The Relative Efficiency of Commercial Banks in Thailand:

DEA Approach

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Abstract

This study aims to examine the relative efficiency of 13 commercial banks in Thailand during 2003 – 2006. Data Envelopment Analysis (DEA) which is one of non-parametric analytic techniques is utilized to measure the relative efficiency of these commercial banks under two different approaches which are operation approach and intermediation approach. Operation approach reflects the way of evaluating the efficiency of commercial banks from the perspective of costs and revenues management, whereas intermediation approach reflects the way of evaluating the efficiency of commercial bank which takes commercial banks as entities which use labor and capital to transform deposits into loans and securities.

According to the analysis, we find that during 2003 – 2006 the efficiency of Thai commercial banks under operation approach was very high and stable with the average efficiencies over 90% in every year while the efficiency under intermediation approach was moderately high and somewhat volatile with the average efficiencies ranging from 72% to 86%. In terms of size, large, medium and small banks, in average, were not different in efficiency under operation approach. Moreover, we find that they were efficient under operation approach with the average efficiencies of 100% during 2003 – 2006. However, small banks were the most efficient banks under intermediation approach. In addition, incumbents which are commercial banks

originally competing in banking business and new entries which are commercial banks previously competing in finance and securities business were also efficient under operation approach with the average efficiencies of 100%. Moreover, they both were not different in efficiency under operation approach. Nevertheless, incumbents, in average, were more efficient than new entries in perspective of intermediation approach.

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CHAPTER 1: INTRODUCTION

1.1) Background and Signification of the Problem

Generally, financial system in Thailand is composed of two major parts. The first part is the financial market which is a broad market for the exchange of capital and credit in the economy. This market allows buyers and sellers to exchange various types of financial securities (such as stocks and bonds) or products that comprise financial securities (such as futures and options). Financial market may be categorized as either money market or capital market. Money market deals in short term debt instruments whereas capital market trades in long term debt and equity instruments.

The latter part of financial system is the financial institutions. They are the institutions that help to channel funds through an economy by accepting the surplus money of savers and supplying that money to borrowers, who pay to use the money. In Thailand, financial institutions include commercial banks, non-bank financial institutions (such as insurance companies and finance and securities companies) and specialized financial institutions (such as government saving bank and government housing bank). However, among these financial institutions, commercial banks have played the most crucial roles and contributed substantially to the finance of Thailand's economy.

The financial system in Thailand has long been dominated by commercial banks. In 2005, Thailand's commercial banks collected over 6 trillion baht of total deposits or deposits equivalent, accounting approximately for 76 percent of total deposits or deposits equivalent at Thailand's financial institutions. This amount is

roughly 88 percent of Gross Domestic Product (GDP) in 2005. Moreover, as the most crucial source of credits, commercial banks provided lending approximately of 5.5 trillion baht in 2005, accounting roughly for 77 percent of total credit provided by Thailand's financial institutions. This amount is around 77 percent of GDP.

Since banking sector are the major sector that contribute substantially to the finance of national economy, efficiency of commercial banks is one of the most interesting and important issues for both the government and private sector. After the financial crisis in 1997, the efficiency of Thai banking sector measured as the total factor productivity (TFP) growth of Thailand's commercial banks sharply declined (Chansarn, 2005) due to enormous Non-Performing Loans (NPLs), stemming from inappropriate lending to real estate business (borrowing short but lending long) and the heavier repayment burden with foreign currency liabilities, stemming from the devaluation of Thai baht in July, 1997.

Now, several years after the crisis, Thailand's commercial banks can now make higher profits and has regained people and investors' trust. Furthermore, there are several changes occurred in Thai banking sector. The main change is the increase in competition among commercial banks mainly due to the entrance of new commercial banks. The competition has strengthened not only with the emergence of commercial banks which formerly competed only in finance and securities business (such as Thanachart Bank, Tisco Bank and Kiatnakin Bank) but also the emergence of commercial bank which was set up with the main purpose to support the major business of headquarter (like Land and Houses Retail Bank). This new environment forces all commercial banks to improve their performance in order to raise their profitability.

Due to the importance of commercial banks to the government, households and investors, the profitability of commercial banks is one of the most concerns. Moreover, people and investors have always been questioning the performance and efficiency of commercial banks.

Consequently, the main purpose of this study is to examine the relative efficiency of each commercial bank in Thailand during the period 2003 – 2006 by utilizing Data Envelopment Analysis (DEA) which is one of non-parametric analytic techniques. DEA has been widely used to measure the efficiency of different financial institutions such as commercial banks, insurance companies or mutual funds. Particularly in banking sector, DEA has been applied to benchmark the performance of different commercial banks or different branches of a particular bank. This study, moreover, examines the relative efficiency of commercial banks in different size (large, medium and small) categorized by their market shares of total assets. Eventually, this study investigates if the commercial banks which have originally competed in banking business and the new banks which formerly competed in finance and securities business are different in efficiency.

1.2) Objectives of the Study

1. To examine the relative efficiency of commercial banks in Thailand during the period 2003 - 2006.

2. To examines the relative efficiency of commercial banks in different size (large, medium and small) categorized by their market share of total assets during the period 2003 – 2006.

3. To investigates if the commercial banks which have originally competed in banking business and the new banks which formerly competed in finance and securities business are different in efficiency.

1.3) Research Methodology

This study aims to examine the relative efficiency of commercial banks in Thailand during 2003 – 2006 by using Data Envelopment Analysis (DEA) which is one of the non-parametric analytic techniques for evaluating relative efficiency of decision making units (DMUs). Furthermore, this study will examine the relative efficiency of commercial banks under two dimensions. Firstly, it aims to examine the efficiency of commercial banks as profit maximizing entities which utilize labors and capitals to generate revenues. It is called *Operation Approach*. Secondly, it aims to examine how efficient commercial banks utilize labors and capitals to transform deposits into loans and investments. It is called *Intermediation Approach*.

1.4) Scope of the Study

1. This study examines the relative efficiency, not absolute efficiency, of commercial banks in Thailand in each year during the period 2003 – 2006.

2. This study examines the relative efficiency only of commercial banks in Thailand, but not foreign bank branches in Thailand.

3. Commercial banks selected for this study are all the current members of the Stock Exchange of Thailand (SET) as of 2006.

1.5) Expected Benefits

1. This study will indicate the relative efficiency of commercial banks in Thailand.

2. Households and Investors gain answers for several interesting and frequently asked questions about investment in commercial banks: Which commercial bank is efficient? Should I deposit my money at the medium or small commercial banks? Or should I deposit my money at the new banks which were previously finance and securities companies? This study will help them make decision on portfolio investment.

3. Authorities, such as the Bank of Thailand and the Ministry of Finance, gain useful information to be used as a guideline in order to set up a policy to for Thai banking sector.

CHAPTER 2: REVIEW OF LITERATURES

The efficiency of banking sector is one of the most interesting economic issues for economists all over the world. The evidence for this is that there are several attempts to investigate the efficiency of commercial banks by a number of economists, both Thai and foreign economists. In Thailand, Chansarn (2007) investigated the efficiency of Thai financial sector including banking sector after the financial crisis in 1997 by looking at the total factor productivity (TFP) growth. He also investigated the efficiency of domestic and foreign commercial banks. Based on the sample of 12 commercial banks listed on the Stock Exchange of Thailand (SET) over the period of 1998 – 2204, the study reveals that the efficiency of Thai banking sector was diminishing over the period 1998 – 2004. However, the sharp decrease in efficiency of banking sector occurred only over the period 1998 – 1999, while the efficiency was decreasing very slightly over the period of 1999 – 2004. The study also suggests that domestic and foreign commercial banks were not different in efficiency.

In addition, Rangkakulnuwat (2007) utilized Data Envelopment Analysis (DEA) to estimate the technical efficiency of 9 Thai commercial banks from 2000 to 2005. The results indicate that commercial banks in the first tier had always produced at production frontiers and had higher technical efficiency than the second and the third tiers. Commercial banks in the second and the third tiers could sometimes produce at production frontiers. Nevertheless, there was no evidence that technical efficiencies of commercial banks in the second tier were higher than those in the third tier.

Although there are many ways adopted to examine the efficiency of commercial banks, Data Envelopment Analysis (DEA) seems to be more popular among economists. DEA was originally introduced by Charnes, Cooper and Rhodes (1978) as they proposed a non-linear programming model to measure the relative efficiency of decision making units (DMUs). The examples of such units to which DEA has been applied are commercial banks, insurance companies, schools, universities and hospitals. Note here that one advantage of DEA is that it can be applied to non-profit making organizations.

Since the mid-1980s, DEA has been receiving an importance as a technique for measuring efficiency in commercial banks in several countries. For instance, Casu and Molyneux (2000) employed the DEA approach to investigate the efficiency in European banking system. They attempted to examine whether the productive efficiency of European banking systems had improved and converged towards a common European frontier between 1993 and 1997, following the process of EU legislative harmonization. Halkos and Salamouris (2001) utilized the DEA approach to measure the efficiency of Greek banking sector with the use of a number of suggested financial ratios for the time period 1997 – 1999. Jemric and Vujcic (2002) used DEA to analyze the efficiency of banking sector in Croatia. They attempted to measure the relative efficiency of commercial banks in Croatian market according to size, ownership structure, date of establishment and quality of assets in the period from 1995 to 2000. Wu (2002) conducted productivity and efficiency analysis of banks operation in Australia since the deregulation of the Australian financial system in early 1980s. DEA is employed in order to investigate the levels of and the changes in the efficiency of Australian banks over the period from 1983 to 2001. Ozkan-Gunnay and Tektas (2006) assessed the technical efficiency of non-

public commercial banks in Turkey between 1990 and 2001, following the DEA model. Debasish (2006) attempted to measure the relative performance of Indian banks, using the output-oriented CRR DEA model. The analysis used 9 input variables and 7 output variables in order to examine the relative efficiency of commercial banks over the period 1997 – 2004. Finally, Luciano (2007) illustrated the efficiency features of Italian banking system through the review of the most important empirical studies over the last fifteen years. Particular emphasis is given to DEA studies.

The fundamental concept of DEA is to compare each commercial bank with the best bank. The best commercial bank will be assigned the efficiency score of 1 or 100%. Any commercial banks with the less than 1 efficiency score is said to be inefficient. We will start with the numerical and graphical example to make it easier to understand. Suppose that we are now trying to examine the relative efficiency among 4 commercial banks. For each bank, we have two outputs (interest income (million baht) and non-interest income (million baht)) and single input (number of staffs). The data we have is as follow.

Bank	Interest Income	Non-Interest Income	Number of staffs
A	2,500	1,000	360
B	460	240	220
C	1,600	1,100	340
D	880	400	320

According to the data above, we can calculate interest income per staff and non-interest income per staff as follow.

Bank	Interest Income per Staff	Non-Interest Income per Staff
A	6.94	2.78
B	2.09	1.09
C	4.71	3.24
D	2.75	1.25

Here we can see that Bank A has the highest interest income per staff, whereas Bank C has the highest non-interest income per staff. Bank B and Bank D do not compare so well with Bank A and Bank C, consequently they are presumably performing less well. That is, they are relatively less efficient at utilizing their given input to produce outputs. In this case, Bank A and Bank C are said to be efficient with the efficiency score of 1.00 or 100%. In contrast, Bank B and Bank D are said to be inefficient with the efficiency score of less than 1.00.

Now, suppose we plot the two ratios for each commercial bank as illustrated below.

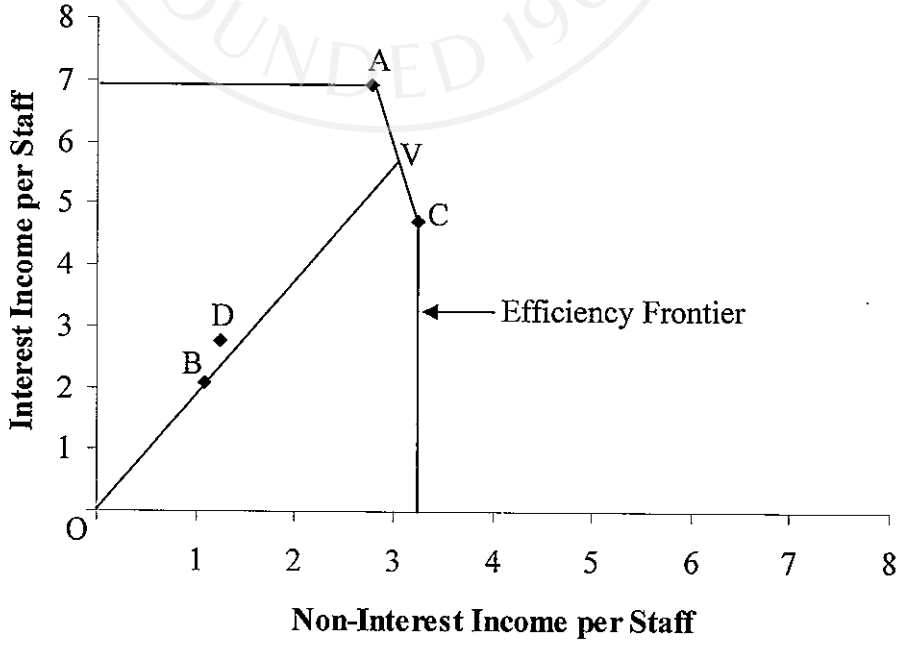

Figure 2.1: Efficiency Frontier

The positions on the graph represented by Bank A (point A) and Bank C (point C) demonstrate a level of performance which is superior to all other banks. A horizontal line can be drawn from the vertical axis to point A, from point A to point C, and a vertical line from point C to horizontal axis. This is called the *efficiency frontier*. It defines the maximum combinations of outputs that can be produced for a given set of inputs. Mathematically, the efficiency frontier is the convex hull of the data.

The efficiency frontier, derived from the examples of the best practice contained in the data we have considered, represents a standard of performance that the banks not on the efficiency frontier could try to achieve.

According to the graph, it is very easy to interpret. Any banks on the efficiency frontier are 100% efficient (have an efficiency score of 1.00). Thus, for our example, Bank A and Bank C have efficiencies of 100%.

Since Bank B and Bank D lie below the efficiency frontier, they are inefficient (have an efficiency score of less than 1.00). Their efficiencies can be determined by comparing them to the virtual bank formed from Bank A and Bank C.

Let's consider the efficiency of Bank B. The virtual bank (point V) is the best possible performance that Bank B could be expected to achieve. This is the point where the line from the origin through Bank B (point B) meets the efficiency frontier. In other word, the virtual bank (point V) represents a bank that, was to exist, would have the same business mix as Bank B and would be 100% efficient.

The efficiency of Bank B is then calculated by finding the fraction of inputs that the virtual bank (point V) would need to produce as many outputs as Bank B. This is easily calculated by looking at the line from the origin, O, to V. The efficiency of Bank B can be measured as OB/OV. Note here that OB is the output

which Bank B can produce, whereas OV is the maximum output which can be produced with the same amount of input as Bank B.

Data Envelopment Analysis (DEA), occasionally called frontier analysis, is a performance measurement technique which can be used for analyzing the relative efficiency of productive units, having the same multiple inputs and multiple outputs. It is a non-parametric analytic technique which allows us to compare the relative efficiency of units as benchmark and by measuring the inefficiencies in input combinations in other units relative to the benchmark. One of the earliest studies relating to DEA is the study of Farrell (1957) who attempted to measure the technical efficiency of production in single input and single output case. However, DEA was originally developed by Charnes, Cooper and Rhodes (1978) with the assumption of constant return to scale (CRS) in attempt to propose a model that generalize the single-input, single output measure of a DMU to a multiple input, multiple output setting. Thus DEA is an entity that uses input to produce output. DEA was extended by Banker, Charnes and Cooper (1984) to include variable returns to scale (VRS). Up to now the DEA measure has been used to evaluate and compare educational departments, health care, agricultural production, banking, armed forces, sports, market research, transportation and many other applications.

DEA is a deterministic methodology for examining the relative efficiency, based on the data of selected inputs and outputs of a number of entities called decision –making units (DMUs). Based on the set of available data, DEA identifies relative efficient DMUs (which are used as reference points) which define the efficiency frontier and evaluate the inefficient of other DMUs which lie below that frontier.

DEA is an alternative analytic technique to regression analysis. Regression analysis approach is characterized as a central tendency approach and it evaluates

DMUs relative to an average. In contrast, DEA is an extreme point method and compare each DMU with the only best DMU. The main advantage of DEA is that, unlike regression analysis, it does not require an assumption of a functional form relating inputs to outputs. Instead, it constructs the best production function solely on the basis of observed data, hence statistical tests for significance of the parameters are not necessary.

Despite the fact that utilizing the DEA approach to investigate the relative efficiency of commercial banks in Thailand was formerly conducted, measuring the relative efficiency of commercial banks in Thailand is still important and interesting. This is because the recent study (Rangkakulnuwat, 2007) covers only the period 2000 – 2005 and does not include the new commercial banks which formerly competed in finance and securities business such as Thanachart Bank, Tisco Bank, Kiatnakin Bank and ACL Bank.

Since the emergence of these new commercial banks mentioned above, they have been trying to compete with the incumbent banks by offering higher rate of interest for saving and many promotions. However, people are still reluctant to deposit their saving with these banks due to the lack of confidence. Consequently, this study will investigate the efficiency of commercial banks in Thailand by utilizing DEA model under two different approaches. The first one is the operation approach which aims to examine the efficiency of commercial banks as profit maximizing entities which utilize labors and capital to generate revenues and the latter is the intermediation approach which aims to examine how efficient commercial banks utilize labors and capitals to transform deposits into loans and investments. Hopefully, this study may shed more light on the efficiency of commercial banks in Thailand.

CHAPTER 3: THAI BANKING SECTOR

3.1) Financial Sector Master Plan

Financial Sector Master Plan (hereafter FSMP) is a 5 – 10 year medium-term development plan for financial institutions under the supervision of the Bank of Thailand (Bank of Thailand, 2006). It was announced by the government in January of 2004 as the road map for the development of Thailand's financial sector. The financial sector as envisaged in FSMP would be efficient and stable while ensuring consumer protection. Furthermore, the financial sector would non-discriminatingly provide financial services to all customer groups including low-income households and small and medium businesses (SMEs).

The visions of FSMP can be focused on three broad categories of policy measures.

Vision 1: Provide financial services to all potential, economically viable, users whereby users should have access to basic financial products and services at the appropriate pricing (Bank of Thailand, 2006).

Vision 1 aims to broaden public access to financial services. Specifically, it aims to promote grass-root financial services. In addition to their current roles, government's specialized financial institutions such as Government Saving Bank (GSB) and the Bank for Agriculture and Agricultural Cooperatives (BAAC) would be charged with the new responsibility to provided financial services to low-income groups in rural areas (Thailand Investor Service Center, 2004).

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Vision 2: Develop competitive, efficient, stable and balanced financial system, capable of servicing the sophisticated and unsophisticated users (Bank of Thailand, 2006).

Vision 2 aims to enhance efficiency of Thai financial sector by restructuring Thai financial institutions and promoting good governance of Thai financial institution. Under vision 2 of FSMP, there will be only two types of licenses for Thai financial institutions which are full-service banks and retail banks. The differences between full-service banks and retail banks are shown in Table 3.1 below.

Table 3.1: Differences between Full-Service Banks and Retail Banks

	Full-Service Banks	**Retail Banks**
Tier-1 Capital Requirements	More than 5 billion baht	More than 250 million baht
Scope of Business	All financial services except (1) insurance underwriting (2) brokering, trading and underwriting of equity securities	All financial services except (1) insurance underwriting (2) brokering, trading and underwriting of equity securities (3) foreign exchange (4) derivative products
Potential Customers	All	Retail customers and SMEs
Lending Limit	25% of tier-1 capital	(1) 0.05% of tier-1 capital for clean loans to retail customers (2) 1% of tier-1 capital for loans with collateral to retail customers (3) 10% of tier-1 capital for loans to SMEs

Source: Thailand Investor Service Center (2004)

Similarly, foreign financial institutions have two license choices which are subsidiaries or full branches. Both licenses allow foreign banks to undertake same activities as those of full-service banks. The only difference is that a subsidiary can open up to four branches, one in Bangkok and three outside, while a branch can only have one (Thailand Investor Service Center, 2004).

As part of the measures to increase efficiency of the sector, the *One-Presence* policy is introduced. A financial conglomerate can have only one type of license while a foreign must opt to be a hybrid bank, subsidiary or full branch. In

addition, basic infrastructure such as credit bureaus, foreclosure and bankruptcy procedures, for the financial sector will be improved. The Bank of Thailand also plans to restructure cumbersome rules and regulations regarding branch opening and closure and lending requirement for provincial branches and foreign bank branches (Thailand Investor Service Center, 2004).

Vision 3: Ensure fairness and protection for customers whereby financial institutions must abide by good corporate governance standard and consumers receive adequate information and advice from various financial institutions to make informed investment decisions (Bank of Thailand, 2006).

Vision 3 focuses on consumer protection. Commercial banks are required to establish customer complaint handling process and to disclose necessary information related to their services to facilitate consumers' decisions. The blanket guarantee should be replaced with a deposit insurance scheme at a proper time (Thailand Investor Service Center, 2004).

FSMP leads to several changes in Thai financial sector. As of the first half of 2005, the Minister of Finance approved all applications to become One-Presence and changed of license applications leading to several new full-service banks and retail banks. For instance, Tisco Finance Public Company Limited merged with Thai Permsap Finance Company Limited becoming Tisco Bank, Kiatnakin Finance Public Company Limited merged with Radhanatun Finance Public Company Limited becoming Kiatnakin Bank, Asia Credit Public Company Limited merged with Bualuang Finance Company Limited becoming ACL Bank and Land and Houses Credit Foncier Company Limited merged with Book Club Finance Public Company Limited becoming Land and Houses Retail Bank Public Company Limited.

3.2) Overview of Thai Commercial Banks

In Thailand, commercial banks are the most crucial part of the financial system. According to the data obtained from the Bank of Thailand, commercial banks not only collect the most deposits (or deposits equivalent) but also provide the most lending in Thailand.

In 2006, total deposits (or deposits equivalents) at Thai financial institutions were equal to 8,642,499 million baht (See Table 3.2). Commercial banks, dominating Thai financial system, collected total deposits (or deposits equivalents) of 6,565,683 million baht, accounting approximately for 76 percent of total deposits at Thailand's financial institutions. Furthermore, this amount of deposits (or deposits equivalent) collected in commercial banks was accounted roughly for 84 percent of Thailand's gross domestic product (GDP) in market price in 2006.

Moreover, deposits of 5,971,836 million baht were household savings mobilized by financial institutions in Thailand (See Table 3.3). Commercial banks possessed deposits of 4,372,312 million baht as household savings, accounting for 73.22 percent of total household savings mobilized by financial institutions. Approximately, it was accounted roughly for 56 percent of Thailand's GDP in 2006. It is thus reasonable to say that commercial banks are the most important place for household to keep their money.

As well, commercial banks have been the most crucial source of credits in Thailand. In 2006, credit provided by commercial banks in Thailand had total value of 5,706,748 million baht (See Table 3.4), whereas total credit extended by Thailand's financial institutions had total value of 7,374,827 million baht. This amount of credit provided by commercial banks in Thailand was accounted roughly for 77 percent of

total credited extended by Thailand's financial institutions and 73 percent of Thailand's GDP in 2006.

In addition, housing loans for personal consumption provided by Thailand commercial banks had the total value of 685,178 million baht (See Table 3.5), accounting roughly for 51 percent (See Table 3.4) of total housing loans extended by Thai financial institutions. Moreover, this amount of housing loan was accounted roughly for 9 percent of Thailand's GDP in 2006.

At this moment (January, 2008), according to the Bank of Thailand (BOT), there are eighteen commercial banks and seventeen foreign bank branches in Thailand.

Eighteen commercial banks in Thailand are as follow.

1. Bangkok Bank Public Company Limited
2. Krung Thai Public Company Limited
3. Bank of Ayudhya Public Company Limited
4. Kasikorn Bank Public Company Limited
5. TMB Bank Public Company Limited
6. Bankthai Public Company Limited
7. The Siam Commercial Bank Public Company Limited
8. Siam City Bank Public Company Limited
9. Standard Chartered Bank (Thai) Public Company Limited
10. United Oversea Bank (Thai) Public Company Limited
11. Thanachart Bank Public Company Limited
12. Tisco Bank Public Company Limited
13. Mega International Commercial Bank Public Company Limited
14. Kiatnakin Bank Public Company Limited

15. Land and Houses Retail Bank Public Company Limited

16. ACL Bank Public Company Limited

17. The Thai Credit Retail Bank Public Company Limited

18. AIG Retail Bank Public Company Limited

Seventeen foreign bank branches in Thailand are as follow.

1. Abn-Amro Bank N.V.
2. JP Morgan Chase Bank, N.A.
3. Oversea-Chinese Banking Corp., LTD.
4. The Bank of Tokyo- Mitsubishi UFJ, LTD.
5. Citibank, N.A.
6. RHB Bank Berhad
7. Bank of America, National Association
8. Calyon Corporate and Investment Bank
9. The Hongkong and Shanghai Banking Corp., LTD.
10. Deutsche Bank AG.
11. Mizuho Corporate Bank, LTD.
12. BNP Paribas
13. Sumitomo Mitsui Banking Corporation
14. Bank of China Limited
15. The Bank of Nova Scotia
16. Societe General
17. Indian Overseas Bank

Table 3.2: Deposits or Deposits Equivalent at Financial Institutions

(Million Baht)

	(December 31st)	2003		2004		2005		2006	
		Value	**%**	**Value**	**%**	**Value**	**%**	**Value**	**%**
1	Commercial banks	5,472,819	76.83	5,699,696	75.18	6,196,052	76.62	6,565,683	75.97
2	Deposits								
3	Government Savings Bank	554,175	7.78	560,623	7.39	564,008	6.97	592,730	6.86
4	Deposits, savings								
5	Certificates etc.								
6	Government Housing Bank	239,371	3.36	309,970	4.09	340,249	4.21	403,481	4.67
7	Deposits								
8	Bank for Agriculture and Agricultural Cooperative	306,860	4.31	341,371	4.50	425,531	5.26	467,393	5.41
9	Deposits								
10	Finance and finance & securities companies	202,850	2.85	253,740	3.35	80,275	0.99	64,582	0.75
11	Promissory notes, etc.								
12	Credit foncier companies	1,619	0.02	1,310	0.02	930	0.01	846	0.01
13	Note payable								
14	Life insurance companies	345,522	4.85	414,424	5.47	479,603	5.93	547,784	6.34
15	Life insurance policy reserves								
16	**Total**	**7,123,216**	**100.00**	**7,581,132**	**100.00**	**8,086,648**	**100.00**	**8,642,499**	**100.00**

Source: Bank of Thailand

Table 3.3: Household Savings Mobilized by Financial Institutions

(Million Baht)

	(December 31st)	2003		2004		2005		2006	
		Value	%	Value	%	Value	%	Value	%
1	Commercial banks	3,894,437	74.90	3,989,936	74.21	4,083,856	73.98	4,372,312	73.22
2	Deposits								
3	Government Savings Bank	523,135	10.06	523,659	9.74	525,739	9.52	531,451	8.90
4	Deposits, savings								
5	Certificates etc.								
6	Government Housing Bank	124,058	2.39	131,914	2.45	183,929	3.33	235,070	3.94
7	Deposits								
8	Bank for Agriculture and Agricultural Cooperatives	160,329	3.08	179,468	3.34	216,706	3.93	258,209	4.32
9	Deposits								
10	Finance and finance & securities companies	150,840	2.90	135,999	2.53	29,593	0.54	26,254	0.44
11	Promissory notes ,etc.								
12	Credit foncier companies	1,527	0.03	1,208	0.02	841	0.02	757	0.01
13	Note payable								
14	Life insurance companies	345,522	6.64	414,424	7.71	479,603	8.69	547,784	9.17
15	Life insurance policy reserves								
16	**Total**	**5,199,848**	**100.00**	**5,376,607**	**100.00**	**5,520,267**	**100.00**	**5,971,836**	**100.00**

Source: Bank of Thailand

Table 3.4: Credit Extended by Financial Institutions

(Million Baht)

	(December 31st)	2003		2004		2005		2006	
		Value	**%**	**Value**	**%**	**Value**	**%**	**Value**	**%**
1	Commercial banks	4,701,475	76.51	5,081,346	77.01	5,488,434	77.23	5,706,748	77.38
2	Government Savings Bank	285,963	4.65	343,891	5.21	394,330	5.55	460,975	6.25
3	Government Housing Bank	347,950	5.66	411,212	6.23	489,411	6.89	560,200	7.60
4	Bank for Agriculture and Agricultural Cooperatives	318,912	5.19	356,680	5.41	418,626	5.89	426,076	5.78
5	Export-Import Bank of Thailand	42,589	0.69	48,551	0.74	59,801	0.84	59,270	0.80
6	Finance companies	236,657	3.85	281,129	4.26	162,058	2.28	58,972	0.80
7	Credit foncier companies	1,254	0.02	1,080	0.02	953	0.01	1,042	0.01
8	Life insurance companies	42,060	0.68	44,893	0.68	50,442	0.71	55,562	0.75
9	Industries Finance Corporation of Thailand	149,971	2.44	n.a.*	n.a.*	n.a.*	n.a.	n.a.	n.a.
10	Small Industries Finance Corporation	18,483	0.30	29,281	0.44	42,576	0.60	45,982	0.62
11	**Total**	**6,145,314**	**100.00**	**6,598,061**	**100.00**	**7,106,631**	**100.00**	**7,374,827**	**100.00**

Source: Bank of Thailand

Remark: *Industries Finance Corporation of Thailand (IFCT) merged with TMB Bank Public Company Limited and DBS Thai Danu Bank Public Company Limited on September 1st, 2004.

Table 3.5: Housing Loans for Personal Consumption Extended by Financial Institutions

(Million Baht)

	(December 31st)	2003		2004		2005		2006	
		Value	**%**	**Value**	**%**	**Value**	**%**	**Value**	**%**
1	Commercial banks	432,105	50.17	544,481	51.95	624,377	51.50	685,178	51.03
2	Government Savings Bank	89,737	10.42	105,051	10.02	115,987	9.57	120,758	8.99
3	Government Housing Bank	332,699	38.63	393,039	37.50	469,909	38.76	535,583	39.89
4	Finance and finance & securities companies	6,609	0.77	5,383	0.51	2,165	0.18	930	0.07
5	Credit foncier companies	191	0.02	119	0.01	59	0.00	155	0.01
6	**Total**	**861,341**	**100.00**	1,048,073	**100.00**	**1,212,497**	**100.00**	**1,342,604**	**100.00**

Source: Bank of Thailand

Among these eighteen commercial banks in Thailand mentioned above, there are now thirteen commercial banks which are the members of the Stock Exchange of Thailand (SET). They are as follow.

1. Bangkok Bank Public Company Limited
2. Krung Thai Public Company Limited
3. Bank of Ayudhya Public Company Limited
4. Kasikorn Bank Public Company Limited
5. TMB Bank Public Company Limited
6. Bankthai Public Company Limited
7. The Siam Commercial Bank Public Company Limited
8. Siam City Bank Public Company Limited
9. Standard Chartered Bank (Thai) Public Company Limited
10. Thanachart Bank Public Company Limited
11. Tisco Bank Public Company Limited
12. Kiatnakin Bank Public Company Limited
13. ACL Bank Public Company Limited

Table 3.6 summarizes the mean values of interest and dividend income, non-interest income, interest expense, non-interest expense, labor-related expense (gross wages), capital-related expense (premises and equipment expenses), total deposit, total loan and net investment of these 13 commercial banks mentioned above during 2003 – 2006. According to Table 3.6, Bangkok Bank is considered to be the largest commercial bank in Thailand during 2003 – 2006 since it possessed the greatest amount of interest and dividend income, non-interest income, interest expense, non-interest expense, labor-related expense (gross wages), capital-related expense (premises and equipment expenses), total deposit and net investment. In

average, it had interest and dividend income of 57.3 billion baht and non-interest income of more than 20 billion baht. It had average net investment of 317 billion baht, accounting roughly for 2.5 times of average net investment of the second place which is the Siam Commercial Bank. Furthermore, it is the only commercial bank which had average deposit of over 1 trillion baht during 2003 – 2006. On the other had, ACL Bank is considered to be the smallest commercial bank in Thailand. It had the average interest and dividend income and non-interest income only of 2.3 and 0.28 billion baht, respectively, collected deposits only of 26.1 billion baht and provided loans only of 28.3 billion baht.

Krung Thai Bank had the second most average interest and dividend income roughly of 50 billion baht. Kasikorn Bank and the Siam Commercial Bank also had the great amount of average interest and dividend income of 38 and 34 billion baht, respectively, whereas Bank of Ayudhya, TMB Bank and Siam City Bank had the average interest and dividend income approximately of 24, 23 and 18 billion baht, respectively. In addition, Bankthai, Thanachart Bank, Standard Chartered Bank (Thai), Tisco Bank and Kiatnakin Bank, in average, had interest and dividend incomes of less than 10 billion baht, whereas ACL Bank had the least average interest and dividend income roughly of 2.3 billion baht.

Table 3.6 : Mean Values of Interest and Dividend Income, Non-Interest Income, Interest Expense, Non-Interest Expense, Labor-Related Expense, Capital-Related Expense, Total Deposit, Total Loan and Net Investment of Commercial Banks during 2003 - 2006

(Million Baht)

Bank	Interest and Dividend Income	Non-Interest Income	Interest Expense	Non-Interest Expense	Labor-Related Expense	Capital-Related Expense	Total Deposit	Total Loan	Net Investment
BBL	57,279.29	20,349.52	21,842.15	31,446.47	9,505.07	5,216.70	1,169,821.14	913,047.18	317,004.58
KTB	50,874.48	8,535.11	15,843.79	22,072.32	8,909.86	2,393.04	990,217.39	934,457.51	94,028.53
KBANK	37,774.82	12,514.81	11,172.12	19,790.60	6,575.63	3,810.93	708,042.80	600,796.67	118,425.96
SCB	33,719.50	14,888.11	9,903.23	18,117.94	6,179.46	3,976.75	660,876.97	590,122.14	124,887.75
BAY	24,333.01	5,023.45	10,371.21	11,025.44	3,560.96	2,287.02	507,201.44	427,769.08	63,873.47
TMB	23,427.15	4,434.12	11,735.62	12,118.54	3,306.04	1,811.86	466,034.06	478,945.67	91,702.08
BT	9,151.17	1,020.45	5,676.42	4,284.15	1,331.08	812.15	189,193.47	122,488.56	54,373.37
SCIB	18,915.37	4,124.75	8,247.51	7,778.25	2,450.37	1,388.14	382,114.35	296,708.83	98,431.24
TBANK	6,415.55	770.41	3,732.35	2,559.91	557.32	211.34	108,680.30	86,825.66	20,645.05
SCBT	7,421.64	2,098.71	1,845.35	4,352.92	1,714.30	641.65	63,172.98	69,436.01	10,337.54
TISCO	4,484.27	1,798.40	2,719.55	1,911.76	671.68	376.27	40,668.12	68,880.67	7,717.32
KK	5,301.33	1,733.39	2,331.19	2,087.28	537.56	178.68	42,102.95	51,175.26	21,729.67
ACL	2,337.82	275.02	1,400.88	729.53	366.64	70.15	26,147.84	28,257.15	12,510.56

Remark: BBL = Bangkok Bank, KTB = Krung Thai Bank, KBANK = Kasikorn Bank, SCB = The Siam Commercial Bank, BAY = Bank of Ayudhaya, TMB = TMB Bank, BT = Bankthai, SCIB = Siam City Bank, TBANK = Thanachart Bank, SCBT = Standard Chartered Bank (Thai), TISCO = Tisco Bank, KK = Kiatnakin Bank and ACL = ACL Bank

Table 3.6 summarizes the mean values of interest and dividend income, non-interest income, interest expense, non-interest expense, labor-related expense (gross wages), capital-related expense (premises and equipment expenses), total deposit, total loan and net investment of these 13 commercial banks mentioned above during 2003 – 2006. According to Table 3.6, Bangkok Bank is considered to be the largest commercial bank in Thailand during 2003 – 2006 since it possessed the greatest amount of interest and dividend income, non-interest income, interest expense, non-interest expense, labor-related expense (gross wages), capital-related expense (premises and equipment expenses), total deposit and net investment. In average, it had interest and dividend income of 57.3 billion baht and non-interest income of more than 20 billion baht. It had average net investment of 317 billion baht, accounting roughly for 2.5 times of average net investment of the second place which is the Siam Commercial Bank. Furthermore, it is the only commercial bank which had average deposit of over 1 trillion baht during 2003 – 2006. On the other had, ACL Bank is considered to be the smallest commercial bank in Thailand. It had the average interest and dividend income and non-interest income only of 2.3 and 0.28 billion baht, respectively, collected deposits only of 26.1 billion baht and provided loans only of 28.3 billion baht.

Krung Thai Bank had the second most average interest and dividend income roughly of 50 billion baht. Kasikorn Bank and the Siam Commercial Bank also had the great amount of average interest and dividend income of 38 and 34 billion baht, respectively, whereas Bank of Ayudhya, TMB Bank and Siam City Bank had the average interest and dividend income approximately of 24, 23 and 18 billion baht, respectively. In addition, Bankthai, Thanachart Bank, Standard Chartered Bank (Thai), Tisco Bank and Kiatnakin Bank, in average, had interest and dividend

incomes of less than 10 billion baht, whereas ACL Bank had the least average interest and dividend income roughly of 2.3 billion baht.

In term of non-interest income, beside Bangkok Bank, only Kasikorn Bank and the Siam Commercial Bank had the average non-interest income of over 10 billion baht during 2003 – 2006. Despite the second most interest and dividend income, Krung Thai Bank, in average, had non-interest income only of 8.5 billion baht. Moreover, Bank of Ayudhya, TMB Bank, Siam City Bank, Standard Chartered Bank (Thai), Tisco Bank, Kiatnakin Bank and Bankthai, in average, had non-interest incomes of 5, 4.4, 4.1, 2.1, 1.8, 1.7 and 1 billion baht, respectively. Thanachart, despite having average interest and dividend income of over 6 billion baht, it had the average non-interest income only of 770 million baht. In addition, ACL Bank had the least average non-interest income roughly of 275 million baht.

Not only having the most average income during 2003 – 2006, Bangkok Bank also had the most expenses, both interest and non-interest expenses. It had the average interest and non-interest expenses of 21.8 and 31.4 billion baht, respectively. Krung Thai Bank, in average, had the second most both interest and non-interest expenses of 15.8 and 22 billion baht. Furthermore, Kasikorn Bank, Bank of Ayudhya and TMB Bank had the average interest and non-interest expenses of over 10 billion baht. The Siam Commercial Bank had the average non-interest expense of 18 million baht, whereas it had the average interest expense only of 9.9 billion baht. Bankthai, Siam City Bank, Thanachart Bank, Standard Chartered Bank (Thai), Tisco Bank and Kiatnakin Bank had the average interest expense, ranging from 1.8 to 8.2 billion baht and the average non-interest expense, ranging from 1.9 to 7.8 billion baht. Moreover, ACL Bank had the least average interest and non-interest expenses of 1.4 and 0.7 billion baht, respectively.

Table 3.6 clearly reveals that labor-related expense which is represented by gross wages substantially contributed to non-interest expense of commercial banks in Thailand during 2003 – 2006, accounting roughly, in average, for 33 percent of non-interest expense, whereas capital-related expense which is represented by premises and equipment expenses was, in average, accounted approximately for 16 percent of non-interest expense. Bangkok Bank, in average, had the most labor-related and capital-related expenses of 9.5 and 5.2 billion baht, respectively. Krung Thai Bank had the second most labor-related expense of 8.9 billion baht; nevertheless it had capital-related expense only of 2.4 billion baht. Kasikorn Bank and the Siam Commercial Bank also had the great amount of labor-related and capital-related expenses. They had the average labor-related expenses of 6.8 and 6.2 billion baht, respectively and the average capital-related expenses of 3.8 and 4 billion baht, respectively. In addition, Bank of Ayudhya, TMB Bank and Siam City Bank had the average labor-related expenses of over 2.4 billion baht and the average capital-related expenses of over 1.3 billion baht. In spite of having the average labor-related expenses of 1.3 and 1.7 billion baht, respectively, Bankthai and Standard Chartered Bank (Thai) had the average capital-related expenses only of 0.8 and 0.6 billion baht, respectively. Furthermore, Thanachart Bank, Tisco Bank and Kiatnakin Bank had the low average labor-related and capital-related expenses of less than 0.7 and 0.4 billion baht, respectively. Due to the smallest commercial bank, ACL Bank had the average labor-related and capital related expenses only of 3.7 and 0.07 billion baht, respectively.

Beside Bangkok Bank whose average total deposit exceeded 1 trillion baht, Krung Thai Bank also collected a great amount of deposit which is 990 billion baht during 2003 – 2006. In addition, Kasikorn Bank, the Siam Commercial Bank,

Bank of Ayudhya, TMB Bank, Siam City Bank, Bankthai and Thanachart Bank, in average, collected deposits of 708, 661, 507, 466, 382, 189 and 109 billion baht, respectively. Moreover, Standard Chartered Bank (Thai), Tisco Bank and Kiatnakin Bank collected the average deposits of less than 70 billion baht, ranging from 40 to 63 billion baht. Finally, ACL collected the least average deposit as mentioned above.

During 2003 – 2006, Krung Thai Bank, in average, provided the most credit of 934 billion baht, following by Bangkok Bank whose average total credit was 913 billion baht. Kasikorn Bank, the Siam Commercial Bank, TMB Bank, Bank of Ayudhya, Siam City Bank and Bankthai were also the very crucial sources of credit of Thailand during 2003 – 2006, providing credits, in average, of 600, 590, 479, 429, 297 and 122 billion baht, respectively. In addition, Thanachart Bank, Standard Chartered Bank (Thai), Tisco Bank and Kiatnakin Bank provided moderate amount of credit, ranging from 51 to 87 billion baht. Eventually, ACL Bank might be considered to be the least important source of credit due to the least credit provided as mentioned above.

Bangkok Bank, in average, possessed the largest amount of net investment during 2003 – 2006 which was equal to 317 billion baht. Kasikorn Bank and the Siam Commercial Bank, although, had far less net investment than Bangkok Bank, their average net investments exceeded 100 billion baht. (They had the average net investments of 118 and 125 billion baht, respectively.) Krung Thai Bank, TMB Bank and Siam City Bank also had large amount of average net investment. Their average net investments during 2003 – 2006 were 94, 92 and 98 billion baht, respectively. Furthermore, Bank of Ayudhya and Bankthai had moderate amount of average net investment which was equal to 64 and 54 billion baht, respectively. Thanchart Bank, Standard Chartered Bank (Thai), Kiatnakin Bank and ACL Bank had rather low

average net investments, ranging from 10 to 22 billion baht, whereas Tisco Bank had the least average net investment only of 7.7 billion baht.

3.3) Thai Commercial Banks Categorized by Size

As mention above, FSMP leads to several new commercial banks. These new banks are considerably different from incumbent banks in many aspects, especially in size. Consequently, studying all commercial banks in Thailand as a whole is not enough. It will be more useful to study commercial banks separately for each group categorized by size.

Therefore, commercial banks in Thailand can be divided into three categories according to their size: large, medium, and small banks. According to the Bank of Thailand (BOT), size is based on the market shares of total assets of commercial banks.

- Large bank includes commercial banks with market share of total assets not less than 10% ($x \geq 10\%$)
- Medium bank includes commercial banks with market share of total assets not less than 3% but less than 10% ($3\% \leq x < 10\%$)
- Small bank includes commercial banks with market share of total assets less than 3% ($x < 3\%$)

Consequently, there are four large commercial banks, five medium commercial banks and four small commercial banks.

Four large commercial banks are as follow.

1. Bangkok Bank Public Company Limited
2. Krung Thai Public Company Limited
3. Kasikorn Bank Public Company Limited

4. The Siam Commercial Bank Public Company Limited

Five medium commercial banks are as follow.

1. Bank of Ayudhya Public Company Limited
2. TMB Bank Public Company Limited
3. Bankthai Public Company Limited
4. Siam City Bank Public Company Limited
5. Thanachart Bank Public Company Limited

Four small commercial banks are as follow.

1. Standard Chartered Bank (Thai) Public Company Limited
2. Tisco Bank Public Company Limited
3. Kiatnakin Bank Public Company Limited
4. ACL Bank Public Company Limited

Table 3.7 compares interest and dividend income, non-interest income, interest expense, non-interest expense, labor-related expense (gross wages), capital-related expense (premises and equipment expenses), total deposit, total loan and net investment of large, medium and small commercial banks during 2003 – 2006. According to Table 3.7, we find that during 2003 – 2006 large commercial banks which are Bangkok Bank, Krung Thai Bank, Kasikorn Bank and the Siam Commercial Bank, dominated Thai banking sector in every single aspect, whereas small commercial banks which are Standard Chartered Bank (Thai), Tisco Bank, Kiatnakin Bank and ACL Bank, were inferior to medium commercial banks which are Bank of Ayudhya, TMB Bank, Bankthai, Siam City Bank and Thanachart Bank and large commercial banks in every single aspect.

Mean values of all variables of large banks, in average, are 2.8 times as much as those of medium banks and 9.93 times as much as those of small banks.

Furthermore, mean values of all variables of medium banks, in average, are 3.68 times as much as those of small banks.

In term of income, large banks had the average interest and dividend income roughly equal to 45 billion baht during 2003 – 2006, accounting for 2.73 and 7.87 times as much as those of medium and small banks which were approximately 16 and 6 billion baht, respectively. Moreover, the average non-interest income of large banks during 2003 – 2006 was around 14 billion baht, accounting for 8.75 and 1.91 times as much as those of medium and small banks which were roughly 3 and 1.6 billion baht, respectively.

During 2003 – 2006, the average interest and non-interest expenses of large banks were 14.7 and 22.9 billion baht, respectively, while those of medium banks were 8 and 7.5 billion baht, respectively, and those of small banks were only 1.4 and 3.5 billion baht, respectively. Furthermore, during that period, large banks, in average, spent 7.8 billion baht on labors and 3.9 billion baht on capital inputs which were premises and equipments. Medium banks, in average, spent 2.2 billion baht on labors and 1.3 billion baht on capital inputs, accounting roughly for 2.48 and 1.95 times less than large banks, while small banks, in average, spent only 1.4 billion baht on labors and 553 million baht on capital inputs, accounting approximately for 4.70 and 5.96 times less than large banks.

During 2003 – 2006, in average, large banks collected deposits approximately of 882 billion baht and provided credits of 760 billion baht. Meanwhile, medium banks, in average, collected deposits roughly of 331 billion baht and provided credits of 283 billion baht. Nevertheless, small banks, in average, collected deposits only about of 56 billion baht but lent 63 billion baht, implying that

small banks, in average, were likely to have substantial amount of debts in financing their credits provided.

Finally, large banks possessed the average net investment approximately of 164 billion baht during 2003 – 2006, while medium and small banks had the average net investment roughly of 66 and 10 billion baht, respectively.

Table 3.7 : Interest and Dividend Income, Non-Interest Income, Interest Expense, Non-Interest Expense, Labor-Related Expense, Capital-Related Expense, Total Deposit, Total Loan and Net Investment of Commercial Banks Categorized by Size during 2003 - 2006

(Million Baht)

Bank	Year	Interest and Dividend Income	Non-Interest Income	Interest Expense	Non-Interest Expense	Labor-Related Expense	Capital Related Expense	Total Deposit	Total Loan	Net Investment
Large	2003	36,600.27	13,026.17	15,573.68	19,218.52	6,230.20	3,380.17	853,298.41	716,066.79	182,258.19
	2004	38,051.19	14,314.72	10,462.08	21,540.80	7,448.76	3,419.35	880,065.15	751,077.89	156,326.19
	2005	43,767.16	12,758.74	10,263.57	23,123.61	8,266.22	3,778.58	862,771.32	757,909.27	157,881.06
	2006	61,229.48	16,187.91	22,461.96	27,544.40	9,224.84	4,819.32	932,823.42	813,369.56	157,881.37
	Mean	**44,912.02**	**14,071.89**	**14,690.32**	**22,856.83**	**7,792.50**	**3,849.35**	**882,239.57**	**759,605.88**	**163,586.70**
Medium	2003	12,277.47	3,551.31	6,887.17	5,913.21	1,614.43	1,076.45	277,559.31	234,353.93	54,492.08
	2004	12,284.08	2,899.65	4,767.93	5,993.51	1,897.15	1,167.28	312,684.00	285,236.31	59,755.74
	2005	16,293.94	3,247.55	6,654.91	7,607.16	2,491.43	1,346.19	359,300.07	303,195.06	72,114.73
	2006	24,938.30	2,600.04	13,500.47	10,699.14	2,961.60	1,618.48	373,035.51	307,404.93	76,857.63
	Mean	**16,448.45**	**3,074.64**	**7,952.62**	**7,553.26**	**2,241.15**	**1,302.10**	**330,644.72**	**282,547.56**	**65,805.04**
Small	2003	4,195.14	1,041.37	944.01	2,928.12	1,185.72	549.92	46,156.03	57,980.17	2,696.38
	2004	4,913.46	1,405.75	664.90	3,738.16	1,433.65	603.28	46,395.86	48,541.97	9,960.11
	2005	7,406.37	2,065.80	1,394.95	4,828.06	1,854.50	731.75	87,698.95	87,993.95	15,245.44
	2006	6,323.75	1,922.18	2,707.29	2,661.48	989.80	326.69	45,340.00	57,885.25	13,851.45
	Mean	**5,709.68**	**1,608.78**	**1,427.79**	**3,538.95**	**1,365.92**	**552.91**	**56,397.71**	**63,100.33**	**10,438.34**

Remark: Large banks are BBL, KTB, KBANK and SCB. Medium banks are BAY, TMB, BT, SCIB and TBANK. Small banks are SCBT, TISCO, KK and ACL.

3.4) Thai Commercial Banks Categorized by Business Background

Aftermath of the implementation of FSMP, several new commercial banks which were formerly finance companies such as Tisco Bank (Tisco Finance PCL), Kiatnakin Bank (Kiatnakin Finance PCL) and ACL Bank (Asia Credit PCL) entered to banking business. Consequently, Thailand's commercial banks may be categorized into two groups according to their business background. The first group is called "Incumbents". Incumbents are commercial banks which have originally competed in banking business. They are as follow.

1. Bangkok Bank Public Company Limited
2. Krung Thai Public Company Limited
3. Bank of Ayudhya Public Company Limited
4. Kasikorn Bank Public Company Limited
5. TMB Bank Public Company Limited
6. Bankthai Public Company Limited
7. The Siam Commercial Bank Public Company Limited
8. Siam City Bank Public Company Limited
9. Standard Chartered Bank (Thai) Public Company Limited

The latter group is called "New Entries". New entries are commercial banks which formerly competed only in finance and securities business and just entered to banking business. They are as follow.

1. Thanachart Bank Public Company Limited
2. Tisco Bank Public Company Limited
3. Kiatnakin Bank Public Company Limited
4. ACL Bank Public Company Limited

Table 3.8 compares interest and dividend income, non-interest income, interest expense, non-interest expense, labor-related expense (gross wages), capital-related expense (premises and equipment expenses), total deposit, total loan and net investment of incumbents and new entries during 2003 – 2006. Table 3.8 reveals that during 2003 – 2006 incumbents which are Bangkok Bank, Krung Thai Bank, Kasikorn Bank, the siam Commercial Bank, Bank of Ayudhya, TMB Bank, Bankthai, Siam City Bank and Standard Chartered Bank (Thai) were superior to new entries which are Thanachart Bank, Tisco Bank, Kiatnakin Bank and ACL Bank in every single aspect. In addition, mean values of all variables of incumbents, in average, are 8.81 times as much as those of new entries.

After considering each variable, we find that during 2003 – 2006 the average interest and dividend income of incumbents was around 29 billion baht, accounting roughly for 6.85 times as much as that of new entries which was about 4 billion baht. Moreover, the average non-interest income of incumbents was around 8 billion baht, accounting for about 10.65 times as much as that of new entries which was only about 761 million baht. In term of expense, incumbents had the average interest and non-interest expenses roughly of 11 and 15 billion baht, respectively, whereas new entries had the average interest and non-interest expenses only of 2.3 and 1.7 billion baht, respectively. In addition, during 2003 – 2006, incumbents, in average, spent 4.8 billion baht on labors and 2.5 billion baht on capital inputs (premises and equipments), whereas new entries, in average, spent only 416 million baht on labors and 159 million baht on capital inputs.

The average total deposit of incumbents was about 571 billion baht, accounting for around 7.3 times as much as that of new entries which was equal to 78 billion baht. Furthermore, incumbents, in average, lent 493 billion baht during 2003 –

2006, accounting for 7.41 times greater than new entries which, in average, lent only 59 billion baht. Finally, the average net investment of incumbents which was equal to 108 billion baht was 5.64 times as much as that of new entries which was equal to 19 billion baht.

Table 3.8 : Interest and Dividend Income, Non-Interest Income, Interest Expense, Non-Interest Expense, Labor-Related Expense, Capital-Related Expense, Total Deposit, Total Loan and Net Investment of Commercial Banks Categorized by Business Background during 2003 - 2006

(Million Baht)

Bank	Year	Interest and Dividend Income	Non-Interest Income	Interest Expense	Non-Interest Expense	Labor-Related Expense	Capital Related Expense	Total Deposit	Total Loan	Net Investment
Incumbents	2003	23,275.41	7,806.62	10,700.71	12,052.17	3,780.56	2,152.94	533,937.82	451,234.90	108,899.09
	2004	24,023.40	8,101.17	7,237.74	13,234.45	4,501.04	2,224.69	565,006.37	494,223.55	101,652.28
	2005	28,737.25	7,607.85	8,098.43	14,776.30	5,198.40	2,488.02	576,252.18	505,823.29	109,992.02
	2006	40,806.79	8,923.93	16,913.07	18,153.37	5,867.90	3,062.46	607,770.11	519,283.44	111,929.72
	Mean	**29,210.71**	**8,109.89**	**10,737.49**	**14,554.07**	**4,836.97**	**2,482.03**	**570,741.62**	**492,641.29**	**108,118.28**
New Entries	2003	2,504.86	642.99	1,368.17	898.74	153.65	76.43	41,705.86	32,902.87	24,097.70
	2004	2,328.00	252.33	1,213.20	758.89	205.11	94.87	45,019.12	31,023.16	19,173.05
	2005	5,309.49	867.92	2,837.87	2,371.61	590.96	184.85	149,014.93	83,196.71	17,415.09
	2006	6,910.83	1,281.30	3,990.44	2,734.74	713.86	278.58	76,975.05	87,123.24	15,962.98
	Mean	**4,263.29**	**761.14**	**2,352.42**	**1,690.99**	**415.89**	**158.68**	**78,178.74**	**58,561.49**	**19,162.20**

Remark: Incumbents are BBL, KTB, KBANK, SCB, BAY, TMB, BT, SCIB and SCBT. New Entries are TBANK, TISCO, KK and ACL.

CHAPTER 4: RESEARCH METHODOLOGY

4.1) DEA Model: CCR-Model

This study aims to investigate the relative efficiency of commercial banks in Thailand during 2003 – 2005 under two different approaches, operation approach and intermediation approach, by employing Data Envelopment Analysis (DEA). Despite the existence of several DEA models, this study utilizes CCR-Model which is an output-oriented model where DMUs deemed to produce the highest possible amount of output with the given amount of input.

CCR-Model is introduced by Charnes, Cooper and Rhodes (1978). This model measures the efficiency of each DMU that obtained as a maximum of a ratio of total sum of weighted outputs to total sum of weighted inputs. Consequently, the efficiency can be defined as follow.

$$Efficiency = \frac{Weighted\ sum\ of\ outputs}{Weighted\ sum\ of\ inputs}$$

The weights for the ratio are determined by the restriction that the similar ratios for every DMU have to be less than or equal to unity, thus reducing multiple inputs and outputs to a single "virtual" input and single "virtual" output without requiring preassigned weights. Therefore, the efficiency score is a function of the weights of the "virtual" input-output combination. Suppose that there are n DMUs, each with m inputs and s outputs, relative efficiency score of a given DMU_0 is obtained by solving the following linear programming model.

$$\max h_0(u,v) = \frac{\sum_{r=1}^{s} v_r y_{r0}}{\sum_{i=1}^{m} u_i x_{i0}}$$

subject to $\frac{\sum_{r=1}^{s} v_r y_{rj}}{\sum_{i=1}^{m} u_i x_{ij}} \leq 1 \; ; \; j = 1,2,.....,n$

$u_i \geq 0 \; ; \; i = 1,2,.....,m \qquad v_r \geq 0 \; ; \; r = 1,2,.....,s$

where x_{ij} = the amount of input i utilized by the jth DMU

y_{rj} = the amount of output r produced by the jth DMU

u_i = weight given to input i

v_r = weight given to output r

Following the Charnes-Cooper transformation (1962), one can select a representative solution (u,v) for which

$$\sum_{i=1}^{m} u_i x_{i0} = 1$$

Hence, the denominator in the efficiency score h_0 shown above is set equal to one, the transformed linear programming model for DMU_0 can be written as follow.

$$\max z_0 = \sum_{r=1}^{s} v_r y_{r0}$$

subject to $\sum_{r=1}^{s} v_r y_{rj} - \sum_{i=1}^{m} u_i x_{ij} \leq 0 \; ; \; j = 1,2,.....,n$

$$\sum_{i=1}^{m} u_i x_{i0} = 1$$

$u_i \geq 0 \; ; \; i = 1,2,.....,m \qquad v_r \geq 0 \; ; \; r = 1,2,.....,s$

The linear programming model shown above will be run n times using Solver add-in that comes with Microsoft Excel in identifying the relative efficiency scores of all the DMUs. Each DMU selects input and output weights that maximize its

efficiency score. Generally, a DMU is considered to be efficient if it obtain a score of 1.00, implying 100% efficiency, whereas a score of less than 1.00 implies that it is inefficient.

4.2) Data and Sources of Data

Secondary time series data in annual format for commercial banks is observed over the four year period (2003 – 2006). Data analyzed in this study is composed of:

1. **Interest and dividend incomes** in million baht
2. **Non-interest incomes** in million baht
3. **Interest expenses** in million baht
4. **Non-interest expenses** in million baht
5. **Labor-related expenses** represented by gross wages in million baht
6. **Capital-related expenses** represented by premises and equipment expenses in million baht
7. **Total deposits** in million baht
8. **Total loans** in million baht
9. **Net investments** in million baht

Interest and dividend incomes, non-interest incomes, interest expenses, non-interest expenses, labor-related expenses and capital-related expenses are extracted from the end-of-year income statements of each commercial bank, whereas total deposits, total loans and net investments are extracted from the end-of-year balance sheets of each commercial bank. Furthermore, income statements and balance sheets of each commercial bank are obtained from the Stock Exchange of Thailand (SET).

4.3) Method of Analysis

As mentioned above, our study utilizes CCR-Model to measure the relative efficiency of commercial banks in Thailand for the period 2003 – 2006 (separately for each year). The reason that the period 2003 – 2006 is chosen for the study is that in the earlier year (before 2003) there is no required data of commercial banks which were formerly finance and securities companies.

As stated before, one of the objectives of this study is to investigate if the commercial banks which have originally competed in banking business and the new banks which formerly competed in finance and securities business are different in efficiency. Unfortunately, before 2002 there is no commercial bank which previously competed in finance and securities business, while in 2002 there is only one such a commercial bank. It is Thanachart Bank which opened in April 2002. Despite the existence of Thanachart Bank, year 2002 is not included in this study because our data will be extracted and analyzed form the end-of-year balance sheet and income statement of each commercial bank. Thanachart Bank start its banking business in the mid of 2002, it is, hence, not appropriate to include year 2002 in our study.

This study aims to look at three issues. First of all, it examines the relative efficiency of each commercial bank in Thailand during the period 2003 – 2006. Secondly, it examines the relative efficiency of commercial banks in different size (large, medium and small) categorized by their market shares of total assets. Finally, it investigates if the commercial banks which have originally competed in banking business and the new banks which formerly competed only in finance and securities business are different in efficiency.

In this study, DEA model will be employed under two different approaches in evaluating the relative efficiency of commercial banks in Thailand.

4.3.1) Operation Approach

This approach reflects the way of evaluating the efficiency of commercial bank from the perspective of costs and revenues management (Jemric and Vujcic, 2002). In other word, it aims to examine the efficiency of commercial banks as profit maximizing entities which utilize labors and capitals to generate revenues (both interest and dividend incomes and non-interest incomes). Consequently, the best commercial bank under operation approach is the bank which is capable of generating the highest revenue with the given amount of labor and capital. It is thus said to be 100% efficient.

According to the review of literatures (Debasiah, 2006, Jemric and Vujcic, 2002 and Rangkakulnuwat, 2007), three inputs and two outputs are chosen for each commercial bank for the study under operation approach.

Input 1 (x_1) = Interest expenses in million baht

Input 2 (x_2) = Labor-related expenses (gross wages) in million baht

Input 3 (x_3) = Capital-related expenses (premises and equipment expenses) in million baht

Output 1 (y_1) = Interest and dividend incomes in million baht

Output 2 (y_2) = Non-interest incomes in million baht

4.3.2) Intermediation Approach

This approach reflects the way of evaluating the efficiency of commercial bank which takes commercial banks as entities which use labors and capitals to transform deposits into loans and securities (Jemric and Vujcic, 2002). In other word, it aims to examine how efficient commercial banks utilize labors and capitals to transform deposits into loans and investments. Under intermediation approach, the best commercial bank is the bank which is able to use labors and capitals to create the

greatest amount of loan and investment with the given amount of deposit. It is thus said to be 100% efficient.

Roughly, the efficiency of commercial banks under intermediation approach may not seem as important as operation approach. That is, the efficiency in generating revenues is likely to be more crucial to Thai economy than the efficiency in creating loans and investments. In fact, the efficiency of commercial banks under intermediation approach is very important since it is highly related to the liquidity of the national economy. The low efficiency under this approach means that commercial banks fail to complete their role as financial intermediaries of which the most important role is to intermediate between people who have an excess demand for funds and those who have an excess supply of funds. That is, they collect deposits but they do not lend or invest. This will probably cause the liquidity problem to real sector and the national economy as a whole.

According to the review of literatures (Debasiah, 2006; Jemric and Vujcic, 2002 and Rangkakulnuwat, 2007), two inputs and two outputs are chosen for each commercial bank for the study intermediation approach.

Input 1 (x_1) = Total deposits in million baht

Input 2 (x_2) = Total expenses (Interest and non-interest expenses) in million baht

Output 1 (y_1) = Total loans in million baht

Output 2 (y_2) = Net investments in million baht

Our study includes 10 commercial banks for the period 2003 – 2005. They are as follow.

1. Bangkok Bank Public Company Limited
2. Krung Thai Public Company Limited

3. Bank of Ayudhya Public Company Limited
4. Kasikorn Bank Public Company Limited
5. TMB Bank Public Company Limited
6. Bankthai Public Company Limited
7. The Siam Commercial Bank Public Company Limited
8. Siam City Bank Public Company Limited
9. Standard Chartered Bank (Thai) Public Company Limited
10. Thanachart Bank Public Company Limited (opened April 22, 2002)

Based on the market shares of total assets of commercial banks, we have 4 large banks (Bangkok Bank, Krungthai Bank, Kasikorn Bank and The Siam Commercial Bank) 5 medium banks (Bank of Ayudhya, TMB Bank, Bankthai, Siam City Bank and Thanachart Bank) and 1 small bank (Standard Chartered Bank (Thai)). Moreover, among these 10 banks, only Thanachart Bank is considered as a commercial bank which was a finance and securities company.

For the year 2006, 3 commercial banks are added for our study, there are, thus, 13 commercial banks. These 3 added commercial banks are as follow.

1. Tisco Bank Public Company Limited (opened July 1, 2005)
2. Kiatnakin Bank Public Company Limited (opened October 3, 2005)
3. ACL Bank Public Company Limited (opened December 23, 2005)

All 3 added commercial banks indicated above are commercial banks which formerly competed in finance and securities business. Moreover, they all can be categorized as small banks.

4.4) Assumptions of the Study

1. Each commercial bank is operating at an optimal level.

2. Production function of commercial banks performs constant return to scale (CRS). The reason for this is that we also assume that each commercial bank is now producing at an optimal level, implying that it is producing the highest possible amount of output with a given amount of input. Therefore, we can expect that doubling the amount of input will double the amount of output, implying that constant return to scale can be used.

4.5) Research Hypothesis

1. Large commercial banks are the most efficient, whereas small commercial banks are the least efficient.

2. Incumbent commercial banks which have originally competed in banking business are more efficient than the new banks which formerly competed in finance and securities business.

CHAPTER 5: EMPIRICAL RESULTS

5.1) Relative Efficiency of Commercial Banks in Thailand

As mentioned above, this study aims to examine relative efficiency of commercial banks in Thailand during 2003 – 2005 under two different approaches which are operation approach and intermediation approach. In this section, I will start with the results under operation approach following by the results under intermediation approach. Eventually, the conclusion of relative efficiency of commercial banks in Thailand will be discussed in the last part of this section.

5.1.1) Results under Operation Approach

The summary result for the analysis under operation approach is presented in Table 5.1. According to Table 5.1, the average efficiency of Thai commercial banks during 2003 – 2006 ranged from 0.9106 to 0.9720 which was considered to be very high and stable. In 2003, the average efficiency was 0.9106. 4 commercial banks which were Kasikorn Bank, the Siam Commercial Bank, Thanachart Bank and Standard Chartered Bank (Thai) were considered to be 100% efficient with the efficiency scores of 1.0000, implying that they had produced their outputs on the efficiency frontier in this year. In 2003, Bangkok Bank, Krung Thai Bank and Siam City Bank, however, were inefficient with the efficiency scores of 0.9486, 0.9558 and 0.9707, respectively, implying that Bangkok Bank must increase its output by 5.14%, Krung Thai Bank must increase its output by 4.42% and Siam City Bank must increase its output by 2.93% with the same amount of input so that they could be considered to be efficient. Bank of Ayudhya and TMB Bank were also inefficient in 2003. They must increase their outputs by 19.28% and 22.39%, respectively, with the

same amount of input so that they could operate on the efficiency frontier. Bankthai was the least efficient bank in 2003 with the efficiency score of 0.6478, indicating that it had to increase its output by 35.22% with the same amount of input so that it could be considered to be efficient.

Table 5.1: Relative Efficiency of Commercial Banks under Operation Approach during 2003 - 2006

Bank	Year				Average
	2003	2004	2005	2006	
Bangkok Bank (BBL)	0.9486	0.9458	1.0000	0.9489	0.9608
Krung Thai Bank (KTB)	0.9558	1.0000	1.0000	1.0000	0.9890
Kasikorn Bank (KBANK)	1.0000	1.0000	1.0000	1.0000	1.0000
The Siam Commercial Bank (SCB)	1.0000	1.0000	1.0000	1.0000	1.0000
Bank of Ayudhya (BAY)	0.8072	0.9555	0.9887	0.8992	0.9127
TMB Bank (TMB)	0.7761	0.9778	0.9295	0.7634	0.8617
Bankthai (BT)	0.6478	0.6873	0.8018	0.8056	0.7356
Siam City Bank (SCIB)	0.9707	1.0000	1.0000	0.8677	0.9596
Thanachart Bank (TBANK)	1.0000	1.0000	1.0000	1.0000	1.0000
Standard Chartered Bank (Thai) (SCBT)	1.0000	1.0000	1.0000	1.0000	1.0000
Tisco Bank (TISCO)	-	-	-	0.8751	0.8751
Kiatnakin Bank (KK)	-	-	-	1.0000	1.0000
ACL Bank (ACL)	-	-	-	1.0000	1.0000
Average	0.9106	0.9566	0.9720	0.9354	
Maximum	1.0000	1.0000	1.0000	1.0000	
Minimum	0.6478	0.6873	0.8018	0.7634	
Number of Banks	10	10	10	13	
Number of Efficient Banks	4	6	7	7	

In 2004, the average efficiency increased from 0.9106 in 2003 to 0.9566. Kasikorn Bank, the Siam Commercial Bank, Thanachart Bank and Standard Chartered Bank (Thai) were still considered to be 100% efficient and had produced their outputs on the efficiency frontier. In addition, Krung Thai Bank and Siam City Bank were also considered to be 100% efficient with the efficiency scores of 1.0000 in 2004. However, Bangkok Bank, Bank of Ayudhya and TMB Bank were inefficient. That is, they had produced their outputs under the efficiency frontier with the efficiency scores of 0.9458, 0.9555 and 0.9778, respectively, indicating that Bangkok

Bank had to increase its output by 5.42%, Bank of Ayudhya had to increase its output by 4.45% and TMB Bank had to increase its output by 2.22% with the same amount of input so that they would be considered to be efficient. Moreover, Bankthai was still the least efficient bank. Its efficiency score of 0.6873 in 2004 indicates that it had to increase its output by 31.27% with the same amount of input in order to operate on the efficiency frontier.

In 2005, the average efficiency increased further to 0.9720. 7 commercial banks which were Bangkok Bank, Krung Thai Bank, Kasikorn Bank, the Siam Commercial Bank, Siam City Bank, Thanachart Bank and Standard Chartered Bank (Thai) were considered to be 100% efficient under operation approach and had produced their outputs on the efficiency frontier. Bank of Ayudhya and TMB Bank had still operated under the efficiency frontier, implying that they were inefficient. Their efficiency scores of 0.9887 and 0.9295, respectively, implied that Bank of Ayudhya must increase its output by 1.13% and TMB Bank must increase its output by 7.05% with the same amount of input so that they would be considered to be efficient. Furthermore, Bankthai was still the least efficient bank. It had to increase its output by 19.82% with the same amount of input to be efficient.

In 2006, 3 new commercial banks were added to the analysis. The average efficiency dropped from 0.9720 in 2005 to 0.9354 in 2006. The efficiency scores of Krung Thai Bank, Kasikorn Bank, the Siam Commercial Bank, Thanachart Bank and Standard Chartered Bank (Thai) were still 1.000, implying that these 5 banks were 100% efficient. Moreover, 2 newly added banks which were Kiatnakin Bank and ACL Bank were also considered to be 100% efficient with the efficiency scores of 1.0000 in 2006. Furthermore, Bangkok Bank, Bank of Ayudhya, Bankthai and Siam City Bank had produced their outputs under the efficiency frontier with the efficiency

scores of 0.9489, 0.8992, 0.8056 and 0.8677, respectively. This result indicates that Bangkok Bank had to increase its output by 5.11%, Bank of Ayudhya had to increase its output by 10.08%, Bankthai had to increase its output by 19.44% and Siam City Bank had to increase its output by 13.23% with the same amount of input so that they could be considered to be efficient. The newly added Tisco Bank had also operated under the efficiency frontier, implying inefficiency. To be efficient, it had to increase its output by 12.49% with the same amount of input. Nevertheless, TMB Bank became the least efficient bank in 2006 with the efficiency score of 0.7634, implying that it must raise its output by 23.66% without increasing the amount of input to operate on the efficiency frontier.

5.1.2) Results under Intermediation Approach

Table 5.2 shows the summary result for the analysis under intermediation approach. According to Table 5.2, during 2003 – 2006, the average efficiency of Thai commercial banks ranged from 0.7120 to 0.8693 which was fairly high but somewhat volatile and lower than the average efficiency under operation approach. In 2003, the average efficiency was 0.8693. Only 3 commercial banks which were Krung Thai Bank, the Siam Commercial Bank and Thanachart Bank were considered to be 100% efficient with the efficiency score of 1.0000, whereas the other 7 commercial banks were inefficient and had produced their outputs under the efficiency frontier. Bangkok Bank had to raise its output by 13.76%, Kasikorn Bank had to raise its output by 16.57%, Bank of Ayudhya had to raise its output by 12.72%, TMB Bank had to raise its output by 13.53%, Siam City Bank had to raise its output by 4.68% and Standard Chartered Bank (Thai) had to raise its output by 26.55% with the same amount of input so that they could be considered to be efficient. Bankthai was the least efficient bank in 2003 with the efficiency score of 0.5915, indicating that it had to increase its

output by 40.85% with the same amount of input to be able to operate on the efficiency frontier.

Table 5.2: Relative Efficiency of Commercial Banks under Intermediation Approach during 2003 - 2006

Bank	Year				Average
	2003	2004	2005	2006	
Bangkok Bank (BBL)	0.8624	0.8717	0.9705	1.0000	0.9262
Krung Thai Bank (KTB)	1.0000	0.4179	0.7880	0.8704	0.7691
Kasikorn Bank (KBANK)	0.8343	0.6457	0.8386	0.7359	0.7636
The Siam Commercial Bank (SCB)	1.0000	0.8175	0.9218	0.7448	0.8710
Bank of Ayudhya (BAY)	0.8728	0.5945	0.7375	0.7064	0.7278
TMB Bank (TMB)	0.8447	1.0000	1.0000	0.6044	0.8623
Bankthai (BT)	0.5915	0.6779	1.0000	1.0000	0.8174
Siam City Bank (SCIB)	0.9532	1.0000	1.0000	0.9296	0.9707
Thanachart Bank (TBANK)	1.0000	1.0000	0.5801	0.3397	0.7300
Standard Chartered Bank (Thai) (SCBT)	0.7345	0.2054	0.7575	0.2247	0.4805
Tisco Bank (TISCO)	-	-	-	0.3452	0.3452
Kiatnakin Bank (KK)	-	-	-	0.7548	0.7548
ACL Bank (ACL)	-	-	-	1.0000	1.0000
Average	0.8693	0.7231	0.8594	0.7120	
Maximum	1.0000	1.0000	1.0000	1.0000	
Minimum	0.5915	0.2054	0.5801	0.2247	
Number of Banks	10	10	10	13	
Number of Efficient Banks	3	3	3	3	

In 2004, the average efficiency of Thai commercial banks decreased to 0.7231. 3 commercial banks which included TMB Bank, Siam City Bank and Thanachart Bank were 100% efficient in 2004, earning the efficiency scores of 1.0000, while the efficiency scores of Bangkok Bank, Krung Thai Bank, Kasikorn Bank, the Siam Commercial Bank, Bank of Ayudhya and Bankthai were 0.8717, 0.4179, 0.6457, 0.8175, 0.5945 and 0.6779, respectively, implying that Bangkok Bank, Krung Thai Bank, Kasikorn Bank, the Siam Commercial Bank, Bank of Ayudhya and Bankthai had to increase their outputs by 12.83%, 58.21%, 35.43%, 18.25%, 40.55% and 32.21%, respectively, with the same amount of input so that they could be considered to be efficient. Standard Chartered Bank (Thai) was the least

efficient bank in 2004 with the efficiency score of 0.2054, meaning that it must raise its output by 79.46% without increasing the amount of input to be regarded as an efficient bank.

In 2005, the average efficiency of Thai commercial banks under intermediation approach increased from 0.7231 in 2004 to 0.8594. However, there were still 3 commercial banks which were considered to be 100% efficient. They were TMB Bank, Bankthai and Siam City Bank whose efficiency scores were 1.0000, indicating that they had operated on the efficiency frontier. Thanachart Bank was the least efficient bank in 2005. It had to raise its output by 41.99% without increasing the amount of input to be efficient. The other commercial banks which included Bangkok Bank, Krung Thai Bank, Kasikorn Bank, the Siam Commercial Bank, Bank of Ayudhya and Standard Chartered Bank (Thai) also had produced their outputs under the efficiency frontier with the efficiency scores of less than 1.0000, indicating that they were inefficient. The result from Table 5.2 indicates that Bangkok Bank, Krung Thai Bank, Kasikorn Bank, the Siam Commercial Bank, Bank of Ayudhya and Standard Chartered Bank (Thai) had to increase their outputs by 2.95%, 21.20%, 16.14%, 7.82%, 26.25% and 24.25%, respectively, with the same amount of input so that they would be considered to be efficient.

After 3 new commercial banks were included in the analysis in 2006, the average efficiency of Thai commercial banks decreased to 0.7120. Bangkok Bank, Bankthai and newly added ACL Bank were considered to be 100% efficient in 2006. Their efficiency scores of 1.0000 indicated that these banks had operated on the efficiency frontier. However, Standard Chartered Bank (Thai) was the least efficient bank in 2006 with the efficiency score of 0.2247, implying that it had to raise its output by 77.53% without increasing the amount of input to be able to operate on the

efficiency frontier. Moreover, Krung Thai Bank, Kasikorn Bank, the Siam Commercial Bank, Bank of Ayudhya, TMB Bank, Siam City Bank and Thanachart Bank were considered to be inefficient in 2006. They had produced their output under the efficiency frontier with the efficiency scores of 0.8704, 0.7359, 0.7448, 0.7064, 0.6044, 0.9296 and 0.3397, respectively, implying that they had to increase their outputs by 12.96%, 26.41%, 25.52%, 29.36%, 7.04% and 66.03% so that they could be considered to be efficient. In addition, 2 newly added banks which were Tisco Bank and Kiatnakin Bank were also considered to be inefficient under intermediation approach with the efficiency scores of 0.3452 and 0.7548, indicating that Tisco Bank had to increase its output by 65.48% and Kiatnakin Bank had to increase its output by 24.52% with the same amount of input so that they could be regarded as the efficient banks.

5.1.3) Conclusion of Relative Efficiency

After considering individual commercial bank under operation approach during 2003 – 2006, the result indicates that Kasikorn Bank, the Siam Commercial Bank, Thanachart Bank and Standard Chatered Bank (Thai) were 100% efficient in every year. Moreover, Kiatnakin Bank and ACL Bank were efficient in the year of their emergences (2006). Although Bangkok Bank, Krung Thai Bank and Siam City Bank were 100% efficient only in some years, their average efficiency scores during 2003 – 2006 were very high (higher than 0.9500). Bank of Ayudhya, TMB Bank and Tisco Bank were inefficient and had produced their outputs under the efficiency frontier in every year, but their average efficiency scores during 2003 – 2006 were quite high, ranging from 0.8617 to 0.9127. Eventually, Bankthai was probably the least efficient bank during 2003 – 2006 due to its average efficiency score of 0.7356.

Nevertheless, after considering individual commercial bank under intermediation approach during 2003 – 2006, the study result indicates that there was no commercial bank which was considered to be 100% efficient in every year. ACL Bank was 100% efficient with the efficiency score of 1.0000 only in the year of its emergence (2006). Bangkok Bank and Siam City Bank, even though, were 100% efficient in some years, they might be considered to be fairly efficient during 2003 – 2006 with the very high average efficiency scores of 0.9262 and 0.9707, respectively. The Siam Commercial Bank, TMB Bank and Bankthai were also 100% efficient in some years, furthermore their average efficiency scores were quite high, ranging from 0.8174 to 0.8710. Thanachart Bank, although, was 100% efficient in both 2003 and 2004, its average efficiency score during 2003 – 2006 was not that high (0.7300) since its efficiency dropped dramatically in 2005 and 2006. Krung Thai Bank, Kasikorn Bank, Bank of Ayudhya and Kiatnakin Bank were considered to be inefficient and had produced their outputs under the efficiency frontier during 2003 – 2006 with the moderately high average efficiency scores of 0.7691, 0.7636, 0.7278 and 0.7548, respectively. Finally, Standard Chartered Bank (Thai) and Tisco Bank were also inefficient, moreover, their average efficiency scores during 2003 – 2006 which were 0.4805 and 0.3452, respectively, were very low.

According to the summary results in Table 5.1 and Table 5.2, it is noticeable that Thai commercial banks were more efficient under operation approach than intermediation approach. This result could reasonably yield the conclusion that during 2003 – 2006 the performance of Thai commercial banks in costs and revenues management was better than the performance in using labors and capitals to transform deposits into loans and investments. In other words, this result reflects that during 2003 – 2006 Thai commercial banks were capable of efficiently utilizing inputs of

production such as labors and capitals to generate revenues, whereas they did not work efficiently as financial intermediaries of which the most important role is to intermediate between people who have an excess demand for funds and those who have an excess supply of funds.

The reason for the lower efficiency in intermediation role of Thai commercial banks is probably the experience with the financial crisis which occurred in 1997. Prior to the crisis, every commercial bank in Thailand lent inappropriately to real estate business (borrowing for short term but lending for long term), leading to enormous Non-Performing Loans (NPLs) in every commercial bank after the collapse. It does take almost a decade with the strong efforts of the government, the Bank of Thailand and private sector to eliminate the NPLs from Thai banking sector. Undoubtedly, this terrible experience with NPLs problem causes Thai commercial banks more cautious in approving loans, leading to too much liquidity situation in banking sector. This is because commercial banks are still unlimitedly and continuously collecting deposits from people, whereas it is harder for people to obtain loans from commercial banks. That is why the efficiency of Thai commercial banks under intermediation approach was not as high as the efficiency under operation approach.

Another possible reason for the lower efficiency in intermediation role of Thai commercial banks is the very low interest rate for saving. At this moment (February 20th, 2008), the interest rate for saving deposit in major commercial banks is only 0.75% per annum, while the interest rate for 3, 6 and 12 month time deposit are only 2.25%, 2.25% and 2.375% per annum, respectively. This situation causes the investment in commercial banks in form of deposits less attractive than the investment

in capital market (bonds and stocks), leading to limitation on lending for commercial banks, especially the small banks.

The analysis of relative efficiency of Thai commercial banks under operation approach and intermediation approach discussed above may lead to the question that "Why are Thai commercial banks considerably efficient in utilizing inputs to generate revenues from the perspective of costs and revenues management despite the fact that they hardly lend but unlimitedly and continuously collect deposit?" (Loans are the major source of interest incomes, while deposits incur interest expenses for commercial banks.) The answer for this question is the gap between lending interest rate and saving interest rate. As mentioned above, the interest rate for saving is very low. On the contrary, the minimum loan rate (MLR) which is the lowest interest rate for lending is 6.875% per annum, whereas the interest rate for personal loan is incredibly high at the maximum of 28% per annum. Such a huge gap between saving and lending interest rate mentioned above leads to the efficiency in generating revenues even though the increase in loans approved is lower than the increase in deposits.

5.2) Relative Efficiency of Commercial Banks Categorized by Size

Thai commercial banks can be divided into 3 categories according to size which is based on their market shares of total assets. Large banks include commercial banks with market share of total assets not less than 10%, medium banks include commercial banks with market share of total assets not less than 3% but less than 10% and small banks include commercial banks with market share of total assets less than 3%.

For the analysis of relative efficiency of Thai commercial banks categorized by size, the mean values of inputs (interest expenses, labor-related expenses and capital-related expenses for the analysis under operation approach and total deposits and total expenses for the analysis under intermediation approach) and outputs (interest and dividend incomes and non-interest incomes for the analysis under operation approach and total loans and net investments for the analysis under intermediation approach) of large, medium and small banks were calculated and used for the analysis under the DEA approach.

The summary result for the analysis of relative efficiency of Thai commercial banks categorized by size under operation approach is presented in Table 5.3. The result in Table 5.3 indicates that, in average, large banks, medium banks and small banks were not different in efficiency under operation approach. Furthermore, they are considered to be 100% efficient with the efficiency scores of 1.0000 in every year during 2003 – 2006, implying that they had produced their outputs on the efficiency frontier in every year.

Table 5.3: Relative Efficiency of Commercial Banks under Operation Approach Categorized by Size during 2003 - 2006

Bank	Year				Average
	2003	2004	2005	2006	
Large Banks*	1.0000	1.0000	1.0000	1.0000	1.0000
Medium Banks**	1.0000	1.0000	1.0000	1.0000	1.0000
Small Banks***	1.0000	1.0000	1.0000	1.0000	1.0000
Average	1.0000	1.0000	1.0000	1.0000	

Remark:
*Large banks include commercial banks with market share of total assets not less than 10%. They are BBL, KTB, KBANK and SCB.
**Medium banks include commercial banks with market share of total assets not less than 3% but less than 10%. They are BAY, TMB, BT, SCIB and TBANK.
***Small banks include commercial banks with market share of total assets less than 3%. They are SCBT, TISCO, KK and ACL.

Table 5.4 presents the summary result for the analysis of relative efficiency of Thai commercial banks categorized by size under intermediation approach during 2003 – 2006. According to Table 5.4, it is reasonable to conclude that, in average, small banks were the most efficient banks under intermediation approach since they have the efficiency scores of 1.0000 in every year during 2003 – 2006, implying that they are 100% efficient and had produced their outputs on the efficiency frontier in every single year. However, large banks are considered to be 100% efficient only in 2003, 2005 and 2006, whereas they were inefficient in 2004 with the efficiency score of 0.9312, indicating that they had to increase their outputs by 6.88% with the same amount of input so that they would be considered to be efficient. Like large banks, medium banks were also considered to be 100% efficient only in 3 years (2004, 2005 and 2006), while they were inefficient in 2003. Their efficiency score in 2003 was 0.9708, indicating that they had to raise their outputs by 2.92% without increasing the amount of input so that they could be efficient.

Table 5.4: Relative Efficiency of Commercial Banks under Intermediation Approach Categorized by Size during 2003 - 2006

Bank	Year				Average
	2003	2004	2005	2006	
Large Banks	1.0000	0.9312	1.0000	1.0000	0.9828
Medium Banks	0.9708	1.0000	1.0000	1.0000	0.9927
Small Banks	1.0000	1.0000	1.0000	1.0000	1.0000
Average	0.9903	0.9771	1.0000	1.0000	

The summary results in Table 5.3 and Table 5.4 confirm the results obtained form Table 5.1 and Table 5.2 that Thai commercial banks were more efficient under operation approach than intermediation approach. However, there are two interesting results arising from this analysis. Firstly, large banks, medium banks and small banks, in average, were not different in efficiency under operation approach. This result reflects that size of commercial banks did not have any

influence on their performance in costs and revenues management. Secondly, small banks were the most efficient banks under intermediation approach, implying that small banks could perform the role of financial intermediaries, using labors and capitals to transfer deposits into loans and investments, more efficiently than large and medium ones. This is not a surprising result, though.

Generally, revenues of commercial banks come from two major sources which are interest incomes and non-interest incomes. However, small banks are normally inferior to large and medium banks in several aspects such as amount of capital, number of labors and reputation, causing the limitations for small banks on generating non-interest incomes from other sources such as investment banking services, money transfer services, foreign exchange services or insurance services. These limitations force small banks to rely heavily on lending to generate incomes, causing them to be less cautious in approving loans than large and medium banks. Consequently, it is easier to obtain loans from small banks than large and medium banks. That is why small banks were more efficient than large and medium banks under intermediation approach.

According to the study results under both operation and intermediation approaches discussed above, the research hypothesis that large commercial banks are the most efficient, whereas small commercial banks are the least efficient is not true.

5.3) Relative Efficiency of Commercial Banks Categorized by Business Background

In addition, Thai commercial banks also can be divided into 2 categories according to their business background: incumbents and new entries. Incumbents are commercial banks which have originally competed in banking business, whereas new

entries are commercial banks which previously competed in finance and securities business and just entered to banking business. For the analysis of relative efficiency of Thai commercial banks categorized by business background, the mean values of inputs and outputs for the analyses under both operation approach and intermediation approach of incumbents and new entries were calculated and used for the analysis under the DEA approach.

The summary result for the analysis of relative efficiency of Thai commercial banks categorized by business background under operation approach is presented in Table 5.5. According to Table 5.5, we could conclude that, in average, incumbents and new entries were not different in efficiency under operation approach. Moreover, they were considered to be 100% efficient in every year during 2003 – 2006 with the efficiency scores of 1.0000, indicating that they had operated on the efficiency frontier.

Table 5.5: Relative Efficiency of Commercial Banks under Operation Approach Categorized by Business Background during 2003 - 2006

Bank	Year				Average
	2003	2004	2005	2006	
Incumbents*	1.0000	1.0000	1.0000	1.0000	1.0000
New Entries**	1.0000	1.0000	1.0000	1.0000	1.0000
Average	1.0000	1.0000	1.0000	1.0000	

Remark:
* Incumbents are commercial banks which have originally competed in banking business. They are BBL, KTB, KBANK, SCB, BAY, TMB, BT, SCIB and SCBT.
** New entries are commercial banks which previously competed in finance and securities business. They are TBANK, TISCO, KK and ACL.

However, the summary result for the analysis of relative efficiency of Thai commercial banks categorized by business background under intermediation approach presented in Table 5.6 is different from the result under operation approach. According to Table 5.6, it is sensible to conclude that, in average, incumbents were more efficient under intermediation approach than new entries. Table 5.6 shows that

incumbents were 100% efficient with the efficiency scores of 1.0000 and had produced their outputs on the efficiency frontier in every year during 2003 – 2006, while new entries were considered to be 100% efficient only in 2003, 2004 and 2006. New entries were considered to be inefficient, producing their outputs under the efficiency frontier, in 2005 when they obtained the efficiency score of 0.7222. This efficiency score of 0.7222 implied that new entries had to increase their outputs by 27.78% with the same amount of input so that they could be considered to be efficient.

Table 5.6: Relative Efficiency of Commercial Banks under Intermediation Approach Categorized by Business Background during 2003 - 2006

Bank	Year				Average
	2003	2004	2005	2006	
Incumbents	1.0000	1.0000	1.0000	1.0000	1.0000
New Entries	1.0000	1.0000	0.7222	1.0000	0.9306
Average	1.0000	1.0000	0.8611	1.0000	

The summary results presented in Table 5.5 and Table 5.6 also confirm that Thai commercial banks were more efficient under operation approach than intermediation approach. Furthermore, it is noticeable that incumbents and new entries were not different in efficiency under operation approach, therefore, it is sensible to conclude that business background of commercial banks had no influence on the efficiency of commercial banks in generating revenues. Nevertheless, according to the analysis under intermediation approach, it turns out that incumbents were more efficient than new entries. The reason is that new entries are commercial banks which were previously finance and securities companies and had just entered to banking business. Undoubtedly, new entries are indeed inferior to incumbents in reputation, causing people to feel reluctant to deposit their saving with them. Consequently, new entries can collect just small amount of deposit, leading to the

limitation for them on lending. That is why incumbents were more efficient than new entries under intermediation approach.

According to the study results under both operation and intermediation approaches discussed above, the research hypothesis that incumbent commercial banks which have originally competed in banking business are more efficient than the new banks which formerly competed in finance and securities business is true.

CHAPTER 6: CONCLUSION AND BEYOND

In this study, Data Envelopment Analysis (DEA) was utilized to analyze the relative efficiency of Thai commercial banks during 2003 – 2006. Overall, the analysis leads to the conclusion that the efficiency of Thai commercial banks during 2003 – 2006 under operation approach which investigated the efficiency of commercial banks from the perspective of costs and revenues management was very high and stable with the average efficiencies over 90% in every year. Several commercial banks such as Kasikorn Bank, Siam Commercial Banks, Thanachart Bank and Standard Chartered Bank (Thai) were 100% efficient under operation approach in every year during 2003 – 2006. Kiatnakin Bank and ACL Bank were also 100% efficient in the year of their emergences (2006). Bangkok Bank, Krung Thai Bank and Siam City Bank were 100% efficient under operation approach at least in one year with the average efficiencies of over 95%. Moreover, Bank of Ayudhya, TMB Bank and Tisco Bank were fairly efficient under operation approach with the average efficiencies of over 85%. Bankthai was the least efficient bank under operation approach during 2003 – 2006 with the average efficiency of 73.56%.

Nevertheless, the efficiency of Thai commercial banks during 2003 – 2006 under intermediation approach which evaluated the efficiency of commercial banks as intermediaries which used labors and capitals to transform deposits into loans and securities was moderately high but somewhat volatile with the average efficiencies about 86% in 2003 and 2005 and about 72% in 2004 and 2006. ACL Bank was 100% efficient under intermediation approach in the year of its emergence (2006). Although Bangkok Bank and Siam City Bank were 100% efficient under intermediation

approach in some years, they were nearly 100% efficient during 2003 – 2006 with the very high average efficiencies of over 92%. Furthermore, the Siam Commercial Bank, TMB Bank and Bankthai were also nearly 100% efficient with the average efficiencies of 87.10%, 86.23% and 81.74%, respectively. Thanachart Bank was 100% efficient under intermediation approach in 2003 and 2006 but inefficient in 2005 and 2006 with the low average efficiencies of under 60%. Krung Thai Bank, Kasikorn Bank, Bank of Ayudhya and Kiatnakin Bank were inefficient under intermediation approach during 2003 – 2006 with the fairly high average efficiencies of over 72%. Finally, Standard Chartered Bank (Thai) and Tisco Bank were also inefficient with the very low average efficiencies under 50% during 2003 – 2006.

Thus it is noticeable that Thai commercial banks were more efficient under operation approach than intermediation approach during 2003 – 2006. The reason for the lower efficiency in intermediation role of Thai commercial banks is probably the terrible experience with NPLs problem stemming from the financial crisis which occurred in 1997. Unquestionably, this experience causes Thai commercial banks more cautious and tougher in approving loans, leading to too much liquidity situation in banking sector. Another possible reason is that the very low interest rate for saving causes the investment in commercial banks in form of deposits less attractive than the investment in capital market, leading to limitation on lending for commercial banks, especially the small banks. That is why the efficiency of Thai commercial banks under intermediation approach was not as high as the efficiency under operation approach.

In term of size, large, medium and small banks, in average, were 100% efficient under operation approach with the average efficiencies of 100% in every year during 2003 – 2006. This result reflects that size of commercial banks did not

have any influence on the performance of Thai commercial banks in costs and revenues management. Moreover, small banks, in average, were the most efficient banks under intermediation approach. Perhaps, the reason is that small banks are normally inferior to large and medium banks in several aspects, causing the limitations for them on generating non-interest incomes from other sources such as investment banking services or insurance services. These limitations force small banks to rely heavily on lending to generate incomes, causing them to be less cautious in approving loans. It is thus easier to obtain loans from small banks than large and medium banks. That is why small banks were more efficient than large and medium banks under intermediation approach.

In term of business background, incumbents which are commercial banks originally competing in banking business and new entries which are commercial banks previously competing in finance and securities business, in average, were 100% efficient under operation approach with the average efficiencies of 100% in every year during 2003 – 2006. It is therefore sensible to conclude that business background of commercial banks had no influence on the efficiency of commercial banks in utilizing inputs to generate revenues. Moreover, it turns out that incumbents, in average, were more efficient than new entries in perspective of intermediation approach. The reason is probably that new entries are normally inferior to incumbents in reputation, causing people to feel reluctant to deposit their saving with them. Consequently, new entries can collect just small amount of deposit, leading to the limitation for them on lending. That is why incumbents were more efficient than new entries under intermediation approach.

According to the analysis under operation approach which evaluates the efficiency of commercial banks from the perspective of costs and revenues

management, it is reasonable to conclude that Thai commercial banks are considerably efficient. Moreover, there is nothing to worry about for ones who wish to deposit money with commercial banks in Thailand since deposits in commercial banks are guaranteed by the government under deposit guarantee program. There is also nothing to worry about even for ones who wish to purchase financial instruments issued by commercial banks such as bills of exchange (B/E), debentures or certificates of deposit (CD) which are not included in the deposit guarantee program by the government. The study result noticeably indicates that Thai commercial banks have efficiently managed their costs and revenues, therefore, it is not likely that Thai commercial banks will fail and end up with loss or bankruptcy. In addition, since there is no difference in term of efficiency among large, medium and small banks, and there is also no difference in term of efficiency between incumbents and new entries, it is certainly reasonable to deposit money with or to purchase financial instruments issued by any commercial banks which offer the highest rate of interest regardless of their size and business background.

Even though the analysis under intermediation approach which investigates the efficiency of commercial banks as intermediaries utilizing labors and capitals to transform deposits into loans and investments suggests that it will be tough and complicated to obtain loans from commercial banks since they are highly cautious in approving loans, there should be nothing to worry about for ones with good financial background (have a good job, high and stable income, collateral and no default record). Always keep in mind that commercial banks always want to lend but only to the right person with acceptable creditability, consequently if you have good financial background like mentioned above, the probability that you will obtain loans form banks will certainly be high. In addition, it will be easier to obtain loans from

small banks but perhaps with the higher interest rate. Although the analysis indicates that new entries which are commercial banks previously competing in finance and securities business and just entering to banking business may have some limitations on lending due to small amount of deposit, there should not be a problem if you just want to obtain housing loan of 2 or 3 million baht. However, it is likely to be harder to obtain loans from new entries if you want to borrow 10 billion baht to finance your new factory project.

Nevertheless, there is a limitation for this study. Always keep in mind that this study just examines the relative efficiency of Thai commercial banks not the absolute efficiency, implying that the commercial banks which are considered to be efficient in this study are just the best banks in comparison to the other banks included in the study. It is thus possible that the efficient banks in this study become inefficient when new commercial banks are added into the study. Therefore, any commercial bank can be better even though it is said to be 100% efficient with the efficiency score of 1.00. Moreover, the study of relative efficiency of commercial banks should be repeatedly conducted whenever there is a new commercial bank entering to the market so that the study result will always be reliable.

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APPENDIX 1: RAW DATA

Table 1A.1: Incomes, Expenses, Deposits, Loans and Investments of Bangkok Bank PCL

(Million Baht)

Variables	2003	2004	2005	2006
Interest and dividend Income	48,072.80	48,245.62	56,030.14	76,768.59
Non-Interest Income	20,824.71	17,840.60	17,693.77	25,039.01
Interest Expense	23,519.47	15,535.16	15,819.87	32,494.10
Non-Interest Expense	29,290.66	28,760.14	31,081.52	36,653.56
Labor-Related Expense	8,407.51	8,867.28	9,828.85	10,916.63
Capital-Related Expense	4,640.63	4,711.71	5,437.69	6,076.78
Total Deposit	1,114,909.90	1,186,111.45	1,156,530.24	1,221,732.97
Total Loan	848,858.84	932,940.38	912,003.36	958,386.14
Net Investment	355,751.45	305,751.78	310,103.04	296,412.04

Source: Stock Exchange of Thailand

Table 1A.2: Incomes, Expenses, Deposits, Loans and Investments of Krung Thai Bank PCL

(Million Baht)

Variables	2003	2004	2005	2006
Interest and dividend Income	39,853.75	46,007.36	50,166.06	67,470.76
Non-Interest Income	7,795.82	8,972.92	7,258.79	10,112.92
Interest Expense	17,220.08	13,314.77	11,433.84	21,406.49
Non-Interest Expense	18,182.80	22,222.37	22,282.42	25,601.71
Labor-Related Expense	7,144.02	8,770.73	9,235.44	10,489.24
Capital-Related Expense	2,912.44	2,049.60	2,019.67	2,590.43
Total Deposit	1,005,929.79	1,003,446.35	983,212.60	968,280.82
Total Loan	979,025.64	937,803.83	894,731.19	926,269.40
Net Investment	84,916.90	71,794.07	102,988.39	116,414.77

Source: Stock Exchange of Thailand

Table 1A.3: Incomes, Expenses, Deposits, Loans and Investments of Kasikorn Bank PCL

(Million Baht)

Variables	2003	2004	2005	2006
Interest and dividend Income	31,035.74	31,233.74	37,330.13	51,499.67
Non-Interest Income	14,186.61	11,367.96	11,462.33	13,042.36
Interest Expense	13,191.12	7,026.38	7,247.91	17,223.08
Non-Interest Expense	15,888.11	18,770.38	20,210.19	24,293.71
Labor-Related Expense	5,041.29	6,266.70	7,381.77	7,612.77
Capital-Related Expense	3,174.96	3,415.00	3,408.74	5,245.03
Total Deposit	685,222.11	705,984.55	688,911.34	752,053.20
Total Loan	530,089.91	578,117.03	621,090.15	673,889.58
Net Investment	140,764.69	116,990.36	106,066.61	109,882.19

Source: Stock Exchange of Thailand

Table 1A.4: Incomes, Expenses, Deposits, Loans and Investments of the Siam Commercial Bank PCL

(Million Baht)

Variables	2003	2004	2005	2006
Interest and dividend Income	27,438.77	26,718.03	31,542.30	49,178.89
Non-Interest Income	9,297.56	19,077.42	14,620.08	16,557.37
Interest Expense	8,364.07	5,972.03	6,552.64	18,724.19
Non-Interest Expense	13,512.50	16,410.31	18,920.31	23,628.63
Labor-Related Expense	4,327.98	5,890.32	6,618.81	7,880.72
Capital-Related Expense	2,792.66	3,501.09	4,248.22	5,365.03
Total Deposit	607,131.84	624,718.24	622,431.10	789,226.70
Total Loan	506,292.76	555,450.32	603,812.36	694,933.13
Net Investment	147,599.73	130,768.56	112,366.20	108,816.50

Source: Stock Exchange of Thailand

Table 1A.5: Incomes, Expenses, Deposits, Loans and Investments of Bank of Ayudhya PCL

(Million Baht)

Variables	2003	2004	2005	2006
Interest and dividend Income	19,080.80	19,813.20	23,756.03	34,682.00
Non-Interest Income	6,860.39	4,493.92	5,507.77	3,231.73
Interest Expense	10,619.42	6,691.23	7,699.92	16,474.26
Non-Interest Expense	9,262.36	9,934.79	11,439.36	13,465.25
Labor-Related Expense	2,911.87	3,326.98	3,879.48	4,125.52
Capital-Related Expense	1,868.73	2,068.96	2,404.82	2,805.55
Total Deposit	420,665.87	492,365.09	553,532.37	562,242.44
Total Loan	395,572.34	415,108.43	442,596.73	457,798.82
Net Investment	60,629.85	57,622.02	64,612.05	72,629.99

Source: Stock Exchange of Thailand

Table 1A.6: Incomes, Expenses, Deposits, Loans and Investments of TMB Bank PCL

(Million Baht)

Variables	2003	2004	2005	2006
Interest and dividend Income	14,754.47	17,161.90	25,845.79	35,946.43
Non-Interest Income	3,402.83	4,429.11	5,657.27	4,247.26
Interest Expense	8,263.57	6,400.43	11,303.52	20,974.96
Non-Interest Expense	7,785.58	8,772.15	12,255.11	19,661.32
Labor-Related Expense	2,012.74	2,512.97	3,952.94	4,745.51
Capital-Related Expense	1,530.37	1,678.21	1,957.71	2,081.14
Total Deposit	322,239.46	456,007.46	517,214.85	568,674.45
Total Loan	301,184.14	516,185.40	555,654.80	542,758.33
Net Investment	47,552.54	94,509.43	107,509.19	117,237.17

Source: Stock Exchange of Thailand

Table 1A.7: Incomes, Expenses, Deposits, Loans and Investments of Bankthai PCL

(Million Baht)

Variables	2003	2004	2005	2006
Interest and dividend Income	7,969.76	6,437.98	8,724.59	13,472.33
Non-Interest Income	1,163.52	1,151.53	1,029.35	737.41
Interest Expense	5,824.28	3,767.53	5,021.73	8,092.14
Non-Interest Expense	4,844.98	3,276.27	3,905.96	5,109.38
Labor-Related Expense	1,112.14	1,216.17	1,381.06	1,614.95
Capital-Related Expense	667.59	721.64	812.71	1,046.64
Total Deposit	196,323.25	184,558.67	194,573.32	181,318.66
Total Loan	119,792.21	130,049.09	137,449.01	102,663.92
Net Investment	37,662.82	37,679.69	65,178.93	76,972.03

Source: Stock Exchange of Thailand

Table 1A.8: Incomes, Expenses, Deposits, Loans and Investments of Siam City Bank PCL

(Million Baht)

Variables	2003	2004	2005	2006
Interest and dividend Income	17,077.47	15,679.31	17,833.79	25,070.89
Non-Interest Income	5,686.80	4,171.34	3,175.46	3,465.38
Interest Expense	8,360.42	5,767.26	6,411.51	12,450.87
Non-Interest Expense	6,774.40	7,225.46	8,063.76	9,049.38
Labor-Related Expense	1,881.76	2,224.54	2,652.72	3,042.48
Capital-Related Expense	1,239.15	1,272.70	1,370.84	1,669.86
Total Deposit	406,862.14	385,469.69	382,164.89	353,960.67
Total Loan	322,318.10	333,815.49	297,078.04	233,623.68
Net Investment	102,517.48	89,794.52	105,858.37	95,554.59

Source: Stock Exchange of Thailand

Table 1A.9: Incomes, Expenses, Deposits, Loans and Investments of Thanachart Bank PCL

(Million Baht)

Variables	2003	2004	2005	2006
Interest and dividend Income	2,504.86	2,328.00	5,309.49	15,519.88
Non-Interest Income	642.99	252.33	867.92	1,318.40
Interest Expense	1,368.17	1,213.20	2,837.87	9,510.15
Non-Interest Expense	898.74	758.89	2,371.61	6,210.38
Labor-Related Expense	153.65	205.11	590.96	1,279.55
Capital-Related Expense	76.43	94.87	184.85	489.22
Total Deposit	41,705.86	45,019.12	149,014.93	198,981.31
Total Loan	32,902.87	31,023.16	83,196.71	200,179.89
Net Investment	24,097.70	19,173.05	17,415.09	21,894.37

Source: Stock Exchange of Thailand

Table 1A.10: Incomes, Expenses, Deposits, Loans and Investments of Standard Chartered Bank (Thai) PCL

(Million Baht)

Variables	2003	2004	2005	2006
Interest and dividend Income	4,195.14	4,913.46	7,406.37	13,171.57
Non-Interest Income	1,041.37	1,405.75	2,065.80	3,881.91
Interest Expense	944.01	664.90	1,394.95	4,377.55
Non-Interest Expense	2,928.12	3,738.16	4,828.06	5,917.35
Labor-Related Expense	1,185.72	1,433.65	1,854.50	2,383.31
Capital-Related Expense	549.92	603.28	731.75	681.67
Total Deposit	46,156.03	46,395.86	87,698.95	72,441.09
Total Loan	57,980.17	48,541.97	87,993.95	83,227.94
Net Investment	2,696.38	9,960.11	15,245.44	13,448.24

Source: Stock Exchange of Thailand

Table 1A.11: Incomes, Expenses, Deposits, Loans and Investments of Tisco Bank PCL

(Million Baht)

Variables	2003	2004	2005	2006
Interest and dividend Income	-	-	-	4,484.27
Non-Interest Income	-	-	-	1,798.40
Interest Expense	-	-	-	2,719.55
Non-Interest Expense	-	-	-	1,911.76
Labor-Related Expense	-	-	-	671.68
Capital-Related Expense	-	-	-	376.27
Total Deposit	-	-	-	40,668.12
Total Loan	-	-	-	68,880.67
Net Investment	-	-	-	7,717.32

Source: Stock Exchange of Thailand

Table 1A.12: Incomes, Expenses, Deposits, Loans and Investments of Kiatnakin Bank PCL

(Million Baht)

Variables	2003	2004	2005	2006
Interest and dividend Income	-	-	-	5,301.33
Non-Interest Income	-	-	-	1,733.39
Interest Expense	-	-	-	2,331.19
Non-Interest Expense	-	-	-	2,087.28
Labor-Related Expense	-	-	-	537.56
Capital-Related Expense	-	-	-	178.68
Total Deposit	-	-	-	42,102.95
Total Loan	-	-	-	51,175.26
Net Investment	-	-	-	21,729.67

Source: Stock Exchange of Thailand

Table 1A.13: Incomes, Expenses, Deposits, Loans and Investments of ACL Bank PCL

(Million Ba

Variables	2003	2004	2005	20
Interest and dividend Income	-	-	-	2,337
Non-Interest Income	-	-	-	275
Interest Expense	-	-	-	1,400
Non-Interest Expense	-	-	-	729
Labor-Related Expense	-	-	-	366
Capital-Related Expense	-	-	-	70
Total Deposit	-	-	-	26,147
Total Loan	-	-	-	28,257
Net Investment	-	-	-	12,510

Source: Stock Exchange of Thailand

APPENDIX 2: INPUT AND OUTPUT WEIGHTS

Table 2A.1: Input and Output Weights under Operation Approach for 2003

Bank	Output		Input			Weighted Sum of Output
	y_1	y_2	x_1	x_2	x_3	
BBL	0.000000	0.000046	0.000013	0.000000	0.000149	0.9486
KTB	0.000024	0.000000	0.000037	0.000000	0.000125	0.9558
KBANK	0.000015	0.000038	0.000032	0.000113	0.000000	1.0000
SCB	0.000020	0.000049	0.000047	0.000000	0.000217	1.0000
BAY	0.000022	0.000056	0.000048	0.000168	0.000000	0.8072
TMB	0.000053	0.000000	0.000075	0.000188	0.000000	0.7761
BT	0.000081	0.000000	0.000116	0.000291	0.000000	0.6478
SCIB	0.000031	0.000077	0.000067	0.000234	0.000000	0.9707
TBANK	0.000399	0.000000	0.000615	0.000000	0.002082	1.0000
SCBT	0.000007	0.000933	0.001059	0.000000	0.000000	1.0000

Table 2A.2: Input and Output Weights under Operation Approach for 2004

Bank	Output		Input			Weighted Sum of Output
	y_1	y_2	x_1	x_2	x_3	
BBL	0.000018	0.000005	0.000025	0.000054	0.000029	0.9458
KTB	0.000021	0.000005	0.000029	0.000063	0.000033	1.0000
KBANK	0.000029	0.000008	0.000040	0.000089	0.000047	1.0000
SCB	0.000031	0.000008	0.000044	0.000096	0.000050	1.0000
BAY	0.000048	0.000000	0.000068	0.000164	0.000000	0.9555
TMB	0.000057	0.000000	0.000080	0.000194	0.000000	0.9778
BT	0.000107	0.000000	0.000138	0.000394	0.000000	0.6873
SCIB	0.000060	0.000016	0.000082	0.000181	0.000095	1.0000
TBANK	0.000430	0.000000	0.000572	0.001275	0.000473	1.0000
SCBT	0.000191	0.000045	0.000417	0.000299	0.000487	1.0000

Table 2A.3: Input and Output Weights under Operation Approach for 2005

Bank	Output		Input			Weighted Sum of Output
	y_1	y_2	x_1	x_2	x_3	
BBL	0.000016	0.000006	0.000016	0.000076	0.000000	1.0000
KTB	0.000019	0.000006	0.000020	0.000081	0.000013	1.0000
KBANK	0.000025	0.000007	0.000026	0.000104	0.000013	1.0000
SCB	0.000020	0.000024	0.000023	0.000094	0.000054	1.0000
BAY	0.000040	0.000008	0.000044	0.000170	0.000000	0.9887
TMB	0.000033	0.000012	0.000033	0.000159	0.000000	0.9295
BT	0.000092	0.000000	0.000087	0.000407	0.000000	0.8018
SCIB	0.000053	0.000016	0.000057	0.000225	0.000028	1.0000
TBANK	0.000175	0.000080	0.000185	0.000747	0.000178	1.0000
SCBT	0.000135	0.000000	0.000524	0.000009	0.000344	1.0000

Table 2A.4: Input and Output Weights under Operation Approach for 2006

Bank	Output		Input			Weighted Sum of Output
	y_1	y_2	x_1	x_2	x_3	
BBL	0.000007	0.000016	0.000023	0.000024	0.000001	0.9489
KTB	0.000015	0.000000	0.000011	0.000000	0.000293	1.0000
KBANK	0.000012	0.000028	0.000039	0.000041	0.000002	1.0000
SCB	0.000011	0.000026	0.000037	0.000038	0.000002	1.0000
BAY	0.000026	0.000000	0.000039	0.000088	0.000000	0.8992
TMB	0.000021	0.000000	0.000016	0.000142	0.000000	0.7634
BT	0.000060	0.000000	0.000044	0.000400	0.000000	0.8056
SCIB	0.000035	0.000000	0.000052	0.000117	0.000000	0.8677
TBANK	0.000064	0.000000	0.000047	0.000431	0.000000	1.0000
SCBT	0.000062	0.000046	0.000136	0.000153	0.000057	1.0000
TISCO	0.000000	0.000487	0.000279	0.000360	0.000000	0.8751
KK	0.000189	0.000000	0.000282	0.000638	0.000001	1.0000
ACL	0.000428	0.000000	0.000226	0.000000	0.009743	1.0000

Table 2A.5: Input and Output Weights under Intermediation Approach for 2003

Bank	Output		Input		Weighted Sum of Output
	y_1	y_2	x_1	x_2	
BBL	0.00000082	0.00000048	0.00000068	0.00000452	0.8624
KTB	0.00000094	0.00000090	0.00000050	0.00001418	1.0000
KBANK	0.00000137	0.00000081	0.00000114	0.00000755	0.8343
SCB	0.00000154	0.00000148	0.00000081	0.00002322	1.0000
BAY	0.00000218	0.00000128	0.00000181	0.00001200	0.8728
TMB	0.00000281	0.00000165	0.00000233	0.00001546	0.8447
BT	0.00000452	0.00000265	0.00000374	0.00002482	0.5915
SCIB	0.00000227	0.00000217	0.00000119	0.00003409	0.9532
TBANK	0.00001786	0.00001711	0.00000938	0.00026861	1.0000
SCBT	0.00001679	0.00000986	0.00001392	0.00009228	0.7345

Table 2A.6: Input and Output Weights under Intermediation Approach for 2004

Bank	Output		Input		Weighted Sum of Output
	y_1	y_2	x_1	x_2	
BBL	0.00000034	0.00000177	0.00000000	0.00002258	0.8717
KTB	0.00000088	0.00000000	0.00000100	0.00000000	0.4179
KBANK	0.00000091	0.00000185	0.00000142	0.00000000	0.6457
SCB	0.00000103	0.00000209	0.00000160	0.00000000	0.8175
BAY	0.00000179	0.00000000	0.00000203	0.00000000	0.5945
TMB	0.00000099	0.00000518	0.00000000	0.00006591	1.0000
BT	0.00000349	0.00000707	0.00000542	0.00000000	0.6779
SCIB	0.00000116	0.00000605	0.00000000	0.00007697	1.0000
TBANK	0.00000761	0.00003984	0.00000000	0.00050708	1.0000
SCBT	0.00001389	0.00002813	0.00002155	0.00000000	0.2054

Table 2A.7: Input and Output Weights under Intermediation Approach for 2005

Bank	Output		Input		Weighted Sum of Output
	y_1	y_2	x_1	x_2	
BBL	0.00000053	0.00000156	0.00000060	0.00000658	0.9705
KTB	0.00000066	0.00000193	0.00000074	0.00000813	0.7880
KBANK	0.00000090	0.00000263	0.00000101	0.00001110	0.8386
SCB	0.00000099	0.00000289	0.00000111	0.00001219	0.9218
BAY	0.00000117	0.00000342	0.00000131	0.00001440	0.7375
TMB	0.00000115	0.00000336	0.00000129	0.00001417	1.0000
BT	0.00000305	0.00000892	0.00000341	0.00003758	1.0000
SCIB	0.00000165	0.00000482	0.00000185	0.00002033	1.0000
TBANK	0.00000432	0.00001265	0.00000485	0.00005334	0.5801
SCBT	0.00000571	0.00001672	0.00000640	0.00007047	0.7575

Table 2A.8: Input and Output Weights under Intermediation Approach for 2006

Bank	Output		Input		Weighted Sum of Output
	y_1	y_2	x_1	x_2	
BBL	0.00000059	0.00000112	0.00000000	0.00001446	1.0000
KTB	0.00000087	0.00000165	0.00000000	0.00002127	0.8704
KBANK	0.00000118	0.00000090	0.00000054	0.00001425	0.7359
SCB	0.00000114	0.00000087	0.00000053	0.00001380	0.7448
BAY	0.00000161	0.00000123	0.00000074	0.00001946	0.7064
TMB	0.00000133	0.00000102	0.00000061	0.00001605	0.6044
BT	0.00000000	0.00001290	0.00000000	0.00007575	1.0000
SCIB	0.00000191	0.00000362	0.00000000	0.00004651	0.9296
TBANK	0.00000387	0.00000000	0.00000158	0.00004361	0.3397
SCBT	0.00000700	0.00001026	0.00001380	0.00000000	0.2247
TISCO	0.00001337	0.00001024	0.00000617	0.00016175	0.3452
KK	0.00001275	0.00001598	0.00001337	0.00009891	0.7548
ACL	0.00002643	0.00002024	0.00001219	0.00031973	1.0000

Table 2A.9: Input and Output Weights of Large, Medium and Small Banks under Operation Approach during 2003 – 2005

Year	Bank	Output		Input			Weighted Sum of Output
		y_1	y_2	x_1	x_2	x_3	
2003	Large	0.000007	0.000000	0.000007	0.000023	0.000000	1.0000
	Medium	0.000016	0.000000	0.000016	0.000056	0.000000	1.0000
	Small	0.000238	0.000000	0.000327	0.000583	0.000000	1.0000
2004	Large	0.000007	0.000000	0.000008	0.000022	0.000000	1.0000
	Medium	0.000016	0.000000	0.000020	0.000055	0.000000	1.0000
	Small	0.000204	0.000000	0.000364	0.000529	0.000000	1.0000
2005	Large	0.000006	0.000000	0.000001	0.000000	0.000063	1.0000
	Medium	0.000012	0.000000	0.000003	0.000000	0.000134	1.0000
	Small	0.000135	0.000000	0.000244	0.000000	0.000902	1.0000
2006	Large	0.000004	0.000000	0.000007	0.000000	0.000017	1.0000
	Medium	0.000007	0.000011	0.000001	0.000062	0.000000	1.0000
	Small	0.000000	0.000130	0.000091	0.000000	0.000015	1.0000

Table 2A.10: Input and Output Weights of Large, Medium and Small Banks under Intermediation Approach during 2003 – 2005

Year	Bank	Output		Input		Weighted Sum of Output
		y_1	y_2	x_1	x_2	
2003	Large	0.00000021	0.00000056	0.00000029	0.00000000	1.0000
	Medium	0.00000051	0.00000137	0.00000072	0.00000000	0.9708
	Small	0.00001533	0.00004120	0.00002167	0.00000000	1.0000
2004	Large	0.00000031	0.00000000	0.00000026	0.00000069	0.9312
	Medium	0.00000070	0.00000000	0.00000059	0.00000155	1.0000
	Small	0.00002060	0.00000000	0.00001722	0.00004565	1.0000
2005	Large	0.00000023	0.00000049	0.00000026	0.00000075	1.0000
	Medium	0.00000044	0.00000093	0.00000050	0.00000143	1.0000
	Small	0.00000829	0.00001773	0.00000948	0.00002708	1.0000
2006	Large	0.00000011	0.00000101	0.00000012	0.00000282	1.0000
	Medium	0.00000020	0.00000180	0.00000021	0.00000504	1.0000
	Small	0.00000432	0.00000000	0.00000551	0.00000000	1.0000

Table 2A.11: Input and Output Weights of Incumbent Banks and New Entries under Operation Approach during 2003 – 2005

Year	Bank	Output		Input			Weighted Sum of Output
		y_1	y_2	x_1	x_2	x_3	
2003	Incumbents	0.000005	0.000000	0.000010	0.000000	0.000000	1.0000
	New Entries	0.000399	0.000000	0.000667	0.000570	0.000000	1.0000
2004	Incumbents	0.000005	0.000000	0.000015	0.000000	0.000000	1.0000
	New Entries	0.000430	0.000000	0.000600	0.001328	0.000000	1.0000
2005	Incumbents	0.000004	0.000000	0.000004	0.000015	0.000000	1.0000
	New Entries	0.000188	0.000000	0.000201	0.000729	0.000000	1.0000
2006	Incumbents	0.000003	0.000000	0.000007	0.000000	0.000000	1.0000
	New Entries	0.000036	0.000000	0.000036	0.000147	0.000000	1.0000

Table 2A.12: Input and Output Weights of Incumbent Banks and New Entries under Intermediation Approach during 2003 – 2005

Year	Bank	Output		Input		Weighted Sum of Output
		y_1	y_2	x_1	x_2	
2003	Incumbents	0.00000025	0.00000000	0.00000021	0.00000000	1.0000
	New Entries	0.00002738	0.00000411	0.00002398	0.00000000	1.0000
2004	Incumbents	0.00000022	0.00000000	0.00000020	0.00000000	1.0000
	New Entries	0.00002198	0.00001659	0.00002221	0.00000000	1.0000
2005	Incumbents	0.00000022	0.00000000	0.00000019	0.00000000	1.0000
	New Entries	0.00000868	0.00000000	0.00000000	0.00019196	0.7222
2006	Incumbents	0.00000000	0.00000099	0.00000014	0.00000078	1.0000
	New Entries	0.00000287	0.00000000	0.00000325	0.00000000	1.0000

Remark:

1) Weighted sum of inputs is restricted to equal 1.0000

2) Under operation approach, x_1 = Interest expenses, x_2 = Labor-related expenses (gross wages), x_3 = Capital-related expenses (premises and equipment expenses), y_1 = Interest and dividend incomes and y_2 = Non-interest incomes

3) Under intermediation approach, x_1 = Total deposits, x_2 = Total expenses, y_1 = Total loans and y_2 = Net investments

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