, and land & buildings as the inputs. In other words, these variables relate to the ones used in DuPont analysis.

b. Standard deviation was used to study all the variables under consideration, like companies' expenses for different years. This was done to know the dispersion of the variables from the mean.

c. The CG scores of Thai banking companies were compared with their efficiency scores for each of the five years from 2015 to 2019 to test hypothesis H1.

**Table 1.** CG scores description categorized by the Institute of Directors

| Score       | 90-100    | 80-89     | 70-79 | 60-69        | 50-59 | <50 |
|-------------|-----------|-----------|-------|--------------|-------|-----|
| Description | Excellent | Very Good | Good  | Satisfactory | Pass  | N/A |

The significant categories of assessment of corporate governance by IOD and SET include the role of stakeholders (20%), disclosure and transparency (20%), board responsibilities (35%), rights of shareholders (15%), and equitable treatment of shareholders (10%). A steering committee comprising industry leaders reviews and comments on the CG score evaluation process.

d. Relative efficiency for each year of Thai banking companies was determined using DEA analysis and evaluated with the ranking of these companies based on their corporate governance scores. This was done to test hypothesis H2. DEA analysis is a proven method to determine firm efficiency and is especially relevant when the data is not normally distributed as it is a non-parametric method. A non-parametric method does not make any assumption about the characteristics of the sample or its parameters and usually means that the data does not have a normal distribution.

One sample Kolmogorov- Smirnov (K-S) test is also used to determine if a variable is normally distributed or not. e. The skewness & kurtosis and one-sample Kolmogorov-Smirnov (K-S) test were performed to determine if the data is normally distributed or not. Skewness can be quantified as representing the degree to which a given distribution varies from a normal distribution, while kurtosis measures whether the data are lightly tailed or heavily tailed relative to the spread or normal distribution.

The use of CG scores and DEA efficiency methods will help to achieve the objective of this study which is to address whether corporate governance in a bank is positively related to its efficiency or not. CG scores are provided by IOD, which is a reliable organization in Thailand. These scores are derived for companies through the use of scientific assessment methods. DEA is an effective and reliable non-parametric method used to determine an organization's efficiency.



### DEA and statistical analysis

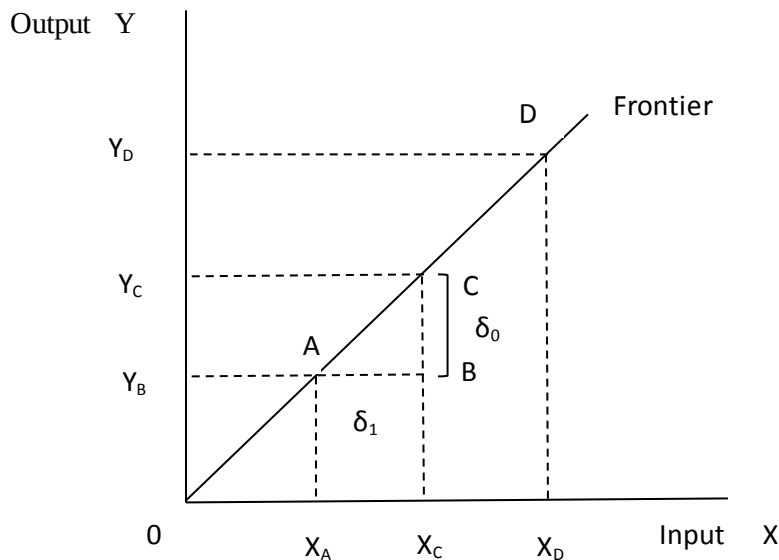
DEA software DEAP and SPSS software were used to perform this research. DEAP software was used to determine companies' efficiency scores, while SPSS software was used to determine Standard deviation, mean and perform Kolmogorov-Smirnov (K-S) test.

DEA can effectively determine an overall score for the efficiency of a firm based on the input and output variables. It is a powerful tool in analyzing the efficiency of a firm. In financial statement analysis, input and output variables are the primary financial items or accounts that can significantly affect firms' efficiency. In the DEA model used in this study, total expenses, Available-for-sales-securities, Securities-held-to-maturity, Land & Buildings have been taken as input variables. At the same time, annual revenue is considered an output variable. These input variables are a firm's significant resources that help it generate its total revenues. Therefore, these variables have been taken as the inputs which affect the output, i.e., total revenues. Contrasting outputs to inputs helps to determine the efficiency of a firm.

**Table 2.** Input and Output Variables used in DEA model

| Input variables                | Output variable |
|--------------------------------|-----------------|
| Total expenses                 |                 |
| Available-for-sales-securities | Total revenues  |
| Securities-held-to-maturity    |                 |
| Land & Buildings               |                 |

A simple DEA model of one input variable and one output variable is explained below:



**Fig. 1.** Simple DEA model - one input variable and one output variable

The decision-making units (DMUs) or firms A, C, and D are considered the most efficient as they are on the efficiency frontier among a set of observations. The curve from 0 and passing through A, C, and F is the efficiency frontier because it shows the best input and

output variables combinations. Firm B is inefficient as it is not on the efficiency frontier. To be efficient, it can do one of two things; one way is to reduce its input from  $X_C$  to  $X_A$  while keeping the output  $Y$  the same. Labeled  $Y_B$ . Another method is increasing its output variable from  $Y_B$  to  $Y_C$  while keeping the same ( $X_C$ ) input. It can be expressed as follows:

1. Firm B should increase its output by  $\delta_0$

$$\gamma = \frac{Y_C/X_C}{Y_B/X_C} > 1$$

Here  $\gamma$  represents the factor by which Firm B's output should be improved to become fully efficient. This approach is called the output-oriented approach as it focuses on improving the output variable.

2. Firm B should decrease its input by  $\delta_1$

$$\theta = \frac{Y_D/X_G}{Y_D/X_E} > 1$$

Here  $\theta$  represents the factor by which Firm B's input should be decreased to become fully efficient. This approach is called the input-oriented approach because it aims at decreasing the input and maximizing efficiency.

For this research, an output-oriented approach and constant returns-to-scale have been assumed. Technical efficiency of 1 is considered the best and means that the decision-making unit (DMU) is the most efficient, whereas a score of 0 means the DMU is least efficient among its peers. In other words, the technical efficiency of DMUs can have a score between 0 and 1, with 0 representing the least efficient firm, while the more the score, the better is the efficiency of a firm with the maximum at 1. DMUs refer to the firms under consideration for their firm efficiency.

## Results

### Financial year (FY) 2015

The following information has been taken from the financial statements and annual reports from 2015-2019. This data pertains to the input and output variables chosen for DEA analysis of eleven (11) banking companies (Public Company Limited) in Thailand. PCL means Public Company Limited. **All units are in Thai Baht (THB) million.**

**Table 3.** Financial information of Thai banking companies for FY 2015

| Bank Name | Annual revenue | Total expenses | Available-for-sales-securities | Securities-held-to-maturity | Land & Buildings | Corporate governance Score |
|-----------|----------------|----------------|--------------------------------|-----------------------------|------------------|----------------------------|
| KBANK     | 147,515        | 66,656         | 215,365                        | 248,272                     | 45,284           | excellent (5 stars)        |
| TTB       | 33,450         | 16,467         | 40,814                         | 39,557                      | 10,292           | excellent (5 stars)        |
| BBL       | 102,728        | 45,045         | 441,497                        | 16,213                      | 46,108           | very good (4 stars)        |
| KTB       | 116,607        | 50,920         | 93,740                         | 124,706                     | 26,355           | excellent (5 stars)        |
| BAY       | 82,773         | 38,947         | 107,756                        | 1,006                       | 20,993           | very good (4 stars)        |
| KKP       | 15,057         | 7,822          | 12,940                         | 1,005                       | 1,892            | excellent (5 stars)        |
| CIMBT     | 12,234         | 7,127          | 26,518                         | 22,399                      | 2,770            | very good (4 stars)        |
| SCB       | 137,258        | 48,797         | 382,200                        | 133,064                     | 39,988           | excellent (5 stars)        |
| TCAP      | 39,895         | 20,009         | 160,527                        | 11,053                      | 8,047            | very good (4 stars)        |
| TISCO     | 16,489         | 5,527          | 7,886                          | 191                         | 2,633            | excellent (5 stars)        |
| LHFG      | 5,543          | 2,400          | 2,353                          | 44,824                      | 499              | excellent (5 stars)        |

**Financial year 2016****Table 4.** Financial information of Thai banking companies for FY 2016

| <b>Bank Name</b> | <b>Annual revenue</b> | <b>Total expenses</b> | <b>Available-for-sales-securities</b> | <b>Securities-held-to-maturity</b> | <b>Land &amp; Buildings</b> | <b>Corporate governance Score</b> |
|------------------|-----------------------|-----------------------|---------------------------------------|------------------------------------|-----------------------------|-----------------------------------|
| KBANK            | 153,403               | 63,854                | 336,234                               | 298,065                            | 49,728                      | excellent (5 stars)               |
| TTB              | 35,223                | 16,589                | 24,355                                | 25,309                             | 12,383                      | excellent (5 stars)               |
| BBL              | 105,858               | 50,505                | 462,742                               | 18,121                             | 45,231                      | very good (4 stars)               |
| KTB              | 124,668               | 50,631                | 106,241                               | 103,088                            | 27,313                      | excellent (5 stars)               |
| BAY              | 91,487                | 43,080                | 114,497                               | 16,700                             | 25,221                      | excellent (5 stars)               |
| KKP              | 16,156                | 7,352                 | 12,914                                | 1,093,949                          | 2,092                       | excellent (5 stars)               |
| CIMBT            | 12,928                | 7,424                 | 30,433                                | 17,511                             | 3,671                       | very good (4 stars)               |
| SCB              | 133,334               | 51,644                | 438,473                               | 122,166                            | 40,888                      | excellent (5 stars)               |
| TCAP             | 40,747                | 21,073                | 165,736                               | 2,917                              | 9,605                       | excellent (5 stars)               |
| TISCO            | 16,757                | 6,541                 | 6,753                                 | 16                                 | 2,653                       | excellent (5 stars)               |
| LHFG             | 6,967                 | 2,602                 | 6,859                                 | 45,803                             | 404                         | excellent (5 stars)               |

**Financial year 2017****Table 5.** Financial information of Thai banking companies for FY 2017

| <b>Bank Name</b> | <b>Annual revenue</b> | <b>Total expenses</b> | <b>Available-for-sales-securities</b> | <b>Securities-held-to-maturity</b> | <b>Land &amp; Buildings</b> | <b>Corporate governance Score</b> |
|------------------|-----------------------|-----------------------|---------------------------------------|------------------------------------|-----------------------------|-----------------------------------|
| KBANK            | 156,856               | 66,372                | 171,397                               | 338,003                            | 50,137                      | excellent (5 stars)               |
| TTB              | 37,439                | 17,792                | 36,865                                | 23,851                             | 12,071                      | excellent (5 stars)               |
| BBL              | 112,468               | 48,948                | 533,651                               | 11,233                             | 30,763                      | very good (4 stars)               |
| KTB              | 123,224               | 49,483                | 158,497                               | 41,837                             | 26,019                      | excellent (5 stars)               |
| BAY              | 100,480               | 48,210                | 66,797                                | 16,438                             | 26,401                      | excellent (5 stars)               |
| KKP              | 16,298                | 8,578                 | 16,737                                | 1,218                              | 2,744                       | excellent (5 stars)               |
| CIMBT            | 13,155                | 7,613                 | 20,811                                | 13,600                             | 3,588                       | very good (4 stars)               |
| SCB              | 182,579               | 57,650                | 432,064                               | 120,671                            | 44,164                      | excellent (5 stars)               |
| TCAP             | 47,323                | 20,836                | 155,454                               | 2,024                              | 8,678                       | excellent (5 stars)               |
| TISCO            | 18,394                | 7,671                 | 7,127                                 | 0                                  | 2,653                       | excellent (5 stars)               |
| LHFG             | 6,493                 | 2,721                 | 1,246                                 | 47,146                             | 343                         | excellent (5 stars)               |

**Financial year 2018****Table 6.** Financial information of Thai banking companies for FY 2018

| Bank Name | Annual revenue | Total expenses | Available-for-sales-securities | Securities-held-to-maturity | Land & Buildings | Corporate governance Score |
|-----------|----------------|----------------|--------------------------------|-----------------------------|------------------|----------------------------|
| KBANK     | 155,483        | 68,348         | 266,798                        | 371,025                     | 48,525           | excellent (5 stars)        |
| TTB       | 48,042         | 17,475         | 40,830                         | 31,143                      | 11,876           | excellent (5 stars)        |
| BBL       | 121,400        | 55,165         | 497,838                        | 19,849                      | 31,168           | very good (4 stars)        |
| KTB       | 117,221        | 53,088         | 196,800                        | 2,392                       | 26,501           | excellent (5 stars)        |
| BAY       | 109,579        | 51,741         | 117,098                        | 16,297                      | 26,239           | excellent (5 stars)        |
| KKP       | 18,103         | 9,470          | 18,715                         | 1,227                       | 2,773            | excellent (5 stars)        |
| CIMBT     | 13,537         | 8,346          | 48,874                         | 20,105                      | 3,536            | very good (4 stars)        |
| SCB       | 188,135        | 64,639         | 432,663                        | 120,645                     | 43,206           | excellent (5 stars)        |
| TCAP      | 49,168         | 20,979         | 147,676                        | 2,231                       | 8,043            | excellent (5 stars)        |
| TISCO     | 20,033         | 8,753          | 8,793                          | 0                           | 2,992            | excellent (5 stars)        |
| LHFG      | 7,060          | 2,768          | 2,408                          | 43,241                      | 292              | excellent (5 stars)        |

**Financial year 2019****Table 7.** Financial information of Thai banking companies for FY 2019

| Bank Name | Annual revenue | Total expenses | Available-for-sales-securities | Securities-held-to-maturity | Land & Buildings | Corporate governance Score |
|-----------|----------------|----------------|--------------------------------|-----------------------------|------------------|----------------------------|
| KBANK     | 160,491        | 72,729         | 336,707                        | 416,369                     | 52,698           | excellent (5 stars)        |
| TTB       | 39,821         | 20,674         | 55,377                         | 0                           | 23,642           | excellent (5 stars)        |
| BBL       | 133,746        | 54,963         | 574,720                        | 23,257                      | 40,754           | very good (4 stars)        |
| KTB       | 125,658        | 62,474         | 344,198                        | 1,737                       | 24,201           | excellent (5 stars)        |
| BAY       | 121,608        | 52,169         | 102,724                        | 13,437                      | 29,029           | excellent (5 stars)        |
| KKP       | 19,168         | 10,194         | 20,701                         | 1,221                       | 3,038            | excellent (5 stars)        |
| CIMBT     | 14,155         | 9,640          | 34,446                         | 19,555                      | 3,429            | very good (4 stars)        |
| SCB       | 201,445        | 70,538         | 270,740                        | 8,717                       | 40,777           | excellent (5 stars)        |
| TCAP      | 14,177         | 3,153          | 33,197                         | 3,046                       | 301              | excellent (5 stars)        |
| TISCO     | 19,436         | 9,271          | 9,146                          | 0                           | 2,984            | excellent (5 stars)        |
| LHFG      | 7,904          | 3,005          | 1,648                          | 42,075                      | 280              | excellent (5 stars)        |

**Statistics**

The standard deviation for all variables like annual revenue, total expenses, etc. is high, which means that dispersion or variation from the mean is high. The skewness coefficient is an indicator for measuring the extent of the latent variables' asymmetrical distribution compared to the normal distribution (Ho & Yu, 2015). When the value of the skewness coefficient is zero, it indicates normality; otherwise the data is not normally distributed. Ho and Yu (2015) suggested that the kurtosis coefficient is an indicator for estimating the extent of pointedness of the latent variables' distribution compared to the normal distribution. When the value of the Kurtosis coefficient is zero, it indicates normal distribution. The skewness and kurtosis of all the descriptive statistics like annual revenue, total expenses, available-for-sale securities etc., for years 2015 to 2019 are not near zero, so the data is not normally distributed. Some variables such as securities-held-to-maturity, the

skewness, and kurtosis in all the years are greater than 1, clearly indicating that the data is not normally distributed.

Kolmogorov-Smirnov (K-S) test is used to measure if the data is drawn from a specific distribution or not (Lall, 2015). Lall (2015) mentions that the K-S test is significant as it is non-parametric, which means that it does not assume that the data comes from some fixed type of distribution. For all variables overall years, the one-sample Kolmogorov-Smirnov (K-S) test is significantly less than one and at times close to zero. It implies that the data are not normally distributed.

DEA is a non-parametric technique that produces an efficient frontier from the data provided (Visbal-Cadavid, 2017). The author also mentioned that DEA enables a single efficient index for each unit evaluated and generates a reference set of efficient units as a benchmark. It can handle multiple input and output variables at the same time. Therefore, using a non-parametric technique like the DEA for further analysis based on these variables is justifiable.

**Table 8.** Descriptive Statistics for variables of Thai banking companies for FY 2015

| Statistics                |                |                |                               |                             |                  |
|---------------------------|----------------|----------------|-------------------------------|-----------------------------|------------------|
|                           | Annual Revenue | Total expenses | Available-for-sale-securities | Securities-held-to-maturity | Land & Buildings |
| Mean                      | 64,504.586     | 28,156.108     | 135,599.670                   | 58389.983                   | 18623.701        |
| Median                    | 39,894.660     | 20,008.940     | 93,740.480                    | 22399.000                   | 10291.850        |
| Std. Deviation            | 54,057.8771    | 22,499.6418    | 152,934.7093                  | 78648.5979                  | 18123.908        |
| Skewness                  | .415           | .378           | 1.217                         | 1.694                       | .605             |
| Kurtosis                  | -1.649         | -1.424         | .367                          | 2.511                       | -1.414           |
| Minimum                   | 5,543.42       | 2,399.65       | 2,352.96                      | 191.00                      | 499.00           |
| Maximum                   | 147,515.13     | 66,656.15      | 441,497.00                    | 248272.00                   | 46108.06         |
| Kolmogorov-Smirnov (Sig.) | .139           | .200           | .197                          | .008                        | .134             |

**Table 9.** Descriptive Statistics for variables of Thai banking companies for FY 2016

|                            | Annual Revenue | Total expenses | Available-for-sale-securities | Securities-held-to-maturity | Land & Buildings |
|----------------------------|----------------|----------------|-------------------------------|-----------------------------|------------------|
| Mean                       | 67,047.853     | 29,208.652     | 155,021.519                   | 158513.211                  | 19926.094        |
| Median                     | 40,746.700     | 21,073.140     | 106,240.860                   | 25309.000                   | 12383.370        |
| Std. Deviation             | 55,350.6415    | 22,821.135     | 175,709.280                   | 322240.420                  | 18643.129        |
| Skewness                   | .371           | .218           | .994                          | 2.926                       | .535             |
| Kurtosis                   | -1.729         | -1.871         | -.625                         | 8.908                       | -1.411           |
| Minimum                    | 6,967.07       | 2,601.53       | 6,752.76                      | 16.00                       | 403.90           |
| Maximum                    | 153,402.68     | 63,854.38      | 462,742.00                    | 1093949.00                  | 49727.87         |
| Kolmogorov- Smirnov (Sig.) | .114           | .200           | .116                          | .000                        | .200             |

**Table 10.** Descriptive Statistics for variables of Thai banking companies for FY 2017

| Statistics                |                |                |                               |                             |                  |
|---------------------------|----------------|----------------|-------------------------------|-----------------------------|------------------|
|                           | Annual Revenue | Total expenses | Available-for-sale-securities | Securities-held-to-maturity | Land & Buildings |
| Mean                      | 74,064.400     | 30,534.011     | 145,513.293                   | 56001.906                   | 18869.306        |
| Median                    | 47,322.860     | 20,835.920     | 66,797.000                    | 16438.000                   | 12070.720        |
| Std. Deviation            | 63,235.807     | 23,643.945     | 179,943.860                   | 99718.630                   | 17653.872        |
| Skewness                  | .518           | .235           | 1.479                         | 2.704                       | .655             |
| Kurtosis                  | -1.280         | -1.851         | 1.242                         | 7.662                       | -.933            |
| Minimum                   | 6,493.43       | 2,720.64       | 1,246.31                      | .00                         | 343.22           |
| Maximum                   | 182,578.75     | 66,371.95      | 533,651.00                    | 338003.00                   | 50136.65         |
| Kolmogorov-Smirnov (Sig.) | .194           | .118           | .035                          | .000                        | .200             |

**Table 11.** Descriptive Statistics for variables of Thai banking companies for FY 2018

| Statistics                |                |                |                               |                             |                  |
|---------------------------|----------------|----------------|-------------------------------|-----------------------------|------------------|
|                           | Annual Revenue | Total expenses | Available-for-sale-securities | Securities-held-to-maturity | Land & Buildings |
| Mean                      | 77,069.149     | 32,797.406     | 161,681.221                   | 57104.972                   | 18650.057        |
| Median                    | 49,167.740     | 20,979.370     | 117,098.000                   | 19849.000                   | 11876.260        |
| Std. Deviation            | 63,566.805     | 25,582.984     | 172,456.313                   | 109662.965                  | 17299.0415       |
| Skewness                  | .477           | .219           | 1.079                         | 2.809                       | .599             |
| Kurtosis                  | -1.226         | -2.006         | .035                          | 8.222                       | -1.104           |
| Minimum                   | 7,060.02       | 2,768.13       | 2,408.04                      | .00                         | 291.71           |
| Maximum                   | 188,134.64     | 68,347.67      | 497,838.00                    | 371025.00                   | 48525.13         |
| Kolmogorov-Smirnov (Sig.) | .165           | .125           | .200                          | .000                        | .200             |

**Table 12.** Descriptive Statistics for variables of Thai banking companies for FY 2019

| Statistics                |                |                |                               |                             |                  |
|---------------------------|----------------|----------------|-------------------------------|-----------------------------|------------------|
|                           | Annual Revenue | Total expenses | Available-for-sale-securities | Securities-held-to-maturity | Land & Buildings |
| Mean                      | 77,964.324     | 33,528.143     | 162,145.801                   | 48128.530                   | 20103.004        |
| Median                    | 39,821.260     | 20,674.370     | 55,377.000                    | 8717.000                    | 23642.380        |
| Std. Deviation            | 71,228.943     | 28,765.075     | 190,437.814                   | 122819.841                  | 19164.078        |
| Skewness                  | .503           | .269           | 1.180                         | 3.251                       | .398             |
| Kurtosis                  | -1.457         | -2.028         | .494                          | 10.672                      | -1.372           |
| Minimum                   | 7,903.86       | 3,005.24       | 1,647.80                      | .00                         | 280.19           |
| Maximum                   | 201,444.74     | 72,729.25      | 574,720.00                    | 416369.00                   | 52697.53         |
| Kolmogorov-Smirnov (Sig.) | .055           | .062           | .038                          | .000                        | .033             |

## DEA analysis

The eleven (11) banking companies are called Decision-making units (DMUs) in DEA analysis. On undertaking the DEA analysis using DEAP software, with revenue as the output and expenses, available-for-sale investments, securities held to maturity, and land

and buildings as inputs, the DEA efficiency of firms for the years under consideration was as follows:

**Table 13.** DEA efficiency scores of Thai Banking companies for Years 2015 to 2019

|               | 2015  | 2016  | 2017  | 2018  | 2019  |
|---------------|-------|-------|-------|-------|-------|
| <b>K BANK</b> | 1.000 | 1.000 | 1.000 | 0.971 | 0.770 |
| <b>TMB</b>    | 0.827 | 1.000 | 0.876 | 1.000 | 0.748 |
| <b>BBL</b>    | 1.000 | 0.842 | 0.742 | 0.946 | 0.788 |
| <b>KTB</b>    | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| <b>BAY</b>    | 0.872 | 1.000 | 1.000 | 1.000 | 1.000 |
| <b>KKP</b>    | 1.000 | 0.976 | 0.777 | 0.724 | 0.809 |
| <b>CIMBT</b>  | 0.690 | 0.648 | 0.718 | 0.545 | 0.543 |
| <b>SCB</b>    | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| <b>TOP</b>    | 1.000 | 0.870 | 0.736 | 0.818 | 1.000 |
| <b>TESCO</b>  | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| <b>LFG</b>    | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| <b>Mean</b>   | 0.944 | 0.940 | 0.895 | 0.909 | 0.851 |

## Discussion

### Comparison of efficiency scores with the CG scores

Praptiningsih (2009) performed a study to measure corporate governance and performance in the banking sector. The author's banking sectors considered were Thailand, Indonesia, Malaysia, and the Philippines. The author found that only CEO duality, the board size, and board independence among all the internal control monitoring mechanisms like CEO duality showed a positive relationship with corporate performance. The study also suggested that the disclosure monitoring mechanism through the big four auditing firms was significantly related to corporate performance. According to Nguyen and Vo (2020), foreign ownership, board independence, and CEO duality showed no significant effect on the bank efficiency levels. Board size had a positive effect on banking efficiency. The authors had conducted this study to evaluate the effect of corporate governance on the efficiency of ASEAN banks from 2007 to 2014. Hsu and Petchsakulwong (2010) conducted research on the impact of corporate governance on the efficiency performance of the Thai non-life insurance industry. They used the DEA method to determine the efficiency of firms. His findings suggest that audit committee size & diligence, board tenure, board ownership, and separation between voting rights and cash flow rights negatively affected firm efficiency. However, firm size and board independence & diligence had a favorable effect on efficiency performance. This discussion highlights that corporate governance is related to the firm's efficiency but not always. It also suggests that some of the mechanisms or categories of corporate governance may be positively related to the firm efficiency but not all of them. There has been a lack of research in Thailand on the overall impact of corporate governance on firm efficiency, particularly for the banking industry. This study contributes to filling this research gap.

Efficiency scores obtained by using DEA are compared with the CG scores of these firms under consideration for each year which is one of the principal objectives of this study. CG score is like a cumulative score of a firm's governance based on significant categories of

corporate governance assessment like stakeholders' role, disclosure and transparency, board responsibilities, rights of shareholders, and equitable treatment of shareholders. As mentioned in the research methodology, the assessment of CG practices is done by IOD in collaboration with SET and is then published in GCR.

**Table 14.** Comparison of CG scores and DEA efficiency scores - FY 2015

| Firm symbol/ticker | CG score            | Efficiency score |
|--------------------|---------------------|------------------|
| K BANK             | excellent (5 stars) | 1.000            |
| TMB                | excellent (5 stars) | 0.827            |
| KTB                | excellent (5 stars) | 1.000            |
| KKP                | excellent (5 stars) | 1.000            |
| SCB                | excellent (5 stars) | 1.000            |
| TESCO              | excellent (5 stars) | 1.000            |
| LFG                | excellent (5 stars) | 1.000            |
| BBL                | very good (4 stars) | 1.000            |
| BAY                | very good (4 stars) | 0.872            |
| COMBAT             | very good (4 stars) | 0.690            |
| TOP                | very good (4 stars) | 1.000            |

From the above comparison, the CG scores have a positive relationship to their firm efficiency for most companies. Hypothesis 1, H1 was that 'High corporate governance score leads to the higher efficiency of the Thai banking companies.' It holds for all the companies in 2015 except for CIMB Thai Bank (CIMBT) whose technical efficiency is relatively low at 0.690.

Hypothesis 2, H2 was that the 'Ranking of Thai banking companies based on their corporate governance scores will concur with the ranking based on their efficiency.' In the case of TMBThanachart Bank (TMB), the CG score was 'excellent', but its efficiency was relatively lower at 0.827. Furthermore, in the case of Bangkok Bank (BBL) and Thanachart Capital (TCAP), the CG score was comparatively lower. However, the efficiency was still maximum, i.e., 1. Therefore hypothesis 2 does not hold for all banking companies in 2015, but it is validated for most of them.

**Table 15.** Comparison of CG scores and DEA efficiency scores - FY 2016

| Firm symbol/ticker | CG Score            | Efficiency score |
|--------------------|---------------------|------------------|
| K BANK             | excellent (5 stars) | 1.000            |
| TMB                | excellent (5 stars) | 1.000            |
| KTB                | excellent (5 stars) | 1.000            |
| BAY                | excellent (5 stars) | 1.000            |
| KKP                | excellent (5 stars) | 0.976            |
| SCB                | excellent (5 stars) | 1.000            |
| TOP                | excellent (5 stars) | 0.870            |
| TESCO              | excellent (5 stars) | 1.000            |
| LFG                | excellent (5 stars) | 1.000            |
| BBL                | very good (4 stars) | 0.842            |
| COMBAT             | very good (4 stars) | 0.648            |



CIMB Thai Bank (CIMBT) has a 'very good' CG score but its efficiency is quite low at 0.648. Hypothesis H1 holds for all companies other than CIMB Thai Bank (CIMBT).

Hypothesis 2, H2 is not satisfied because Kiatnakin Phatra Bank (KKP) and Thanachart Capital (TCAP) have relatively lower efficiencies at 0.976 and 0.870, respectively, although they have 'excellent' CG scores. Therefore, the ranking of a few companies based on their CG scores is not in line with their efficiencies.

**Table 16.** Comparison of CG scores and DEA efficiency scores - FY 2017

| Firm symbol/ticker | CG Score            | Efficiency score |
|--------------------|---------------------|------------------|
| K BANK             | excellent (5 stars) | 1.000            |
| TMB                | excellent (5 stars) | 0.876            |
| KTB                | excellent (5 stars) | 1.000            |
| BAY                | excellent (5 stars) | 1.000            |
| KKP                | excellent (5 stars) | 0.777            |
| SCB                | excellent (5 stars) | 1.000            |
| TOP                | excellent (5 stars) | 0.736            |
| TESCO              | excellent (5 stars) | 1.000            |
| LFG                | excellent (5 stars) | 1.000            |
| BBL                | very good (4 stars) | 0.742            |
| COMBAT             | very good (4 stars) | 0.718            |

Hypothesis H1 is not validated as Kiatnakin Phatra Bank (KKP) and Thanachart Capital (TCAP) CG scores are 'excellent', but their efficiency is relatively lower. For all other companies, though, the CG scores reflect a positive relationship with their corresponding efficiency.

Hypothesis H2 is also not validated as the ranking of banking companies based on their CG scores does not concur with the ranking based on their efficiency for two companies, Kiatnakin Phatra Bank (KKP) and Thanachart Capital (TCAP).

**Table 17.** Comparison of CG scores and DEA efficiency scores - FY 2018

| Firm symbol/ticker | CG Score            | Efficiency score |
|--------------------|---------------------|------------------|
| K BANK             | excellent (5 stars) | 0.971            |
| TMB                | excellent (5 stars) | 1.000            |
| KTB                | excellent (5 stars) | 1.000            |
| BAY                | excellent (5 stars) | 1.000            |
| KKP                | excellent (5 stars) | 0.724            |
| SCB                | excellent (5 stars) | 1.000            |
| TOP                | excellent (5 stars) | 0.818            |
| TESCO              | excellent (5 stars) | 1.000            |
| LFG                | excellent (5 stars) | 1.000            |
| BBL                | very good (4 stars) | 0.946            |
| COMBAT             | very good (4 stars) | 0.545            |

Like in 2017, in 2018 hypothesis 1, H1 does not hold as Kiatnakin Phatra Bank (KKP) and Thanachart Capital (TCAP) CG scores are 'excellent', but their efficiency is lower. Also, hypothesis H2 is not validated because both Kiatnakin Phatra Bank (KKP) and Thanachart Capital (TCAP) scores highest on CG scores but not on the efficiency criteria. Therefore, the relative CG scores of a few banking companies do not concur with that of their efficiencies.

**Table 18.** Comparison of CG scores and DEA efficiency scores - FY 2019

| Firm symbol/ticker | CG Score            | Efficiency score |
|--------------------|---------------------|------------------|
| K BANK             | excellent (5 stars) | 0.770            |
| TMB                | excellent (5 stars) | 0.748            |
| KTB                | excellent (5 stars) | 0.703            |
| BAY                | excellent (5 stars) | 1.000            |
| KKP                | excellent (5 stars) | 0.809            |
| SCB                | excellent (5 stars) | 1.000            |
| TOP                | excellent (5 stars) | 1.000            |
| TESCO              | excellent (5 stars) | 1.000            |
| LFG                | excellent (5 stars) | 1.000            |
| BBL                | very good (4 stars) | 0.788            |
| COMBAT             | very good (4 stars) | 0.543            |

The efficiency scores of banks like Kasikorn Bank (KBANK), TMB Thanachart Bank (TMB), and Krung Thai Bank are lower while their CG scores are highest, which is 'excellent'. Hypothesis 1, H1 does not hold.

Ranking of efficiencies also does not concur with the efficiencies of several companies like CIMB Thai Bank (CIMBT), Kiatnakin Phatra Bank (KKP), Kasikorn Bank (KBANK), TMBThanachart Bank (TMB), and Krung Thai Bank. For CIMB Thai Bank (CIMBT), its relative efficiency is not as high as Bangkok bank's (BBL) efficiency, although its CG score is the same as the latter.

### Conclusions and Recommendations

For all the years from 2015 to 2019, The Siam Commercial Bank (SCB), LH Financial Group (LFG), and TISCO Financial Group (TISCO) have been the best performing both in terms of corporate governance and firm efficiency. These companies secured an 'excellent' CG score and an efficiency of 1 for all five years. Their CG scores and efficiency are positively related. Although CIMB Thai Bank (CIMBT) secured a 'very good' rating for its CG scores for all years, its efficiency varied more from year to year. Overall, its efficiency was relatively lower than its corresponding CG scores, and it was relatively the least efficient and had the lowest CG scores overall.

In all the years from 2015 to 2019, most banking companies with a high CG score also had a high firm efficiency. The notable ones where this was not the case were Kiatnakin Phatra Bank (KKP) and Thanachart Capital (TCAP). Notably, in 2016, 2017, and 2018, a high CG score of these two companies did not lead to high efficiency. Further, in no year from 2015 to 2019 did the ranking of the banking companies concur with the ranking based on their efficiency.

Studies were done by Salim et al. (2016), Ongore and Owoko (2011), and Lin et al. (2009) suggest that some CG assessment parameters or criteria have a positive relationship to the firm efficiency but not all of them. The effect of corporate governance on the firm efficiency is also dependent on the nature of a firm like whether it is government-owned, private or a foreign enterprise. The results in this research paper reflect that although there is a clear and positive relationship between corporate governance and the firm efficiency of most Thai Banking companies, this positive relationship cannot be said for all of them. This finding adds to the debate for managers and academia whether sound corporate governance will always lead to higher firm efficiency. This finding implies that sound corporate governance helps achieve effective utilization of resources and enhances the efficiency of most firms. However, other factors are involved, which may lead to higher firm efficiency for

Thai Banking companies. Some of these factors could be employee morale, use of latest technology, etc., for which more study will need to be done. When skilled employees are retained and their morale is stable, it leads to decreased costs and better organizational efficiency (Pampurini & Quaranta, 2018). When employees are recognized for their performance and productivity, it increases their morale and job satisfaction, translating into better firm efficiency (Afsar et al., 2017). Gumbau-Albert and Maudos (2002) mentioned that using the latest technology like new machines improved the efficiency of firms in the Spanish industry. These studies confirm that other factors may also affect firm efficiency.

The present study will be helpful to the stakeholders like investors, managers, and the government to know more about the corporate governance and firm efficiency of banking firms and how far they are related in the different Thai Banking firms. The managers and analysts of the companies like Kiatnakin Phatra Bank (KKP) and Thanachart Capital (TCAP) can identify and analyze the reasons and factors responsible for lower firm efficiency based on all the years despite the 'excellent' CG scores that they have. The managers of Kasikorn Bank (KBANK), TMBThanachart Bank (TMB) and Krung Thai Bank can also analyze the reasons for lower efficiency in 2019 despite excellent CG score. Further study is needed to identify other factors that, along with corporate governance, can be used to analyze their effect on the firm efficiency in Thai Banking companies. Future research can also look at how some categories of assessment of corporate governance, like disclosure and transparency, affect the firm's efficiency.

### Limitations

As noted above, corporate governance and other factors can be identified and studied to analyze their effect on the firm efficiency of Thai banking companies. This research includes the study of banking companies only. Future research can also include other sectors in the financial industry like insurance companies and other financial companies in Thailand. Further studies of different sectors will help determine if similarities exist with the Thai banking sector. This research considers the CG scores, an aggregate derived from different categories of assessment of corporate governance. Some of these categories, like the role of stakeholders or disclosure and transparency, should be considered individually to analyze their impact on firm efficiency.

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