

What is the impact of monetary policy on local commercial bank profitability in Thailand from 2002 to 2020?



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An Independent Study Submitted in Partial Fulfillment of the
Requirements
for the Degree of Master of Arts in Business and Managerial Economics
Field of Study of Business and Managerial Economics
FACULTY OF ECONOMICS
Chulalongkorn University
Academic Year 2020
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นโยบายการเงินมีผลกระทบอย่างไร ต่อความสามารถในการทำกำไรของธนาคารพาณิชย์ใน
ประเทศไทย ตั้งแต่ปี 2545 ถึง 2563



สารนิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรมหาบัณฑิต
สาขาวิชาเศรษฐศาสตร์ธุรกิจและการจัดการ สาขาวิชาเศรษฐศาสตร์ธุรกิจและการจัดการ
คณะเศรษฐศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2563
ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

Independent Study Title	What is the impact of monetary policy on local commercial bank profitability in Thailand from 2002 to 2020?
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Field of Study	Business and Managerial Economics
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Accepted by the FACULTY OF ECONOMICS,
Chulalongkorn University in Partial Fulfillment of the
Requirement for the Master of Arts

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เหวินจุน ฟาน : นโยบายการเงินมีผลกระทบอย่างไร ต่อความสามารถในการทำกำไร
ของธนาคารพาณิชย์ในประเทศไทย ตั้งแต่ปี 2545 ถึง 2563. (What is the
impact of monetary policy on local commercial bank
profitability in Thailand from 2002 to 2020?) อ.ที่ปรึกษา
หลัก : ภาณุทัต สัมพะไชย

เอกสารดังกล่าวได้ตรวจสอบความสัมพันธ์ระหว่างนโยบายการเงินและความสามารถ
ในการทำกำไรของธนาคารพาณิชย์ในประเทศไทย การศึกษาใช้fixed effect panel
modelของข้อมูลธนาคารรายไตรมาสตั้งแต่ช่วงไตรมาสที่ 4/2545 ถึงไตรมาสที่
3/2560 ผลการวิจัยเชิงประจักษ์พบว่า การเปลี่ยนแปลงของอัตราดอกเบี้ย 14 วัน
(Repo) ส่งผลดีต่อความสัมพันธ์กับความสามารถในการทำกำไรของธนาคาร (ROA และ
ROE) นั้นยังพบว่าขนาดของธนาคารที่วัดโดยสินทรัพย์รวมมีความสัมพันธ์เชิงบวกกับ
ROE



สาขาวิชา	เศรษฐศาสตร์ธุรกิจและการ จัดการ	ลายมือชื่อ นิติติ
ปีการศึกษา	2563 ลายมือชื่อ อ.ที่ปรึกษา หลัก

6284128129 : MAJOR BUSINESS AND MANAGERIAL ECONOMICS

KEYWORD monetary policy, bank profitability, bank size

RD:

Wenjun Fan : What is the impact of monetary policy on local commercial bank profitability in Thailand from 2002 to 2020?. Advisor: Asst. Prof. PANUTAT SATCHACHAI, Ph.D.

The paper investigated the relationship between monetary policy and commercial bank profitability in Thailand. The study used fixed effect panel model of quarterly bank data from the period of Q4/2002 to Q3/2020. The empirical results showed that changes in 14-day repurchase rate (Repo) had positive impact on the bank profitability (ROA and ROE). I also found that the size of the bank measured by total assets was only positively related to the ROE.



Field of Study:	Business and Managerial Economics	Student's Signature
Academic Year:	2020	...
		Advisor's Signature
		..

ACKNOWLEDGEMENTS

Firs of all, my grateful thanks to the committee of MABE progarm in Chulalongkorn University, who accept me and provide an opportunity to continue my study. It is an honor to be a student and part of Chulalongkorn University.

Secondly, I would like to thank my advisor Asst. Prof. Dr. Panutat Satchachai, who are willing to help and guide me with critical comments, excellent explanations and correction of the individual study during the writing process.

Thirdly, I would like to thank Ms. Wilaiwan Muensanthi and Ms. Nalatporn Chaimongkol, who provide technical help in fancilitating my paper.

Lastly and most of all, I am very grateful for my beloved parents, and wife for their financial and mental supports during my difficult time. They become the drivers that push me forward.

Wenjun Fan

TABLE OF CONTENTS

	Page
ABSTRACT (THAI)	iii
ABSTRACT (ENGLISH).....	iv
ACKNOWLEDGEMENTS.....	v
TABLE OF CONTENTS.....	vi
Chapter 1: Introduction	1
Chapter 2: Literature Review	4
2.1 Bank Profitability.....	4
2.2 Monetary Policy.....	4
2.3 Macroeconomic determinants.....	5
2.3.1 Money Supply	5
2.3.2 Inflation	6
2.3.3 Economic Growth.....	7
2.3.4 Stock Market Development.....	7
2.4 Bank-level Characteristic.....	7
2.4.1 Bank Size.....	8
2.4.2 Ownership	8
2.5 Bank Management	9
2.5.1 Capital Adequacy	9
2.5.2 Liquidity	9
2.5.3 Asset Quality	10
Chapter 3: Conceptual Framework	11
3.1 Multicollinearity	12
Chapter 4: Methodology	13
4.1 Empirical Approach.....	13
4.2 Targeted Banks	14

4.3 Measurements of Variables	15
Chapter 5: Results	16
5.1 Data Descriptive	16
5.2 Data Correlation.....	18
5.3 Regression Results.....	19
5.4 Additional Time-Lagged Effect.....	23
Chapter 6: Conclusion.....	24
6.1 Question 1: What is the impact of monetary policy on local commercial banks profitability from 2002 to 2020?	25
6.2 Question 2: How would bank size affect the profitability?	25
6.3 Question 3: Whether would foreign-owned bank respond positively to the change in policy rate than the local?	25
6.4 Research Recommendation	25
6.5 Limitations	26
REFERENCES	27
VITA.....	29

Chapter 1: Introduction

During the financial crisis in past years, the goals of monetary policy on banking sector were to maintain economic stability and development. The effects of monetary policy on the banking sector are to influence the short-term interest rate and long-term rate to achieve soundness of financial market. In the financing sector, banks and other financial institutions as intermediaries might alter their activities such as operation strategies and interest rate to avoid potential interest loss led by official rate alteration.

It is obvious that the banking sector plays important role in the transmission mechanism of monetary policy. Commercial banks alter interest rates and operation activities according to changes in policy rate and macro-environment. The changes of monetary policy led to fluctuation of commercial banks' profitability and hence the profitability can be considered as a gauge of monetary policy effect. In recent years, the relationships between the profitability and monetary policy mechanism have been paid more attention in some developed countries and emerging markets. Sufian and Habibullah (2009a) analyze profitability of nation-owned¹, joint-stock², and city-level³ banks with specific Chinese monetary policies. They find that national and local city level commercial banks would response to the changes of macroeconomic environment whereas the joint-stock banks are comparatively independent. The major factors that encourage the profitability of joint-stock banks are less non-interest expense and more loan loss provisions. Scheiber, Silgoner, and Stern (2016) study cases of banks in Sweden and Denmark in a context of low interest rate. They argue that the current ultra-low and negative central bank interest rates might not cause slump of bank profitability for the investigated banks. They also point out that interest income comes from loan-deposit spreads. Altavilla, Boucinha, and Peydró (2018) expand the target scope into euro area to explain the relationship. They find that

¹ Nation-owned banks are the Chinese commercial banks directly controlled by the Ministry of Finance.

² Joint-stock banks are also called Chinese joint-equity commercial banks which top shareholder could be state or private.

³ City-level banks are also called Chinese urban commercial banks developed from local urban credit cooperatives.

monetary policy easing has no significant effect on the profitability. The ultra-low official rate might exert a substantial adverse effect as it is kept for long period.

Since the Asian financial crisis, many researchers have begun to study on effectiveness of monetary policy in the context of Thailand. For instance, Disyatat and Vongsinsirikul (2003) attempt to gauge pass-through speed and effectiveness of interest-rate, bank lending and asset price channels as well as output and price level to 14-day repurchase rate before and after inflation-targeting regime deployed. Later, Charoenseang and Manakit (2007) test pass-through effect of the interest-rate and credit channels to the economy during the period of June 2000 to July 2006. On the other hand, many academics focus on the role of banks and their performances from the transmission. Ximenes and Li (2018) compare Thai commercial banks in terms of profitability with micro and macro level conditions before and after the global prime crisis in 2008 and 2009. They find that operational efficiency measured by total operating expense to total operating income is negatively related to ability of utilizing assets and equity as well as generating net interest. Macroeconomic condition such as GDP growth rate, inflation rate, and real interest rate would not affect the profitability. Ratanavararak and Ananchotikul (2018) study the effects of low monetary policy on Thai bank profitability and risk during the period between 2004-2017. They find that lower official short-term rate tends to reduce the profitability as measured by ROA and ROE. However, low official rate would not increase banking sector risks.

Recently, there are many widely cited papers analyzed the link between profitability of banks and monetary policy, for example, Borio, Gambacorta, and Hofmann (2017), Sufian and Habibullah (2009a), Ratanavararak and Ananchotikul (2018). There are two components of explanatory variables estimating the profitability. The first component is bank-level or internal data including measurements related to bank management and bank characteristics. For example, Borio, Gambacorta, and Hofmann (2017) and Ratanavararak and Ananchotikul (2018) both use liquidity ratio to measure ability of bank assets converting to cash for bank management. However, Borio, Gambacorta, and Hofmann (2017) use a ratio of total costs over sum of net interest and non-interest income, whereas Ratanavararak and

Ananchotikul (2018) take ratios of loan-to-assets and non-performing loans to measure quality of loans in bank management. As for measurement of bank characteristics, both use natural logarithm of total assets as the measure of size of bank.

External or macroeconomic variables are the other important aspect of measuring the profitability of banks. For instance, Borio, Gambacorta, and Hofmann (2017) and Ratanavararak and Ananchotikul (2018) use GDP growth rate to measure economic development while Sufian and Habibullah (2009a) use natural logarithms of GDP. Inflation is also taken into consideration that may influence the profitability. Sufian and Habibullah (2009a) use annual inflation rate, but Ratanavararak and Ananchotikul (2018) use consumer price index (CPI) growth rate.

In this paper, there are three questions that I would like to analyze. The first objective is to determine whether changes in official rate would affect ability to generate profits for local commercial banks in Thailand from 2002 to 2020. Secondly, to investigate whether the bank size would cause changes on their profitability. Finally, I would like to know how major stockholder identity (foreign or Thai) would respond to change in policy rate and how it influences the banks' profitability.

This paper might be important for following reasons: First, studying about the impacts of monetary policies on banks' profit enhances understanding the conventional interest rate channel in Thailand. Second, it would provide evidence of individual bank characteristics on ability to generate profit with changes in monetary policy.

The reminder of this paper is structured as follows: Section 1 provides background of existed literature on bank profitability and monetary policy as well as other control variables. Section 2 describes conceptual framework. Section 3 presents empirical method and variables used in this paper. Section 4 provides source of data, data descriptive, correlation and results of the regression. Section 5 shows the conclusions, suggestions and limitations.

Chapter 2: Literature Review

First, bank profitability and monetary policy in terms of measurements and historical perspective are described. Second, key macroeconomic, bank characteristics and bank management variables will be discussed as well as their effect on bank profitability.

2.1 Bank Profitability

Profits of banks mainly come from two components: provided services and assets. Return on assets (ROA) and return on equity (ROE) are usually considered as proxy in measuring overall performance. Differences between the ROA and ROE are that ROE reflects the ability of banks using leverage, whereas the ROA emphasizes efficiency of utilizing assets. Some researchers use the measurement of ROA only in identifying determinants of overall bank profitability such as Hassan and Bashir (2003) and Borio, Gambacorta, and Hofmann (2017). According to Hassan and Bashir (2003), heavy reliance on leverage is the apparent attribute for most of banks and ROA represents a better measure of ability utilizing assets. However, there are a number of papers use both measures to describe the profitability of banks (Sufian, 2010; Alper & Anbar, 2011; Ratanavararak & Ananchotikul, 2018; De Leon, 2020).

2.2 Monetary Policy

Short-term monetary policy in Thailand is announced interest rate. It is proxied by 14-day repurchase rate. Long-term interest rate is measured by ten-year government bond or yield curve. However, difference between two-year and ten-year government bonds can be approximated as an expectation on future interest rate (Ratanavararak & Ananchotikul, 2018). The effect of official interest rate on bank profits is the difference between interest income of long-term loans and interest expense of short-term savings.

In general, banks would benefit from increasing in the interest rate (Hancock, 1985). Some authors also find that interest rate positively affect bank profitability. For instance, Borio, Gambacorta, and Hofmann (2017) argue that both higher short-term and long-term interest rate increase interest margin by investigating 109 large international banks located in 14 developed countries during the period of 1995-2012. But in recent years, many researches show different relationships. Kohlscheen, Murica, and Contreras (2018) find that for 534 banks of 19 emerging economies from 2000 to 2014, the higher short-term rather than long-term interest rate leads to a reduction of bank profits because of increasing cost of funding. For Thailand, Ximenes and Li (2018) find that local large commercial banks' net interest income is negatively related to interest rate during 2004 to 2008 and 2010-2014. They also find the real interest rate of Thailand is not related to the ROA and ROE. However, Ratanavararak and Ananchotikul (2018) point out that lower interest rate would damage the net interest income for Thai banks from 2004-2017.

2.3 Macroeconomic determinants

There are numerous macroeconomic factors influencing the bank profitability. Money supply, inflation, GDP growth, and stock market development are such factors. Money supply expresses current liquidity in economy leading to more lending opportunities but might lead to more adverse selection problem. Inflation includes price changes in cost and product for banks. GDP growth describes economic and business cycle. And finally, degree of development in stock market affects cost of funding and hence profitability.

2.3.1 Money Supply

IS-LM model explains classical channel that central bank injects money in circulation to decrease real cost of funding, and hence encourage consumption and investment through banks and financial market. It implicitly implies positive influences on bank lending business. However, Disyatat and Vongsinsirikul (2003) argue that it also contains an effect of more available loans from banks to borrowers

in the interest rate channel. They express that the situation might cause possibly adverse selection and moral hazard problems which potentially decrease profitability of banks. Therefore, overall effect of the money supply on bank profitability is not clear.

Literatures generally use money supply as a macroeconomic condition for analyzing profitability of banks. Molyneux and Thornton (1992) compare profitability of European banks in 18 regions under a yearly growth in money stock. Mamatzakis and Remoundos (2003) use the total money supply to describe size of economy.

Supriyono and Herdhayinta (2019) indicate that higher quantity of money supply significantly and negatively affects credit of banks and their profitability in Indonesia. But Sufian and Habibullah (2009a) express that joint-stock commercial banks are not affected by the money supply statistically in China, comparing to stated-owned and city-level banks which are consistent with in Indonesia during the period of 2000 to 2005.

2.3.2 Inflation

An increasing price level in economy pulls up lending rate which offers greater opportunity to gain higher interest income, while it also drives up the cost of funding and can reduce bank's profits. Sufian and Habibullah (2009a) find that profitability of main three types commercial banks (state-controlled, joint-equity and local city banks) are not correlated with inflation in China during the year of 2000 to 2005. Ratanavararak and Ananchotikul (2018) and Ximenes and Li (2018) also find that there is no significant relationship between the profitability of Thai banks and inflation. However, Guru, Staunton, and Balashanmugam (2002) argue that inflation is positively related to return on average assets of Malaysian banks, but significantly negative to foreign banks in Malaysia.

2.3.3 Economic Growth

Gross domestic product is often used to describe level of economic activities. Economic development generally encourage real sector to raise funds for expanding business. However, it is unclear whether it would positively affect banks' profitability. Sufian and Habibullah (2009a) concludes that the economic development and growth is only related to joint-equity commercial banks in China but not correlated for other types such as nation-owned and city banks. In Thailand, Ratanavararak and Ananchotikul (2018) express that it is correlated to return on equity (ROE) rather than ROA of banks. Ximenes and Li (2018) conclude that the profitability is not related to GDP growth for Thai commercial banks in 2004 to 2008 and 2010 to 2014. But according to De Leon (2020), the GDP growth rate negatively affects the profitability of banks in Malaysia, Indonesia and Thailand from 2012-2017.

2.3.4 Stock Market Development

Total capitalization of stock market to GDP is a common proxy for level of financial market development. The stock market is considered as a substitution to savings. Generally speaking, well-established stock market provides lower cost of funding. Therefore, it is rationally expected that the ratio of stock market capitalization to GDP would be beneficial for the profitability of banks. In Tunisia, the banks' ROA is heavily affected by the development of stock market (Naceur, 2003). In European region, stock market plays important role of influencing net interest margin positively (Albertazzi & Gambacorta, 2009; Albertazzi & Gambacorta, 2010).

2.4 Bank-level Characteristic

There are two bank characteristics in this paper. I am going to use bank size and ownership of bank. In general, banks with larger assets are expected to perform better due to its favorable risk resistance. For ownership, attitude of largest stockholder in a bank might cause changes in direction and goals of operation as

macroeconomic changes. Besides, decisions of the foreign and local stockholders may differ.

2.4.1 Bank Size

Financial literature describe size of banks by total assets. It is commonly in a form of natural logarithm of total assets. According to Smirlock (1985), larger size of banks are expected to generate more profits. But many research find that the profitability may not associate with bank size. Ratanavararak & Ananchotikul (2018) and Ximenes and Li (2018) point out that in the context of Thailand, there is no relationship between bank size and profitability. Tran and Hong Vo (2018) also find similar results between intellectual capital and bank profitability. Borio, Gambacorta, and Hofmann (2017) argue that the profitability measuring in form of ROA and provisions are not related to total assets of selected international banks. Sufian and Habibullah (2009a) find that return on assets of stated-owned commercial banks and joint-stock commercial banks are not correlated to their assets. This independence is also found in Bangladesh (Sufian & Habibullah, 2009b). Another interesting negative result on interest margin is found in Tunisian banks due to scale inefficiencies (Naceur, 2003).

2.4.2 Ownership

State-owned banks may have different operation strategies comparing with private-owned, foreign-owned and local banks. Behaviours and competition abilities between different types of ownership might explain the profitability in banking sector. Joint-stock banks in China response differently comparing with national and city banks to macroeconomic changes (Sufian & Habibullah, 2009a). Foreign banks benefit from tighten short-term money policy, whereas public banks' profitability is positively (negatively) affected by decreasing (increasing) policy rate in India (Bhaumik, Dang, & Kutan, 2011).

2.5 Bank Management

There are three aspects in describing management of banks which are capital adequacy, liquidity, and assets quality. Capital adequacy measures efficiency of raised capital. Liquidity describes ability of paying off debts. Components of assets quality are loans to assets ratio and non-performing loans to assets ratio which represent ability of utilizing loans.

2.5.1 Capital Adequacy

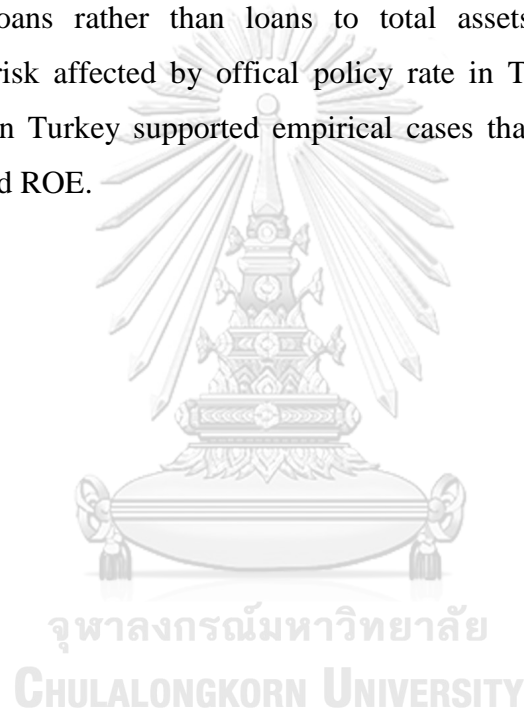
A ratio of internal capital to assets can be interpreted as demand for external funds. The less demand for the external side or higher ratio, the better operation and profitability of banks. Therefore, the capital adequacy ratio implies a positive relationship on its profitability in terms of lower possibility of collapse (Berger, 1995; Hassan & Bashir, 2003). Borio, Gambacorta, and Hofmann (2017), Ratanavararak and Ananchotikul (2018), Sufian and Habibullah (2009a), and Naceur (2003) found empirical evidences supporting hypothesis of capital adequacy to profitability in some economies. Alper and Anbar (2011) express that there is no relationship between internal capital and the profitability in Turkey from 2002 to 2010.

2.5.2 Liquidity

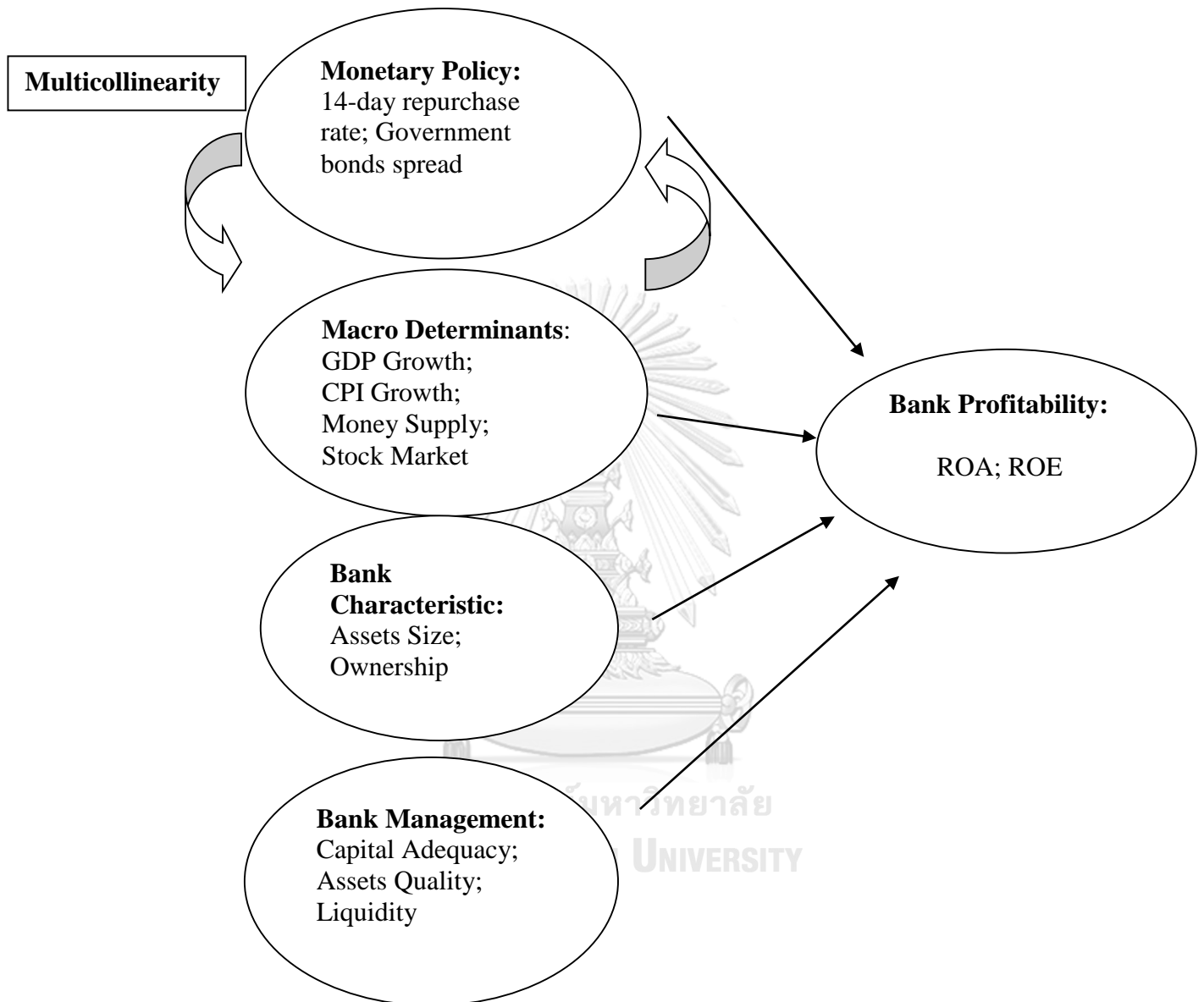
Liquidity ratio measures ability of banks that hold convertible assets. It is a common variable to analyze causes of bankruptcy but they also explain opportunity cost of investing in other assets. Bourke (1989) points out that banks with higher liquidity might lead to better profitability due to more amount of loanable source. In contrast, Molyneux and Thornton (1992) conclude a negative relationship between the ratio and level of profitability. Ratanavararak and Ananchotikul (2018) and Ximenes and Li (2018) both find that the liquidity is associated with only net interest income of Thai banks.

2.5.3 Asset Quality

Two components constitute measurements of assets: total loans to total assets and non-performing loans to total loans. Former explains a main source of income and it is expected to affect profitability positively. Ratio of non-performing loans is an important measure of loans quality and hence asset quality. A higher ratio reflects that default risk becomes more serious even under large loans issued. Tran and Hong Vo (2018) suggest that loans to assets ratio is not related to profitability of Thai banks during a period of 1997 to 2016. Ratanavararak and Ananchotikul (2018) find that non-performing loans rather than loans to total assets play an important role of measuring loans risk affected by official policy rate in Thailand. Alper and Anbar (2011) also find in Turkey supported empirical cases that the ratios are significantly related to ROA and ROE.



Chapter 3: Conceptual Framework



The conceptual framework basically shows how internal and external factors would affect the relationship between monetary policy and bank performance. Monetary policy is measured as short-term (14-day repurchase rate) and long-term (government bonds spread between two-year and ten-year).

Bank profitability is measured as ROA and ROE with respect to entire effect. For macroeconomic variables, I use GDP growth, CPI growth, money supply, and magnitude of stock market development at time t . GDP growth represents changes of economy to previous period in nominal term, accounted for economic growth and business cycle. CPI growth represents changes in domestic consumption price index, accounted for inflation. Money supply represents the quantities of broad money M2 supplied in economy. The stock market development is total stock market capitalization to quarterly nominal GDP, accounted for alternative channel of source of funding for banks.

Bank-level variables include bank specific characteristics and management variables. Characteristics of banks denote ownership (dummy variable, foreign=1 or local=0), size of banks (natural logarithm of total assets). Management indicators include ratios of equity, liquidity, total loans and non-performing loans at current period t .

3.1 Multicollinearity

Macroeconomic changes and short-term official policy mutually affect each other. The multicollinearity can be explained that expansionary policy rate would lead to encourage consumption and investment which might increase demand for loans and hence banks' profitability improves. Booming economy would lead to an upward pressure for official rate which may decrease money supply, slow down economic growth, inflation and bank lending business. Therefore, a problem of multicollinearity between monetary policy and macroeconomic variables would exist causing relative bias and unaccuracy for measuring effect of the official rate to bank profitability.

Chapter 4: Methodology

4.1 Empirical Approach

Methods provided in the literature about profitability of banks majorly use panel data model. The original panel model framework below follows to Alper and Anbar (2011):

$$Y_{i,t} = \alpha_i + \beta * \text{Bank-Specific Vector} + \Omega * \text{Macro-Specific Vector} + \varepsilon_{i,t}$$

where Y_{it} refers to profitability for an individual bank i at specific time t , contains ROA and ROE; Bank-specific vector contains $\log A$, LQD , LA , LFA , DP , and CA . $\log A_{i,t}$ is the bank size measured by natural logarithm of total assets; $LQD_{i,t}$ denotes the liquidity assets to total assets; $LA_{i,t}$ denotes loans to total assets; $LFA_{i,t}$ represents net loans to total loans; $DP_{i,t}$ represents the deposits to total assets; $CA_{i,t}$ represents the ratio of shareholder's equity to total assets; Macro-specific vector constitutes GDP , INF , and RI . $GDP_{i,t}$ represents the annual real GDP growth rate; $INF_{i,t}$ represents the annual Consumer Price Index (CPI) for all goods and services; $RI_{i,t}$ represents the real interest rate; $\varepsilon_{i,t}$ is a normally distributed disturbance term. All variables are measured at current period, t .

In this paper, I propose to expand the variables of macroeconomic, bank management and some characteristics. It is because the empirical evidences support that money supply, stock market capitalization would affect the profitability of banks at the macroeconomic-level. For bank-level factors, literatures suggest that dominating power of stockholder may play role of influencing the profitability. Therefore, the model is as followed:

$$Y_{i,t} = \delta_i + \alpha_1 * \text{Repo}_t + \alpha_2 * \text{Spread}_t + \beta_1 * \text{LnTA}_{i,t} + \beta_2 * \text{EQTA}_{i,t} + \beta_3 * \text{NPL}_{i,t} + \beta_4 * \text{LOAN}_{i,t} + \beta_5 * \text{LQD}_{i,t} + \beta_6 * \text{OWN}_{i,t} + \lambda_1 * \text{GDP}_t + \lambda_2 * \text{INF}_t + \lambda_3 * \text{MS}_t + \lambda_4 * \text{MCAP}_t + \varepsilon_{i,t}$$

where the left side, $Y_{i,t}$, is ROA and ROE separately, representing overall profitability of the Thai banks. Repo represents a difference between short-term policy rate at previous period, $t-1$, and current period at t ; Spread represents a difference between two-year and ten-year government bonds; Bank-level variables contain existed natural logarithm of total assets (LnTA), equity ratio (EQTA), non-performing loans ratio (NPL), loans to assets ratio (LOAN), and additional characteristic variable, ownership (OWN). All are at current period t . Macroeconomic variables are GDP growth rate (GDP), CPI growth rate (INF), money supply of M2 (MS), and stock market cap to GDP (MCAP) at current period, t .

There are two interesting issues associated with questions in the paper. First, is there any relationship between bank size and bank profitability. Second, by adding variable ($OWN_{i,t}Repo_t$), I would like to know whether ownership of banks cause different profitability with changes in monetary policy.

Alper and Anbar (2011) uses the method of static panel model with fixed effect. Static panel models normally will be estimated by either fixed effects or random effects. Random effects model is that individual-specific effect is independent which is not correlated to other explanation variables. However, the panel model with fixed effects has individual-specific effect for selected samples. Hence, the fixed effect should be rational in this paper.

4.2 Targeted Banks

I use quarterly data from the website of www.sec.or.th, the Bank of Thailand (BOT), the Stock Exchange of Thailand (SET), and the National Statistical Office of Thailand for the years 2002 through 2020 to investigate banks in the following list:

Bangkok Bank
Krung Thai Bank

Kasikorn Bank
Siam Commercial Bank
Bank of Ayudhya
TMB Bank
Kiatnakin Phatra Bank

4.3 Measurements of Variables

Here are the variables I used and their measurements:

	Variable	Measure	Notation	Sign(ROA)	Sign(ROE)
Dependent Variables	Overall Profitability	Return on Assets=Net Income /Total Assets	ROA _t		
		Return on Equity=Net Income/ Total Equity	ROE _t		
Policy Variables	Monetary Policy	Changes in 14-Day repurchase rate	Repo _t	+	+/-
		Difference between two-year and ten-year government bonds	Spread _t	+/-	+/-
Bank-Specific Characteristic Variables	Assets Size	Natural Logarithm of Total Assets	LnTA _t	-	+
	Ownership	Largest stockholder is foreign=1; Thai=0	OWN _t	+/-	+/-
Bank-Specific Management Variables	Capital Adequacy	Total Equity/Total Assets	EQTA _t	+	+/-
	Assets Quality	Non-Performing Loans/Total Loans	NPL _t	+/-	+/-
		Total Loans/Total Assets	LOAN _t	+/-	+/-
Liquidity	Current Assets/Current Liability	LQD _t	-	-	

Macro-level Independent Variables	Economic Growth	GDP Growth rate period/period at seasonal adjusted	GDP_t	+/-	+/-
	Inflation	CPI Growth rate period-on-period	INF_t	+	+/-
	Money Supply	M2 Money Supply in log form	MS_t	+/-	+/-
	Stock Market Development	Market. Cap/quarter nominal GDP	$MCAP_t$	+	+/-

Chapter 5: Results

In this section, data descriptive, data correlation, and regression results are given separately. All results are generated by the software gretl.

5.1 Data Descriptive

The below table is statistics summary of all numeric variables from the Q4/2002 to Q3/2020. The Repo, Spread, INF, MS and GDP are calculated based on the source from the Bank of Thailand. Reminders related to bank financial ratios from the www.sec.or.th. Historical information of shareholding structure is collected from annual report on each bank's website and the www.sec.or.th to measure the ownership.

Table 1

Summary Statistics, using the observations 1:01 - 7:72

Variable	Mean	Median	S.D.	Min	Max
ROA	0.00231	0.00264	0.00533	-0.0421	0.0192
ROE	0.0194	0.0259	0.0804	-0.715	0.177
LOAN	0.663	0.666	0.0711	0.363	1.47
EQTA	0.107	0.105	0.0398	0.0361	0.309
Repo	-0.0208	0	0.348	-1.25	0.75
Spread	1.03	0.879	0.705	-0.007	3.14
INF	0.164	0.139	0.369	-1.36	1.62
MS	30.1	30.2	0.18	29.9	30.4
GDP	0.814	0.925	2.22	-9.44	9.38
MCAP	3.13	3.03	0.855	1.3	4.43
NPL	0.0737	0.0487	0.055	0.0208	0.303
LQD	1.24	1.2	0.171	1.01	2.31
LnTA	13.8	14	0.994	10.5	15.2
OWN	0.167	0	0.373	0	1
RepoOWN	-0.0099	0	0.13	-1.25	0.75

Each variable observation is 72 for each bank. The dependent variable ROA or return on assets has a mean of 0.00231 or 0.231%, standard deviation or S.D. of 0.00533 or 0.533%. This represents the average ROA for the 7 local commercial banks is 0.231%, variation among them is 0.533%. The ROA of the banks imply that they have slightly different ability of utilizing assets during the period. Another dependent variable ROE shows a mean of 0.0194 or 1.94%, S.D. of 0.0804 or 8.04%. On the average, the banks have 1.94% return on shareholders' equity. But with 8.04% variation it is notable that capital leverage ability varies a lot for the banks. There is a bank with a maximum 17.7% and one with minimum -71.5% ROE during the time.

Independent variable Repo (changes in official rate) shows that the Bank of Thailand decreases the 14-day repurchase rate by 0.0208% quarterly on the average from Q4/2002 to Q3/2020. In most the time, the authority keeps the rate unchanged (median = 0). But they had decided to decrease the official rate at 1.25% (Min = -

1.25), whereas just increase 0.75% (Max = 0.75) under upward economic pressure. The overall variation is 0.348%.

Independent variable Spread (difference in two and ten-year government bonds) shows an average rate at 1.03% (Mean = 1.03). Its deviation is 0.705% over the period. It is worthy to see that there occurs a situation which the two-year bond interest rate is close to the ten-year (Min = -0.007%). However, the median reports that the difference between them is 0.879% mostly.

Identity of top shareholder or dummy OWN shows that 16.7% of them are foreign institutions on the average. For most of the banks, domestic investors are the major ones in the shareholding structure.

5.2 Data Correlation

The below table is the correlation matrix among dependent and explanatory variables including the bank management, bank characteristic, macroeconomic and official monetary rate variables. There are 504 observations for 7 commercial banks in the period of Q4/2002 to Q3/2020. The correlation matrix is produced by the software gretl in two-tailed test with 5% critical value.

According to Kennedy (2008), correlation that exceeds a value of 0.7 would cause a problem of multicollinearity. From the table, it is notable that the most correlated variables are MCAP and MS at 0.8676, representing stock market capitalization to quarter nominal GDP and broad M2 money supply in natural logarithm form are positively correlated with each other. It is also notable that the MS is highly correlated with NPL with a value at -0.762. Therefore MS should be dropped out from the data set.

In this paper, variables such as repurchase rate, long-term government bond rate, economic growth, inflation rate and stock market capitalization to GDP may

have the problem of it theoretically. However, results of the table show that there is no such issue in data which deny the multicollinearity hypothesis.

Table 2

ROA	ROE	NIM	NII	PROV	LOAN	EQTA	Repo	Spread	INF	MS	GDP	MCAP	NPL	LQD	LnTA	OWN	RepoOWN	
1	0.9032	0.5898	-0.0042	-0.1345	-0.0877	0.3588	0.1113	0.0313	-0.0139	0.0901	-0.0202	0.0768	-0.0956	0.2373	-0.1735	-0.0015	0.0826	ROA
	1	0.4895	0.0403	-0.1594	0.0006	0.0768	0.1215	-0.0071	-0.02	0.1639	-0.0313	0.1251	-0.1285	0.0868	0.0095	0.0008	0.0184	ROE
		1	0.0071	-0.1475	-0.1212	0.3245	0.0527	-0.0665	-0.0261	0.0996	-0.0446	0.0764	-0.1219	0.2571	-0.1706	-0.1282	0.1254	NIM
			1	-0.1672	-0.2484	0.0211	-0.013	-0.1165	-0.127	0.4216	-0.0535	0.3635	-0.2881	0.1481	0.3642	-0.0786	0.0271	NII
				1	-0.2875	-0.0402	0.0641	0.4468	0.0984	-0.5049	0.0914	-0.433	0.8113	-0.2715	-0.2305	-0.1342	0.052	PROV
					1	-0.1909	0.0248	-0.0535	-0.0124	0.0397	-0.016	0.0427	-0.1891	0.0839	-0.0334	0.3819	-0.0729	LOAN
						1	0.0035	-0.0583	-0.0409	0.1667	-0.0239	0.1588	-0.1565	0.6295	-0.5225	0.1529	0.0801	EQTA
							1	-0.1072	0.202	-0.098	0.2211	0.0503	0.0571	-0.0009	-0.0589	-0.0497	0.3697	Repo
								1	-0.0259	-0.4585	0.0526	-0.379	0.459	-0.2118	-0.2201	-0.112	-0.0239	Spread
									1	-0.2575	0.2125	-0.1155	0.1648	-0.0509	-0.1165	-0.048	0.0789	INF
										1	-0.1696	0.8676	-0.762	0.3065	0.4504	0.1923	-0.061	MS
											1	-0.092	0.1264	-0.032	-0.0796	-0.0498	0.1163	GDP
												1	-0.6887	0.251	0.3882	0.1749	-0.0069	MCAP
													1	-0.3297	-0.4151	-0.1598	0.0451	NPL
														1	-0.385	0.1518	0.0454	LQD
															1	-0.0955	-0.0634	LnTA
																1	-0.1713	OWN
																	1	RepoOWN

5.3 Regression Results

I use static panel model with fixed effects for the selected seven local commercial banks through Q4/2002 to Q3/2020. Following table is the result of monetary policy effect on bank profitability. The main independent variable is Repo, accounted for changes in official 14-day repurchase rate. Bank profitability in total is measured by net income to total assets and to total equity (ROA and ROE). Meanwhile, the table also shows the outcomes for other effects: the bank size effect (measured by natural logarithm of total assets) and effect of official policy rate on majority shareholder (RepoOWN).

Table 3

Fixed effects, 504 observations
 Included 7 cross-sectional units
 Time-series length = 72

	ROA		ROE	
const	-0.00592545		-0.410790	
	(0.014131)		(0.224679)	
Repo	0.002079	***	0.041746	***
	(0.000712)		(0.011317)	
Spread	0.000817	**	0.012392	**
	(0.000362)		(0.005763)	
INF	0.000015		0.002438	
	(0.000629)		(0.009996)	
GDP	-8.80772e-05		-0.00143159	
	(0.000101)		(0.001608)	
MCAP	-0.000198428		-0.00460969	
	(0.000485)		(0.007715)	
NPL	-0.0101445		-0.132566	
	(0.006933)		(0.110226)	
LQD	-0.000865787		-0.0492325	
	(0.002046)		(0.032536)	
LOAN	-0.00218859		-0.0219192	
	(0.004079)		(0.064846)	
EQTA	0.044924	***	-0.0114445	
	(0.010671)		(0.169655)	
LnTA	0.000487		0.037730	**
	(0.001004)		(0.015962)	
OWN	-0.00105214		-0.0147225	
	(0.000933)		(0.014831)	
RepoOWN	0.000420		-0.0152187	
	(0.001827)		(0.029050)	
R square	0.217091		0.128284	
P-value(F)	0.000000		0.000000	
Durbin-Watson	2.065571		1.976359	

It is notable that Repo or changes in 14-day repurchase rate would affect the return on equity (ROE) and return on assets (ROA) positively. The magnitude of the

effect for ROA is $0.002079 + 0.00042*OWN$. The magnitude of the effect for ROE is $0.041746 - 0.0152187*OWN$. It implies that the quarterly 14-day repurchase rate decreases (increases) by 1%, ROA of the commercial banks would decrease (increase) by 0.2079% + 0.042%*OWN on the average, whereas the ROE would decrease (increase) by 4.1746% - 1.52187%*OWN. Dummy variable OWN in this paper is either 1 for foreign or 0 for Thai. Therefore, the total effects of the short-term monetary policy for ROA and ROE would be 0.2079% and 4.1746% separately, as the largest shareholder has local identity. But another possible outcome of the effect would be 0.2499% for ROA and 2.65273% for ROE for the foreign. It implies that the Thai rather foreign largest shareholder would cause a better impact on banks' ROA and ROE. The co-movement pattern between the official rate and profitability is consistent with Ratanavararak and Ananchotikul (2018) and Borio, Gambacorta, and Hofmann (2017).

Spread or changes in interest rate between two-year and ten-year bonds are positively related to ROA and ROE for the selected local commercial banks. The coefficients are 0.000817 or 0.0817% for ROA and 0.012392 or 1.2392% for ROE. It implies that the difference between the bonds increases by 1%, the ROA and ROE would also increase by 0.0817% and 1.2392% separately. Ratanavararak and Ananchotikul (2018) argue that only the ROE is positively related to the long-term rate differences. Borio, Gambacorta, and Hofmann (2017) point out the long-term rate is significantly and positively related to the ROA. However, Kohlscheen, Murica, and Contreras (2018) supports the relationship for ROE by using ten-year yield.

LnTA significantly encourages the profitability in terms of ROE only. The coefficient of the bank size for ROE is 0.037730, representing that when the size expands by 1% the ROE would increase by 3.773% on the average. This is opposite from innocent relationship between the size and profitability in the context of Thailand (Ratanavararak & Ananchotikul, 2018; Ximenes & Li, 2018).

OWN is not significantly related to either ROA or ROE. Top Shareholder does not affect overall profitability of banks.

RepoOWN is not correlated to the overall profitability with respect to ROA and ROE. It implies that each largest shareholder in selected banks would not affect profitability of the banks as the monetary policy changes in Thailand.

LOAN is not correlated to ROA and ROE separately. This result is consistent with Tran and Hong Vo (2018). However, some research finds opposite relationship, such as both positive to ROA and ROE (Ratanavararak & Ananchotikul, 2018) and both negative relationship (Hassan & Bashir, 2003).

EQTA is positively related to the ROA while negatively related to the ROE. This result is consistent with Ximenes and Li (2018). Many research find that the equity of banks is only positively related to ROA (Borio, Gambacorta, & Hofmann, 2017; Sufian & Habibullah, 2009a).

INF is not statistically correlated to either ROE or ROA. This is same as Ratanavararak and Ananchotikul (2018) and Ximenes and Li (2018) who conclude that there is no relationship between inflation and bank profitability in Thailand. Some other researchers also find same results such as Kohlscheen, Murica, and Contreras (2018), Alper and Anbar (2011), and Sufian and Habibullah (2009a).

GDP growth is not related to both ROA and ROE from the table. Ximenes and Li (2018) also find consistent results to Thai commercial banks in similar period. But Ratanavararak and Ananchotikul (2018) express that economic growth significantly affects ROE in Thailand. Unlike the former, De Leon (2020) finds the economic development would damage the profitability in Thailand and other countries such as Malaysia and Indonesia.

MCAP is not related to ROE and ROA. Some literatures support that they are not clearly relationship (Albertazzi & Gambacorta, 2009; Albertazzi & Gambacorta, 2010).

NPL is not statistically related to the overall profitability of the commercial banks in Thailand. In contrast, Ratanavararak and Ananchotikul (2018) find that it would be important for measuring loans risk under effect of official policy rate in the economy. Altavilla, Boucinha, and Peydró (2018) argue that this would damage the ROA instead of ROE.

LQD is measured by current assets to current liability which is not related to ROA and ROE. Ratanavararak & Ananchotikul (2018) also provide same results of the liquidity. But Bhaumik, Dang, and Kutan (2011) point that it is related to all banks they investigated.

5.4 Additional Time-Lagged Effect

There are many authors believe that the current performance of bank profitability would reflect internal decisions about operation management and goals made at previous period (Borio, Gambacorta, & Hofmann, 2017; Ratanavararak & Ananchotikul, 2018). Therefore, a time-lagged effect may becomes another potential factor influencing the model results. A summarized result table with added time-lagged effect is followed:

Table 4

	ROA		ROE	
const	-0.0149171		-0.514509	**
	(0.015369)		(0.243439)	
Repo	0.002137	***	0.038952	***
	(0.000682)		(0.010798)	
Spread	0.000762	**	0.011564	**
	(0.000367)		(0.005818)	
LnTA_1	0.001055		0.042175	**
	(0.001092)		(0.017297)	
OWN_1	-0.00121857		-0.0136560	
	(0.000954)		(0.015117)	
RepoOWN_1	0.000436		-0.00294438	
	(0.001787)		(0.028307)	
R-squared	0.210454		0.123587	
P-value(F)	0.000000		0.000000	
Durbin-Watson	2.073400		1.984669	

From the results with time-lagged effect, it is worthy to note that the overall effects of Repo, LnTA and RepoOWN are consistent with no time-lagged. However, the coefficients of ROA and ROE are slightly different. Coefficient of ROA with the additional effect is 0.002137 or 0.2137% which is higher than the treatment at 0.002079. But ROE shows opposite results compared with ROA. Time lagged effects of ROE provides the coefficient of 0.038952 or 3.8952% which is less based on the model without the effect, 0.041746 or 4.1746%.

Chapter 6: Conclusion

In this section, I conclude the results for the three questions. The first question is “What is the impact of monetary policy on local commercial banks profitability from 2002 to 2020?”; second, how would bank size affect the profitability; third, whether would foreign-owned bank respond positively to the change in policy rate than the local.

6.1 Question 1: What is the impact of monetary policy on local commercial banks profitability from 2002 to 2020?

The official monetary policy would positively affect the bank profitability. From overall performance of the selected seven banks, loose (tightened) in 14-day repurchase rate set by the Bank of Thailand decreases (increases) the return on shareholders' equity and the return on total assets and during the period 2002 to 2020. However, there is no clear evidence supporting that the RepoOWN is correlated with ROA and ROE. The actual effect of the Repo is 0.002079 or 0.2079% for ROA and 0.041746 or 4.1746% for ROE as the authority of Thailand decides to increase the repo rate at current period. It implies that every 1% 14-day repurchase rate decreases (increases), the return on assets would fall (rise) by 0.2079% as well as the return on shareholders' equity by 4.1746%.

6.2 Question 2: How would bank size affect the profitability?

The bank size would positively affect the return on equity for the seven commercial banks in Thailand during the period. The banks with 1% larger sizes would be beneficial for shareholders' equity by 3.773%. In another words, the larger banks would utilize the leverage of banks.

6.3 Question 3: Whether would foreign-owned bank respond positively to the change in policy rate than the local?

There is no evidence that foreign institutions have difference in the net income when repurchase rate changes during the period of Q4/2002 to Q3/2020. It is also found from the annual reports of the banks that the largest shareholder does not have the function of affecting the daily operation, management and strategy of the bank.

6.4 Research Recommendation

These findings in the paper might be important for the commercial banks' managers and policy makers. The banks might be benefited or hampered from

alteration of the monetary authority and their own characteristics. Therefore, recommendations from the results in this paper are followed:

First, due to the co-movement pattern relationship, prolonged low official rate might cause negative impact on robustness of banks. The downward economic trend has prompted the monetary authority to decrease the official rate to encourage economic activities. This situation should be seriously considered by bank according to the positive relationship between the official rate and profitability. Therefore, issuing fixed interest rate loans to reliable corporations becomes necessary. Keeping long-term good relationship between enterprises and banks could ensure the use of idle capital. Furthermore, the loans would reduce the adverse effects of short-term policy rate to a certain extent.

Second, the investigated banks are big established banks locally and this characteristic effect might bring more benefits. Majority of total assets in the banks is loan category to individual and corporate. Within maintaining the advantages of size, the banks would be recommended by improving process of qualification. Efficient risk management would lead to low risks of non-performing loans, adverse selection and moral hazard problems (Ratanavararak & Ananchotikul, 2018) typically under ultra low official interest rate periods.

6.5 Limitations

This study would have some limitations as followed: first, the target scope is not big enough to conclude general features of commercial banks in Thailand. Second the relationship between the monetary policy and profitability may not be perfect linearity according to Borio, Gambacorta, and Hofmann (2017).

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