

I. INTRODUCTION

Since the financial crisis in 1997, Thai financial landscape, including macroeconomic, financial structure and regulation, has changed dramatically, affecting the profitability of Thai commercial banks. Two years after the crisis, the macroeconomic conditions were suffered from negative GDP growth and high inflation period. GDP growth, inflation and return on assets (ROA) of Thai commercial banks and Net profit are shown in Figure I.

[Figure I is here]

The recession not only hindered the investment of business sectors but also increased bad debt within the Thai banking system. The high inflation, which was due to the depreciation of Thai Baht after changing the exchange rate regime to managed floating system, affects cost of business creating problems to the banks.

During this financial crisis, Thai financial structure also encountered changes from the concentration and the increasing role of stock market. A decreasing number of finance companies as well as the merger of some banks result in an increase of the concentration. Furthermore, the stock market becomes an alternatives source of financial support to business units. This role of the stock market, which may act as the competitors to the bank lending business, is increasing due to the substitution between equity finance and debt finance. The stock market capitalization and all Thai commercial banks' assets and the ratio of the stock market capitalization to GDP, bank assets to GDP, and stock market capitalization to bank are shown in Figure II.

[Figure II is here]

Regarding the role of Thai bond market, it seems unlikely to affect to the bank profitability. This is because the cost of funding from issuing bonds is highly relative to the cost of borrowing from banks or issuing the stocks. Moreover, most of bond issuers in Thai that corporate bond market are the firms with reputation and have the high demand for funds. Although, the Thai bond market continuously expands and the size of domestic bonds (at par) is

about 57.6 percent to GDP¹ in 2007, the corporate bonds are only 19.1 percent of domestic bonds.

In order to solve the performance problem of Thai commercial banks, the Bank of Thailand released the limitation of the holding stocks in Thai commercial banks for foreign investors. Therefore, foreign investors increase their investment in some private-ownership banks, which leads to an aggressive competition between private- and government-ownership banks. Regarding to the supervision, a prudential regulation propelled the banks to improve the efficiency and strength.

Since 1999, banks have improved the profitability with tend to increase net interest margins (NIM). In addition, net profit and ROA have turned to be positive since year 2000 with an exception of some period (such as IAS39 in 2006 Q2 - 2007 Q1) due to the effects of determinants and shocks from the change in regulation. NIM and ROA of Thai commercial banks are shown in Figure III.

[Figure III is here]

This paper studies the determinants of profitability of Thai commercial banks, and focuses on the impact of these determinants on private-owned and government-owned banks. This study aims to examine the effects of bank's characteristics, macroeconomic conditions and financial structures on Thai commercial banks' profitability. Panel quarterly data of ten Thai commercial banks from 1997-2007 are analyzed, and the regression results are estimated with fixed effect and random effect. The results are then compared using Hausman test. The differences of the impacts of determinants to profitability of private-ownership banks and of government-ownership banks are investigated by comparing the data set of these two groups and then regressing each group with fixed effect model. Results are expected to be beneficial for bank managers to improve bank management and for central bank to design the appropriate bank policy.

¹ Source : Thai BMA

The results show that all bank's characteristics except bank size significantly affect bank profitability. The equity to asset ratio is positively related to profitability because banks with strong capital have lower cost of funding. For credit risk, Loan loss provision has a negative relationship to the profitability. The operating cost management of Thai commercial banks has negative impact to profitability.

In term of the macroeconomic conditions, GDP growth supports bank profitability while inflation does not have any significant impact. With regarding to the financial structures, the increasing role of stock market relative to bank has a negative impact on bank profitability, reflecting the substitution between bank and stock market. Furthermore, the concentration is beneficial for profitability of overall banks and private-ownership banks.

The rest of the paper is organized as follows. Section 2 reviews the literature on bank profitability. Section 3 presents the theoretical models and methodology while Section 4 describes the data set. Section 5 reports our findings and analyzes the results. Section 6 concludes the study and discusses some policy implications.

II. LITERATURE REVIEW

2.1 Studies on the determinants of profitability of banks in single country

The papers on the determinants of profitability of banks in single country such as by Berger (1995), Naceur (2003), Panayiotis *et al.* (2005), and Park and Weber (2006), mostly focus on the effect of the banks' characteristic, macroeconomic conditions, and financial structure. However, the results are mixed. Berger (1995) found that banks with a high net interest margin, low operating costs per employee, high equity capital ratio, or low NPL to total loans were more profitable. Naceur (2003) also found the positive relationship between capital and NIM and profitability.

Regarding the size of bank, the effects to ROA are mixed due to economies of scales and scale inefficiency, but most studies found the significantly negative relationship on the NIM. Furthermore, some studies found that the size of bank had no relationship with profitability.

According to Panayiotis *et al.* (2005) who studied on Greek banks over the period 1985-2001, all bank-specific determinants, except size, affect banks' profitability.

Regarding the macroeconomic factors, most studies found the positive relationship between growth of GDP or GDP per capita and bank profitability, while Panayiotis *et al.* (2006) found that there was no linkage between economic GDP per capita and profitability. Moreover, the effects of inflation to profitability are also mixed. While Naceur (2003) found no impact of inflation on profitability, Panayiotis *et al.* (2005) found the positive impact of inflation and cyclical output on the performance of the banking sector.

For the financial structure, the impacts of concentration are also mixed. Naceur (2003) reported that the concentration is less beneficial to the Tunisian commercial banks than competition. This result is similar to the report by Panayiotis *et al.* (2005), suggesting that the concentration does not support Structure-Conduct-Performance (SCP) hypothesis. However, Park and Weber (2006) found the evidence that bank efficiency has a significant effect on bank profitability and supports the efficient structure hypothesis for Korean banking sector for the period of 1992-2002.

2.2 Studies on the determinants of profitability of banks across countries

Staikouras and Wood (2003), Goodard *et al.* (2004), Panayiotis *et al.* (2006), and Pasiouras and Kosmidou (2007) studied on the determinants of profitability of banks across countries and mostly found that there are differences of the effect of determinants between countries.

Staikouras and Wood (2003) found that loan to assets ratio and the proportion of loan loss provisions are negatively related to banks' ROA, while banks that have more equity are relatively more profitable. For the concentration, there is no evidence to support either the structure-conduct-performance or the efficient hypothesis. However, Panayiotis *et al.* (2006) examined the profitability behavior of bank-specific, industry-related and macroeconomic determinants of South Eastern European (SEE) credit institutions over the period 1998-2002 and

found that the positive effect of concentration supports the Structure-Conduct-Performance (SCP) hypothesis and efficient-structure hypothesis.

In addition, Goodard *et al.* (2004) investigated the determinants of profitability in Denmark, France, Germany, Italy, Spain and the UK during 1992-1998. They found that there is the weak evidence for size-profitability relationship and a positive relationship between capital-assets ratio and profitability.

III. THE THEORETICAL MODELS AND METHODOLOGY

The variables mostly used to measure the profitability are return on assets (ROA), return on equity (ROE), or net interest margin (NIM). In this study, we use ROA as the dependent variable, calculated as profit after taxes divided by total assets. In order to investigate the effects of determinants to ROA, we classify independent variables into internal variables and external variables.

The internal bank's characteristics represent size, capital strength, credit risk, and operating cost. In addition, the external variables represent macroeconomic conditions (such as economy growth and inflation), and financial structure (such as the important of stock market or banking sector to the economy). In term of the variables used in the models, we discuss each variable below. Based on this relationship, the profitability function is shown as follow.

ROA = f (Bank's characteristic, Macroeconomic conditions, Financial structure)

3.1 Determinants

3.1.1 Dependent variable

ROA = bank's profitability

The measure of profitability used in this study is the return on assets (ROA) which has been widely used in several banks' profitability studies. ROA measures the profit after tax to the total assets that reflect the ability of bank to manage the resources to generate profits.

3.1.2 Independent variables

Independent variables are consisted of four internal factors (or bank characteristics) and six external factors (or macroeconomic and financial structures).

3.1.2.1 Internal factors: Bank characteristics

(i) Total assets (SIZE)

Generally, the effect of the growing size is positive to the profitability of firms due to the economies of scale. However, in a case of banks that are extremely large, the size could negatively affect the profitability due to diseconomies of scale. The relationship between size and profitability is therefore a non-linear relationship. Eichengreen and Gibson (2001) suggested that the banks' total assets and their square should be used in order to capture the possible non-linear relationship. In this study, the expected relationship between the asset size of bank and profitability is positive. In other words, size is beneficial to profitability due to the economies of scale.

(ii) Equity to asset ratio (EA)

The ratio of equity to assets (EA) used in this study is a proxy of the capital strength. Berger (1995) computed the ratio of the capital and reserved to total assets as a proxy of banks' solvency. The expected sign is positive because the bank capital reflects the strength of funds supporting the business and is the safety net to the risk. Thus, the high capital signals lead to the strength of bank and increased creditability which directly result in the good performance. Moreover, it is expected that the high equity to asset ratio can decrease the need of external funding that support higher profitability. Therefore, well capitalized banks face lower costs of going bankrupt, causing the reduction of cost of funding (Neaur, 2003). In addition, Demirguc-Kunt and Huizinga (1999) also found that a bank with higher equity needs to borrow less to support their activities.

(iii) Loan loss provision to loans ratio (PL)

Loan loss provision to loans ratio (PL) is an indicator of credit risk. Several studies have used loan to assets ratio as variable measuring an ability to expand the loan to profitability. Bank loans are the main source of income and thus are generally expected to have a positive impact on bank's profitability. However, only bank loans cannot be considered as a sole indicator of bank's profitability as credit risks of loans may also influence the profitability. In this study, PL is therefore used as a proxy of credit risk that it should have negatively relationship with the profitability. The data show that PL is relatively high for government-ownership banks, indicating that their loan quality is relatively poor comparing with private-ownership banks.

(iv) Operating cost to assets ratio (COSASS)

Operating cost to assets ratio is computed as the ratio of operating costs to total assets. High operating costs imply an increase of operating inefficiency as well as a decrease of bank profitability. In case that banks have market power, higher costs or inefficient will lead to higher margins (Altunbas *et al.*, 2001). Likewise, Demirguc-Kunt and Huizinga (1999) found that the overhead and the operating costs influence bank interest margin through the transmission of their operating costs to depositors and lenders. However, some investments such as IT investment for services and training and education support services can improve bank efficiency and bank profitability, while some investments such as hardware and software investment may reduce banks' performance (Elena, 2001). In this study, the expected sign is negative because most of Thai banks do not mainly invest in an IT technology.

3.1.2.2 External factors : Macroeconomic and Financial structure

(i) GDP growth (GDP)

According to the relationship between the real sector and lending business, the GDP growth is expected to have a positive impact on bank's performance. However, the relationship between bank margins and growth depends on the correlation between prices, costs and business cycles. Economic growth is negatively related to bank prices and costs, although the extent to which these variables are affected may be significantly different, meaning that the net effect on

margins cannot be clearly determined (Carbó *et al.*, 2003). In this study, the expected sign is positive, reflecting the positive relationship between the demand for loan with low bad debt and the bank profit.

(ii) Inflation (INF)

Generally, high inflation rates are associated with high loan interest rates and high incomes. However, if inflation is not anticipated and banks slowly adjust their interest rates, bank costs will possibly increase above incomes. Hanson and Rocha (1986) studied determinants of interest spreads for 29 countries during 1975-1983 and found that the correlation between inflation and interest margin was positive. Demirguc-Kunt and Huizinga (1999) also found that the inflation is linked with high interest margins and high profitability, implying that bank incomes increase more than bank costs. In this study, the sign of inflation depends on how banks can adjust themselves under the inflation to increase the profitability.

(iii) Total assets of Thai banks to GDP ratio (ASSGDP)

The ratio of total assets of Thai banks to GDP represents the development of the banking sector. ASSGDP measures the importance of bank in the economy. A high ratio most likely indicates high banking services that lead to increase competition among banks and decrease bank profitability. Demirguc-Kunt and Huizinga (1999) found that ASSGDP has a significantly negative effect on margins and profits of countries with a more competitive banking sector.

(iv) Stock market capitalization to GDP ratio (MACGDP)

The ratio of stock market capitalization to GDP is a proxy of stock market development. The coefficient of MACGDP may have a positive relationship with net interest margin and profitability due to the complementary effect between debt finance and equity finance. Since the large stock markets improve information of potential borrowers, banks can analyze and monitor them more accurately. However, it can be negative if the stock market plays the role as the competitor of banking sector such as being an alternative of funding for business sector.

(v) Stock market capitalization to total asset of depository institution ratio (MACPASS)

The ratio of the stock market capitalization to total asset of banks is a proxy of the role of stock market relative to banks. It also reflects the importance of equity finance relative to debt finance. The increasing role of stock market can cause advantages and disadvantages to the bank profitability depending on the relationship between debt finance and equity finance.

In practical, debt and equity finance may complementary. Demirguc-Kunt and Maksimovic (1996) found that the ability to attract equity capital is positively associated to the firms' borrowing capacity (mostly in underdeveloped financial market). Nonetheless, the increasing role of stock market could negatively affect the bank profitability because of the substitutability between debt and equity finance. For example, the firms can issue stocks for funding as capital equity instead of borrow from banks. In this study, it is difficult to expect the influence of MACPASS to ROA, and thus the estimation results depend on stock market has whether complementary or substitution effect to bank profitability.

(vi) Concentration (HHI)

A Herfindhal–Hirschman index, a measure of concentration ratio, is computed from the sum of squares of the market share of banks total assets in national markets. The benefit of HHI gives more weight to larger firms, instead of equal weight. According to the traditional structure-conduct-performance (SCP) hypothesis, concentration and banks margins are positively related, and larger banks tend to get higher margins due to the advantage of higher market power.

The SCP hypothesis is derived from the behavior of firms in oligopoly market, supporting the collusion in concentrated markets. The market power also causes banks to pay lower deposit rates and to charge higher lending rates, especially on retail customers.

However, the concentration may have weak relationships with profitability. Berger (1995) concluded that the relationship between bank concentration and performance in the US depend on what other factors are held constant.

3.2 Methodology

3.2.1 Fixed effect

This study focuses on the determinants of profitability of Thai banks by using balanced panel on quarterly data from 1997-2007. The relationship of bank's characteristic, financial market structure, macroeconomic factors, and profitability is estimated by fixed effect model. The fixed effects model in simple form is defined according to the following regression model:

$$y_{it} = \alpha_i + \beta'X_{it} + \varepsilon_{it} \quad i = 1, \dots, N ; t = 1, \dots, T \quad (1)$$

y_{it} indicates the dependent variables (ROA)

X_{it} determines the vector of k explanatory variables.

α_i $i = 1, \dots, N$ are constant coefficients specific to each bank.

β = vector of individual coefficients comprising of ten variables of bank characteristics, macroeconomic variables.

The equation (1) can be expanded as follow:

$$\begin{aligned} \text{ROA} = & a_i && \text{(constant term of bank } i) \\ & + b_1\text{SIZE} + b_2\text{EA} + b_3\text{PL} + b_4\text{COSASS} && \text{(bank's characteristic)} \\ & + b_5\text{GDP} + b_6\text{INF} && \text{(macroeconomic)} \\ & + b_7\text{MACGDP} + b_8\text{ASSGDP} + b_9\text{MACPASS} + b_{10}\text{HHI} && \text{(financial structure)} \\ & + e_i && \text{(error term)} \end{aligned} \quad (2)$$

Then, we regress equation (2) in four models as follow:

model (1) : ROA = f (bank's characteristic)

model (2) : ROA = f (bank's characteristic, macroeconomic)

model (3) : ROA = f (bank's characteristic, macroeconomic, financial structure (MACPASS))

model (4) : ROA = f (bank's characteristic, macroeconomic, financial structure (ASSGDP and MACGDP))

In order to validate the fixed effects specification, the joint null hypothesis is to test whether the individual coefficients α_i $i = 1, \dots, N$ are not all equal. Since fixed effect model is

used, the redundant fixed effect test which conducts the F-test to determine whether the null hypothesis among the intercept of ten banks are all equal.

$$H_0 : \alpha_1 = \dots = \alpha_n = \alpha \quad (3)$$

The fixed effect intercept means that there is different intercept estimated for each pooled variables ($\alpha_{it} = \alpha_i$). This study uses F-statistics to test whether fixed effect intercept is suitable for the model.

$$F_{(n-1, nT-n-k)} = \frac{R_u^2 - R_r^2 / n - 1}{(1 - R_u^2) / nT - n - k} \quad (4)$$

where n is number of cross-section;

T is number of periods;

k is number of explanatory variables excluding the intercept.

3.2.2 Random effect

To specify the model, this study compares the result from fixed effect to the random effect. In the random effects case, the model is defined as follows:

$$y_{it} = \beta'X_{it} + \varepsilon_{it} \quad i = 1, \dots, N ; t = 1, \dots, T \quad (5)$$

where $\varepsilon_{it} = \mu_i + \nu_{it}$ are the error component disturbances.

μ_i = The individual specific effects that are random and distributed normally ($\mu_i \sim N(0, \sigma_\mu^2)$) and are independent of the residual terms.

ν_{it} = The residual terms that are distributed normally ($\nu_{it} \sim N(0, \sigma_\nu^2)$).

The random effect model (3) is estimated by the feasible generalized least squares method (FGLS), and the result of this model is then compared the estimation result from the fixed effect model (3).

3.2.3 Hausman specification test

Hausman specification test is conducted in order to compare the two categories of specification whether the fixed or random effects model should be used. It is proven that, under the null hypothesis, the two equations [equations (1) and (5)] could not differ systematically since they are both consistent. Thus, the test can be based on the difference. Under the null hypothesis, the Hausman statistic is asymptotically distributed as chi-square with k degrees of freedom and is written down as follows:

$$H = (\hat{\beta}_{GLS} - \hat{\beta}_F)'(\hat{V}(\hat{\beta}_F) - \hat{V}(\hat{\beta}_{GLS}))^{-1}(\hat{\beta}_{GLS} - \hat{\beta}_F) \quad (6)$$

where $\hat{\beta}_F$ and $\hat{\beta}_{GLS}$ are, respectively, the estimates of the fixed effects and random effects model. $\hat{V}(\cdot)$ are the corresponding variance-covariance matrices of these estimated coefficients.

To study the effect of ownership, the sample is separated into private-ownership banks and government-ownership banks and regress with fixed effect and random effect on model (3), then compare the results and specify these models. Generally, the private-ownership banks outperform the government-ownership banks in management and performance since some role of the government-ownership banks may act as the tools of government for supporting the government policy.

IV. DATA

4.1 Firm Selection

This study focuses on Thai commercial banks and is limited only the banks, which their data is completed since 1997-2007 for quarterly balanced panel data. Therefore, the four new banks including Thanachart Bank, Tisco Bank, Keatnakin Bank and ACL Bank are not included in this studied sample. The retail banks that have limitation of the business scope and the foreign bank branches that have their characteristics differ from the Thai commercial banks are also excluded from the sample.

The main reason for excluding the foreign bank branches from the sample is that the foreign bank branches have the main sources of fund from parent banks and that their targets are

mainly to support large firms and firms from their countries. Moreover, it may not represent the exact effects of determinants to the profitability. In addition, the average asset shares of foreign bank branches from 1997-2007 is about 12.7 percent of Thai banking system, which could be omitted from this study. The assets of all banks in Thai banking system is shown in Figure IV and the list of all banks in Thai banking system is shown in Appendix B.

[Figure IV is here]

The banks in this studied sample comprises of ten Thai commercial banks that their asset size is about 74.6 percent of Thai banking system. They are classified into two groups by ownership as follows:

Private-ownership banks

- Bangkok Bank Public Company Ltd. (BBL)
- Kasikornbank Public Company Ltd. (KBANK)
- The Thai Military Bank Public Company Ltd. (TMB)
- Siam Commercial Bank Public Company Ltd. (SCB)
- Standard Chartered Bank (Thai) Public Company Ltd. (SCBT)
- United Overseas Bank (Thai) Public Company Ltd. (UOB)
- Bank of Ayudhya Public Company Ltd. (BAY)

Government-ownership banks

- Krung Thai Bank Public Company Ltd. (KTB)
- The Siam City Bank Public Company Ltd. (SCIB)
- Bank Thai Public Company Ltd. (BT)

4.2 Bank Characteristic Data

Bank characteristic data is collected from the balance sheet and income statement of each bank from the SETSMART and Bank of Thailand. We use the data from bank business rather than consolidated financial statement because of the completeness of data and the reason of focusing on the core business of bank.

Four variables reflecting the characteristics of banks in four factors are size, strength, credit risk and operating management. These factors are proxied by log of asset size (LNSIZE), equity to asset ratio (EA), loan loss provision to loans ratio (PL) and operating cost to assets ratio (COSASS), respectively.

4.3 Macroeconomic Data

The macroeconomic variables used in the models are GDP growth (GDP) and Inflation rate (INF). GDP growth is a proxy of the growth of economy. It is expected that when the economy grows, the business units would expand the business, leading to increasing corporate loans to the firms. Moreover, people would have increasing purchasing power, which is the chance of banks to expand the consumer loan. Overall, the GDP growth leads to the increasing bank profit from the growth of lending. Therefore, the GDP growth should positively relate with the profitability of banks. The GDP data is collected from the office of National Economic and Social Development Board.

The inflation rate is assumed to be equal to the *ex ante* rate of the expected inflation. The inflation rate is calculated from the rate of change of consumer price index (CPI) from the previous year. The effect of the inflation to ROA is unclear due to the ability to management of banks to get the benefit from the inflation. The CPI data is collected from The Ministry of Commerce.

4.4 Financial Structure Data

The stock market capitalization to GDP ratio (MACGDP) and all Thai commercial banks' assets to GDP (ASSGDP) represent the role of stock market and banks in the economy respectively. For the stock market capitalization, we use the market capitalization of SET index collected from SETSMART. However, these two variables have high correlation (-0.796), and thus it should be concerned of the multicollinearity when use both variables in the same equation. Alternatively, the stock market capitalization to Thai commercial banks' assets (MACPASS), which reflects the role of stock market comparing with banks, is used in the model instead of

MACGDP and ASSGDP. If the stock market supports the bank business as complementary, the coefficient of MACPASS should be positive related to ROA. However, it should be negative when the stock market acts as the competitor for lending business of banks. The summary of the variables used in models is in the Table I; definitions, notation and the expected sign of the explanatory variables of model on bank profitability are provided.

[Table I is here]

Table II reports the descriptive statistics including the comparison of the basic statistics of private-ownership banks and government-ownership banks.

[Table II is here]

On average, the size of private-ownership bank group is larger than the government-ownership group. By comparing the asset size of Thai banks in this sample at the end of year 2007, Bangkok bank (BBL) is the largest bank with total assets of 1,573 billion baht. The second largest is Krung Thai bank (KTB) with 1,211 billion baht while Bank Thai is the smallest one with 204 billion baht. By comparing the equity to asset ratio (EA), private-ownership banks have the average EA of 0.069 which is more than 0.053 of the government-ownership banks. It indicates that on average, private-ownership banks have the stronger capital than government-ownership banks. Moreover, the PL ratio of the government-ownership bank of 11.972 is substantially higher than the private-ownership banks of 7.299, reflecting that the credit risk of government-ownership banks is higher than the private-ownership banks.

The operating cost to asset ratio of the private-ownership banks is higher than the government-ownership banks, suggesting that the private-ownership banks may focus on the investment in both technology and employees higher than the government-ownership banks. The descriptive statistics is shown in Table III.

[Table III is here]