The impact of foreign direct investment and macroeconomic variables on commercial banks performance in Thailand.

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An Independent Study Submitted in Partial Fulfillment of the Requirements
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ผลกระทบของการลงทุนโดยตรงจากต่างประเทศ และปัจจัยทางเศรษฐศาสตร์มหภาค ต่อผลการดำเนินงานของธนาคารพาณิชย์ในประเทศไทย

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Role of commercial banks in economic as financial intermediary was previously researched in various perspective and framework, especially to investigated factors effecting commercial bank performance. This study extends the literature by investigating the impact of foreign direct investment and macroeconomic variables that stimulate commercial bank profit in Thailand, expressed through return on asset (ROA), on three commercial bank groups. This study used secondary data of foreign direct investment and macroeconomic variables from Bank of Thailand for the period of year 2007 to 2019. Multiple regression method is used to examine the effect of determinant factors: FDI, GDP Growth, Inflation, Real Lending Interest, Unemployment and Exchange rate. Resulted from regression found that there is no significant relationship between FDI and commercial bank ROA. While two macroeconomic variables have a significant relationship to commercial bank ROA: Inflation is positively related and Real Lending Interest is negatively related. The resulted also stated that smaller commercial banks affected by external factors more than large commercial banks. From the empirical resulted, it provides a guideline to commercial banks in Thailand that they should focus on inflation rate and real lending interest rate to maximizing their profit.

Field of Study:	Business and Managerial Economics	Student's Signature .....
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Phalakorn Boonkuntinat

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1. INTRODUCTION

1.1 Background

Financial system is one system that playing an important role to every economy by ensuring financial intermediaries to act as a services provider of capital mobilization and allocation. Stability and efficiency of financial system is an important key success factor supporting and leading to sustainable economic growth. Significance of financial system to economic growth had been debated and tested in many perspectives, Choe and Moosa, 1999, had studied and proof that there was a positive relationship between a development of financial systems, economic growth and emerging market in Korea during year 1970 - 1989. The financial institution normally divided into 2 types: depositary corporations and non-depositary corporations. Depositary corporations would directly receive saving from public as deposit and lend it out, such as commercial banks and specialized financial institution ; on the other hand, non-depositary corporations would indirectly receive saving from general public via different sources, such as mutual fund or insurance. Regarding information of total asset of all financial institutions from Bank of Thailand (here after BOT), table 1 below represented that commercial banks is one type of financial institutions; which is major leader among all types of financial institutions since its hold highest value of assets.

Table 1: Percentage of total asset of Thai financial institutions

Type Financial institution	2013	2014	2015	2016	2017	2018	2019
Commercial Banks	39%	48%	48%	46%	45%	45%	45%
Specialized institutions	12%	15%	15%	15%	15%	15%	15%
Mutual Funds	7%	9%	10%	11%	11%	11%	10%
Insurance Companies	6%	7%	8%	8%	8%	9%	10%
Other	36%	21%	19%	20%	21%	20%	20%

Source: financial stability report year 2013-2019, Bank of Thailand

Apart from acting as a major financial intermediary, commercial banks also responsible for linking the monetary policy apply by each country's National Bank to control the stability of money supply in the system.

In Thailand, according to information provided by BOT as of Q1/2020, currently, there are 14 private commercial banks registered as Thai commercial banks showing in table 2 as follows.

Table 2: List of private commercial banks in Thailand

No.	Commercial Bank Name	Acronym	Website
1.	Bangkok Bank	BBL	www.bangkokbank.co.th
2.	Siam Commercial Bank	SCB	www.scb.co.th
3.	Kasikorn Bank	KBANK	www.kasikornbank.com
4.	Krung Thai Bank	KTB	www.krungthai.com
5.	Bank of Ayudhya	BAY	www.krungsri.com
6.	Thai Military Bank	TMB	www.tmbbank.com
7.	Thanachart Bank	TBANK	www.thanachartbank.co.th
8.	Kianakin Bank	KKP	www.kianakin.co.th
9.	Industrial and commercial Bank of China (Thai)	ICBC	www.icbcthai,com
10.	Land and House Bank	LH	www.lhbank.co.th
11.	Standard Chartered Bank (Thai)	SHBC	www.sc.com
12.	United Overseas Bank (Thai)	UOB	www.uob.co.th
13.	Tisco Bank	TISCO	www.tisco.co.th
14.	CIMB Thai Bank	CIMB	www.cimbthai.com

Source: Bank of Thailand

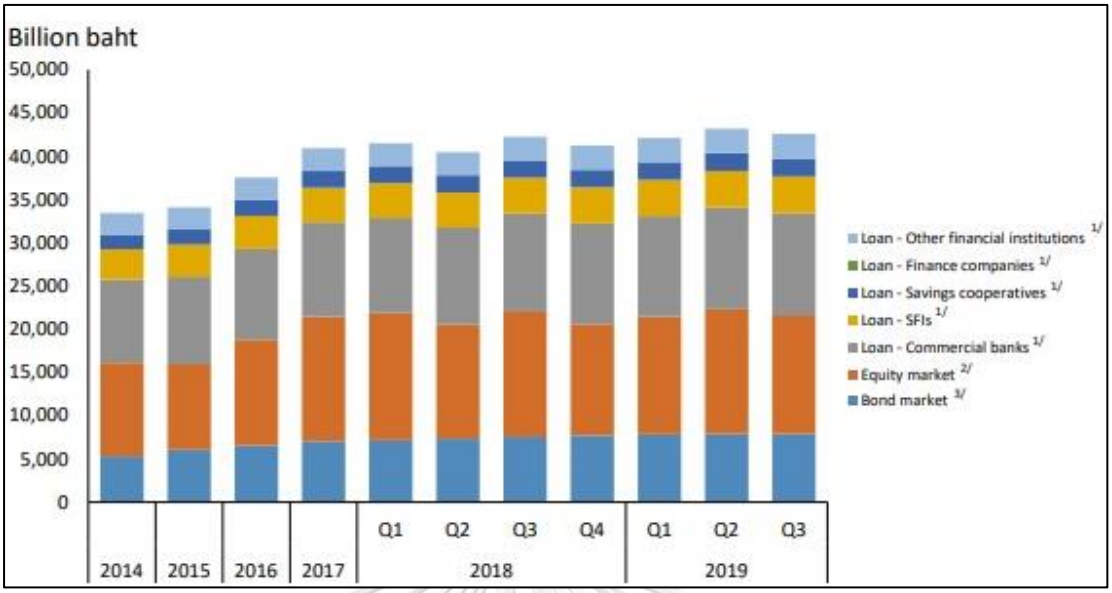
Commercial banks play an essential role in financial market as an intermediary help boosting economic by channeling funds from savers to borrowers and be considered as one large source of funding in Thailand's financial system. Yakubu and Affoi, 2013, explained that activity of commercial banks influenced economic growth by granting credit to investors who know how to utilize those money more efficient and create additional wealth to economic.

The result shown in figure 1 and 2 below can explain that apart from an increasing growth in equity market, commercial banks loan still playing its own duty as source of funding since year 2013 - 2019. Although the portion of commercial loan provided by all commercial banks was decreased from 74% in year 2013 to 69% in year 2019, but the total amount still had an upward trend from 9,100 Billion Baht in year 2013 to 10,700 Billion Baht in year 2019. For now, around 70% of the total credit are classified as commercial credit and the rest 30% are classified as personal loan, this ratio can lead to an answer and shown the importance of commercial bank to economic activity. Based on all information provided, we can state and conclude that Thailand is still considered as a bank-based financial system.

Structure of commercial bank performance can divide into 2 parts, revenues, and cost. For revenue, main source of commercial bank income is interest receive from granting credit to borrower, lending both commercial loan and personal loan. Another type of commercial bank revenue is fees income receive from providing goods and services.

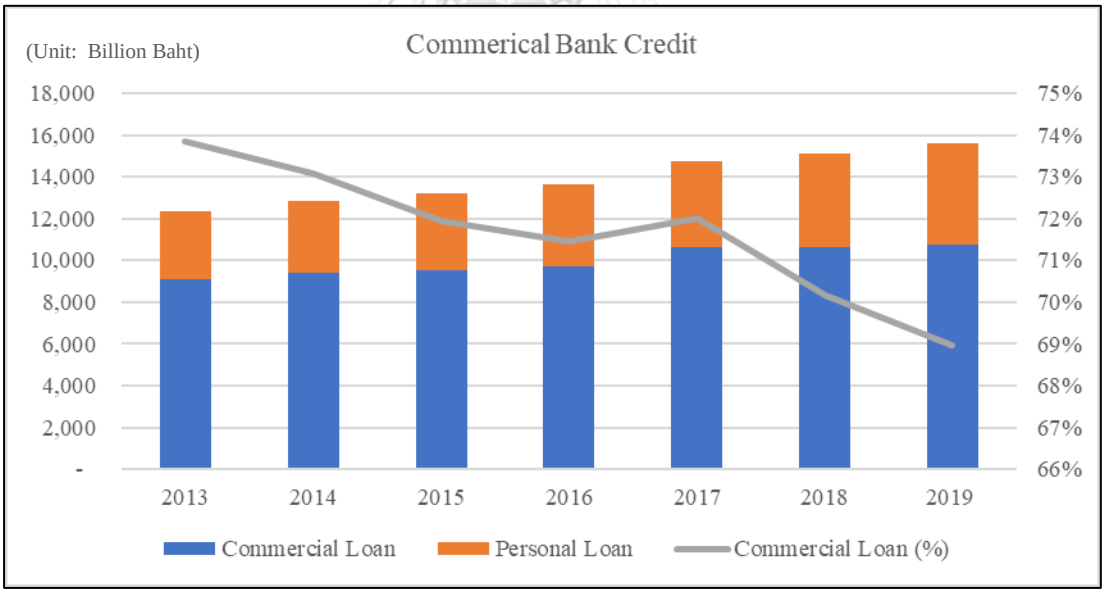
Although there are many evidences lead to an analysis that amount of loan provided by banking sector are significantly related to economic growth, but ineffective banking sector can also bring financial crisis worse when it happened, such as non-performing loan. The classic example of Thailand financial crisis during year 1997, known as Tom Yum Krung Crisis, are considered since it created a huge potential loss to Thailand's financial system and some financial institutions included commercial banks were forced to shut down or merged with each other to withstand from impacted of crisis. The importance of banking sector was issued and signally considered, changing included an improvement of regulation, risk management and reconsideration of foreign penetration permission. Hence, performance of commercial banks in Thailand is crucial determinant requiring to be emphasized.

Figure 1: Thailand's financial system: Type of funding



Source: financial stability report year 2019, Bank of Thailand

Figure 2: Thailand's Commercial Banks Credit since year 2013 - 2019



Source: Bank of Thailand

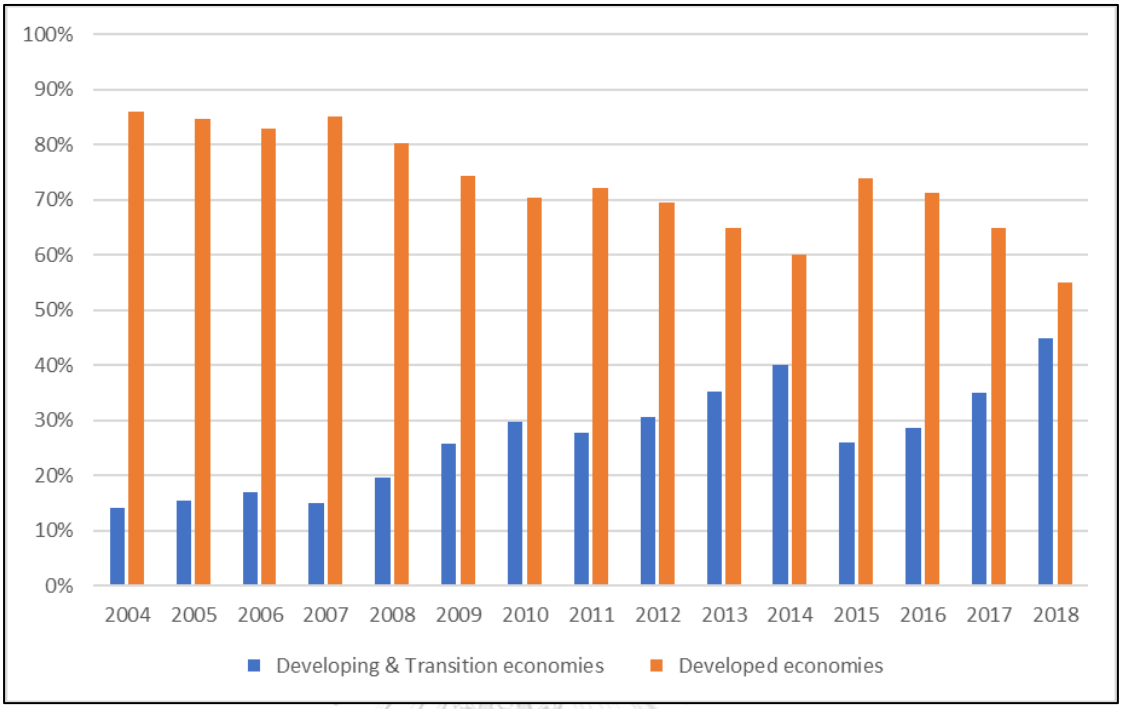
Foreign investment is the allocation of asset include both tangible and intangible from one country (Home Country) to the destination in other country (Domestic or Host Country) with an objective to weather invest in business or in financial market. Foreign investment can diversify into 2 types; foreign direct

investment (hear after FDI) and international portfolio investment, depend on their objective. This study focuses mainly on FDI only, while world bank provided a definition that FDI is the amount of net investment in domestic country that lead to an obtaining at least 10 percent or more of voting stock in target enterprise.

For FDI, it can define into 2 category of fund flow called outward foreign direct investment (here after ODFI) and inward foreign direct investment (FDI). After all the previous decade, all country especially for emerging country mostly emphasize on FDI, with an intention to magnetize a money inflow from aboard. Plenty of beneficial that FDI can bring to domestic country are to promote economic growth, motivate employment level, and technology transfer when an enterprise firms came from both developing and developed country. As data in figure 3, although there was a sharp upward trend of total OFDI value from developing & transition economies since year 2004 – 2018, increased from ~14% to 43% but currently main OFDI amount around ~55% that invested and flow over the world still originated by developed economies.

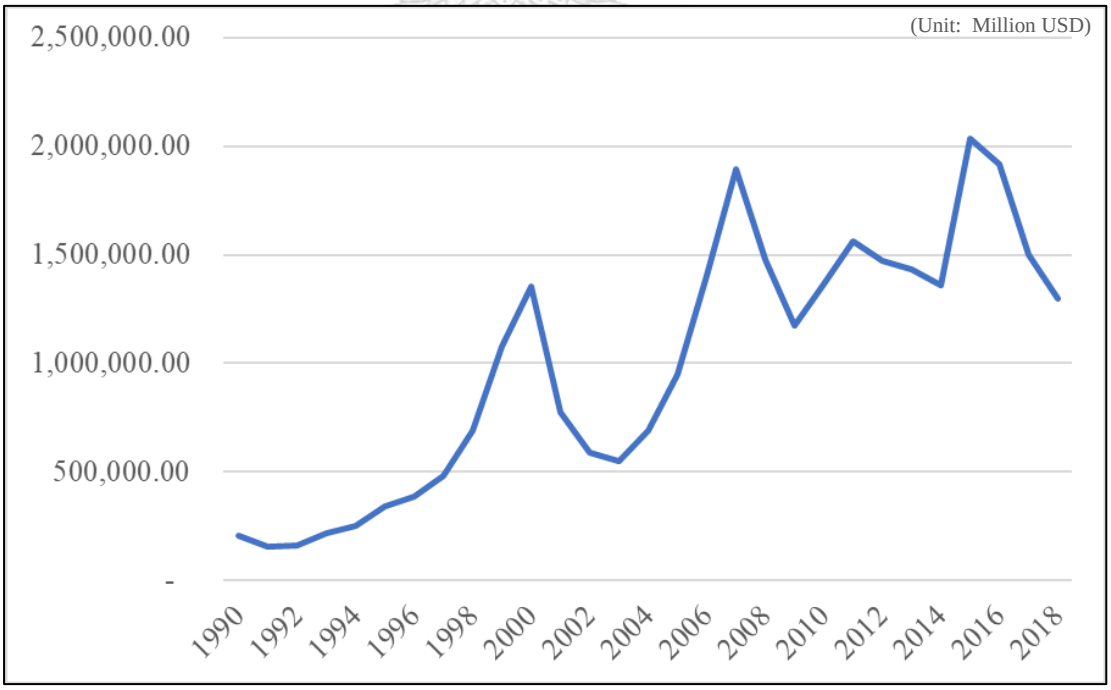
The way of using FDI as an investment channel increased intensively & globally since year 1990, a world's FDI stock raised from USD 205,000 Million only at the end of year 1990 and claimed up to lead it highest amount at USD 2,030,000 Million in year 2015, see data in figure 4. This widely spread of fund lead to an expanding of transnational corporations and growing of global economic growth. Apart from rapidly increased in total FDI stock, the portion in term of destination also changed from developed economies to developing & transition economies. Figure 5 shows that in at the end of year 1990, 83% of FDI stock were invested in developed economies, while only 17% were invested in developing economies. However, at the end of year 2018, a totally different proportion of FDI inflow was found, more than haft of FDI stock goes to developing and transition economies and the rest remain in developed economies, 57% and 43$ respectively.

Figure 3: Portion of world accumulated OFDI Stock during year 2004 - 2018



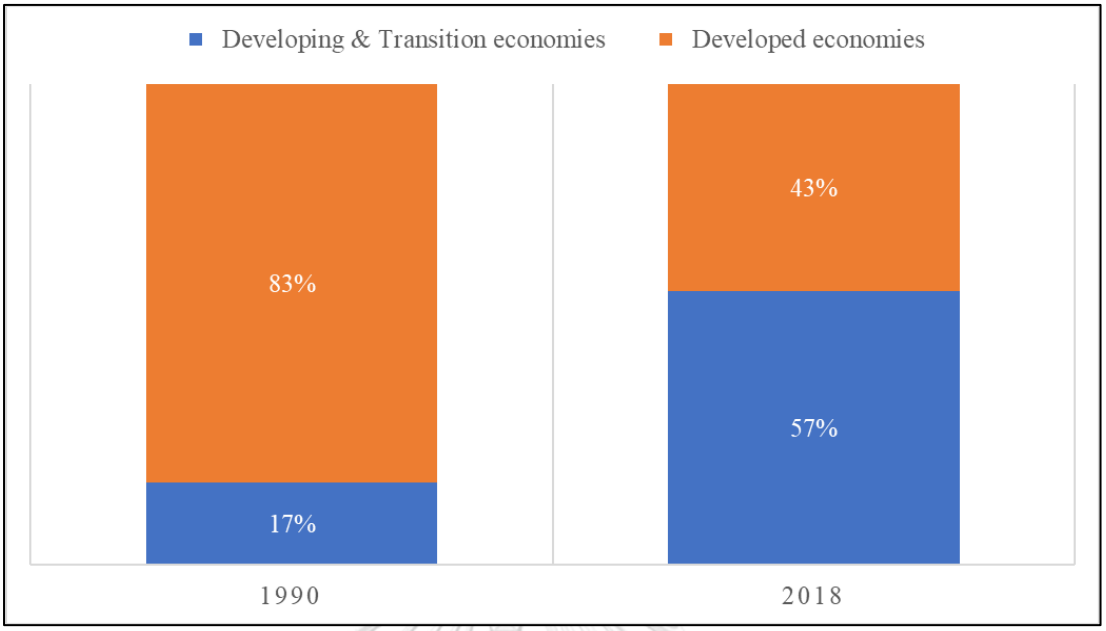
Source: UNCTAD

Figure 4: World FDI accumulated amount during year 1990 - 2018



Source: UNCTAD

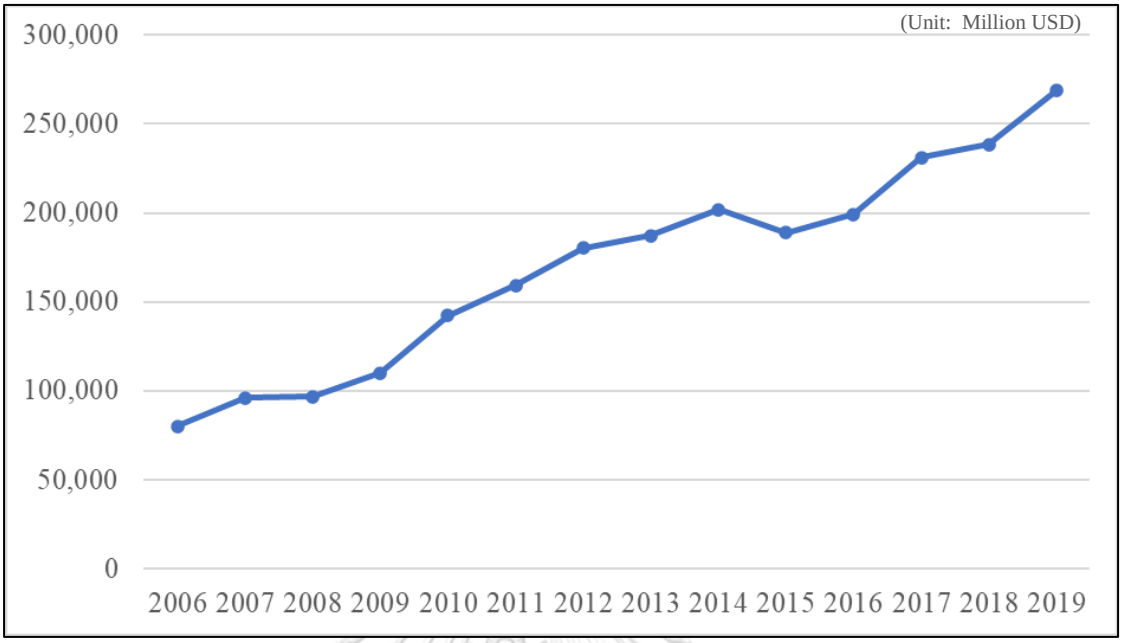
Figure 5: Portion of world FDI Stock at the end of year 1990 & 2018



Source: UNCTAD

Thailand is one of an efficient economy in South East Asia that can magnetize flow of FDI stock from all over the world, developing countries. Before Tom Yum Krung Crisis in year 1997, there was only USD 3,880 Million of FDI stock in Thailand (data from UNCTAD) while after Thailand change the monetary policy from Fixed Exchange Rate system into Floating Exchange Rate, a large pooled of FDI stock flowed into Thailand continuously. Even thought, Thailand were forced to encounter with internal problems, political unrest in year 2009 and natural disaster in year 2011, that caused a divestiture of foreign investors. However, high potential growth of Thai economy not only drawn them back, but Thailand had been facing with a consistently upward trend from around USD 80,000 Million in year 2006 to almost USD 270,00 Million at the end of year 2019 (see data in figure 6).

Figure 6: Accumulated FDI amount during year 2006 – 2019



Source: Bank of Thailand

Previous academic researches show that FDI can lead to an increased in crucial positive impacts on a developing in host country. Moreover, FDI can be a source of technology innovation and know-how while bringing up linkages between a host country and domestic firms, which can help jumpstart an economy. Based on growth theory, FDI is a factor helps raising GDP, and FDI also leads to technological transfer from multinational firms to domestic plants (Tanna and Topaiboul, 2005).

1.2 Significant of Problems

FDI is another large source of capital that could determine economic direction especially for developing country like Thailand. In addition, value of FDI could directly impact economic growth and level of productivity via knows how & technology transfer (see Borensztein, Gregorio and Lee, 1998, Iamsiraroj and Ulubaşoğlu, 2015). Some foreign investors may come up with fully own budget, while the rest need financial support in term of commercial loan from domestic commercial banks.

Previous studies about impacted of FDI, Sghaier and Abida, 2013, have argued that FDI was one of significant factors that caused financial sector in many

developing countries to an increased in their efficiency & development. This means commercial banks have an opportunity to weather provide the commercial loan to an foreign enterprise firms or turn these huge amounts of money brought with them into loans and generate more returns which will enhance their profitability.

While some research claimed that most intense stimulants effected commercial banks performance are internal determinants (see Kosmidou, Tanna, and Pasiouras, 2015), however, external determinants, variables that are not under commercial banks control such as GDP growth rate, inflation rate and real interest rate should not be forgotten.

The interested point is does FDI and macroeconomic variables effected commercial banks performance in Thailand. The results from this study would be mechanism for commercial banks in Thailand to concern the effect of FDI and macro policy to their efficiency.

1.3 Scope of study

To identify the impact of FDI and macroeconomic variables on commercial banks performance in Thailand during year 2007 -2019 by using financial ratio analysis (here after FRA) as measurement. While an appropriated FRA that commonly use and could represent the commercial banks performance is return on asset (here after ROA).

To achieve providing most accurate consequence, this study will express commercial bank profit through average ROA of all 8 observed banks, as well as average ROA of 2 more commercial bank groups, considered large & small banks, with independent variables mentioned.

1.4 Research Objective & Hypothesis

Main Objective of this study is not tried to investigated on how much money FDI bring to banking sector but focus to identify the relationship of FDI and key macroeconomic variables on commercial banks profitability in Thailand for the period of year 2007 – 2019. There are 3 main objectives this study would like to explain.

1. To test the impact and direction of FDI whether it has a positive or negative relationship with commercial banks performance.

2. To test the impact and direction of macroeconomic variables whether it has a positive or negative relationship with commercial banks performance.
3. To compare the impact of each variable correlation coefficient on profitability of 3 commercial banks groups (All banks, Large banks, and Small banks).

1.5 Contribution

Primary contribution of this study is to understand weather FDI does impact or not impact commercial bank performance in Thailand? If yes, in which direction and does large & small commercial banks resulted the same? And apart from FDI, does any macroeconomic variables affect commercial banks performance? If yes, in which direction and does large & small resulted the same?

After obtaining the result, this study can give a signal to an executive management level of commercial banks in Thailand and they can use result show in this study to determine their policy and adjust their both short-term and long-term strategy to maximize their profit along with factors that are not under banks control. In other word, a bank with better performance can withstand or be more resilient to various external (negative) shocks occur and continue providing financial stability to Thai's financial system.

2. LITERATURE REVIEWS

2.1 Measuring Commercial Bank Performance

Profitability and performance of commercial bank have been well researched and measured around the world with higher attention over the past decades caused by previous global financial crisis. Failure of operating a commercial banks lead to deteriorating health of financial institution and justified that performance of commercial banks need to be investigated. Chunhachinda & Li, 2010, compared profit of Thai commercial bank before and after financial crisis in year 1997, and found a notable lower profit and higher cost in the post-crisis period, while 6 commercial banks were reported closure. In addition, Kumbirai and Webb, 2010, described in their research with an evidence in South Africa banks case that overall banks performance went in line with economic situation, increased before and fell after subprime crisis during year 2005 – 2009.

To explain factors that affected commercial bank performance, recent literatures defined them as internal and external determinants. Internal factors are considered as firm specific determinants, factors that considered as inside bank management such as asset size, liquidity level and cost (operational efficiency). While economic indicator and regulation provided by Central Bank that could affects commercial bank operation are external determinants. Both type of determinants could be used according to an objective of the study. Kosmidou, Tanna, and Pasiouras, 2015, told in their research about relationship between internal and external determinants on UK commercial banks' profit that both internal and external determinants affected UK commercial banks' profit. Although internal factors like capital strength, cost- to-income ratio and bank size are the more significant than external factors, but GDP growth and inflation individually also impacted UK owned banks' profit as well. On the other hand, Anbar and Alper, 2011, used internal data and three macroeconomic indicators, GDP, Inflation and Real interest rate to explained ROA of Turkey commercial banks by regression model, but found that only internal had a significant relationship with banks profit.

Previous research from many literatures debated about ways to measuring commercial bank performance and limitations of each techniques such as traditional financial ratio analysis (here after FRA) and non-parametric Data Envelopment

Analysis (here after DEA) or parametric Stochastic Frontier Approach (here after SFA) as alternative ways (see Ncube, 2009, Berger and Humphrey, 1997). In this study FRA method is more suitable due to lower complexity, availability of information and it can control for any asset size effect.

2.2 FDI and Economic Growth

The impact of FDI as an engine promoted economic growth on receiving countries (domestic or host country) have been lashings reported that financial and capital investment required along with FDI inflow. The relationship between FDI and economic growth are commonly explained by applying famous economic models, neoclassic growth, or Solow-Swan growth model was pioneered by Solow (1956 and 1957). The theory was developed by Cobb and Douglas (1928), and assume that economic production function, or the aggregate production function equal to Y = f (A, L, K), where Y is output, K is a capital, L is labor force, and A is technology level which changes over time. The framework shown that accumulation of capital stock directly leaded to economic growth. Moreover, growth of economic also depend on level of labor and technology. From this theory, since FDI is consider as one large source of capital stock for receiving country, so FDI would have positively impact with economic growth.

Apart from neoclassic growth theory, Mahembe and Odhiambo, 2014, explain in their finding that FDI also promote economic growth thought numerous channel such as transfer of technologies and know-how.

Some of these academic researches' studies about relationship between FDI and its impact on host countries economic growth can support the above framework. Borensztein, Gregorio and Lee, 1998 investigated the effects of FDI on economic growth by using cross-country regression and found that FDI truly contributed an increase of productivity level by technology transfer and lead to economic growth, but the effectiveness is also depended on readiness of internal resources on host country. And Iamsiraroj and Ulubaşoğlu, 2015, added that FDI provides the host country with a stable flow of funds and act as important source of capital that influence economic growth and FDI had more impacted in developing countries. Work by Barrios, Görg

and Strobl, 2005, find that foreign direct investment represents as greater competitor and forces local firm to an adaptation and created a huge investment of local firm.

Alguacil, Cuadros, and Orts, 2011, looked at this relationship in another corner and question that does macroeconomic condition and efficient institution attracted decision of foreign investor to invested in domestic country or not. Data of developing counties during year 1976 – 2005 was tested by OLS method. The authors find that stability of macroeconomic and quality of a financial institution could exploit more FDI into host countries.

2.3 Macroeconomic Variables and Commercial Bank Profit

Literatures during late 1990s' and beginning of 2000s'era, commercial banks performance, mainly measured by ROA, was identify to have a significant relationship with macroeconomic condition. And macroeconomic variable like GDP growth rate or per capita income were commonly used by bank's management committees as a signal to assign bank's future policy. In other word, upward economic growth trend encourages commercial bank to easier lending out more loan and earn higher profit. The studied of US's bank profit across state by Neely and Wheelock, 1997, used US's bank ROA and ROE across state for year 1947 – 1995 and stated that economic activity and per capita income in each state level is positively influence bank earning. Future more, a work by Glen and Mondragón-Vélez, 2011, characterized business cycle and loan portfolio of commercial banks in developing economies, included Thailand, and suggested that GDP Growth promoted highest affected and lending rate have second-order effects.

Apart from GDP Growth, other basis economic indicators like inflation and interest rate examined to have a significant relationship with commercial banks profit as well. The exposition of inflation effect on bank performance by Umar, Maijama'a, and Adamu, 2014, inflation discourage saver to deposit money in banks because the higher the inflation, the higher the opportunity cost to carry currency. Saver trend to transfer their money and invest more in non-monetary capital (real estate or land) to avoid loss. Resulted in lower availability of money to planning loan policy. However, their finding did not investigate the direction of effect inflation caused commercial bank profit. While, Sufian 2011, found that inflation is positively related to Korean

banks' profitability. The reason behind her studied is Korean banks adjust their interest rate with inflation to earn higher profit.

On the flip side, GDP Growth in China during the period 2003 – 2009 was also found to have a significant relationship with a sample of 101 China's banks profitability, ROA and NIM (Net interest margin), but in negative not positive relationship (Tan and Floros, 2012). Their resulted argued and support an ideal that with higher economic growth, overall domestic business performance improve, consequently in an increase in banking sector competition and lower profit margin obtained.

2.4 FDI and Banking Sector

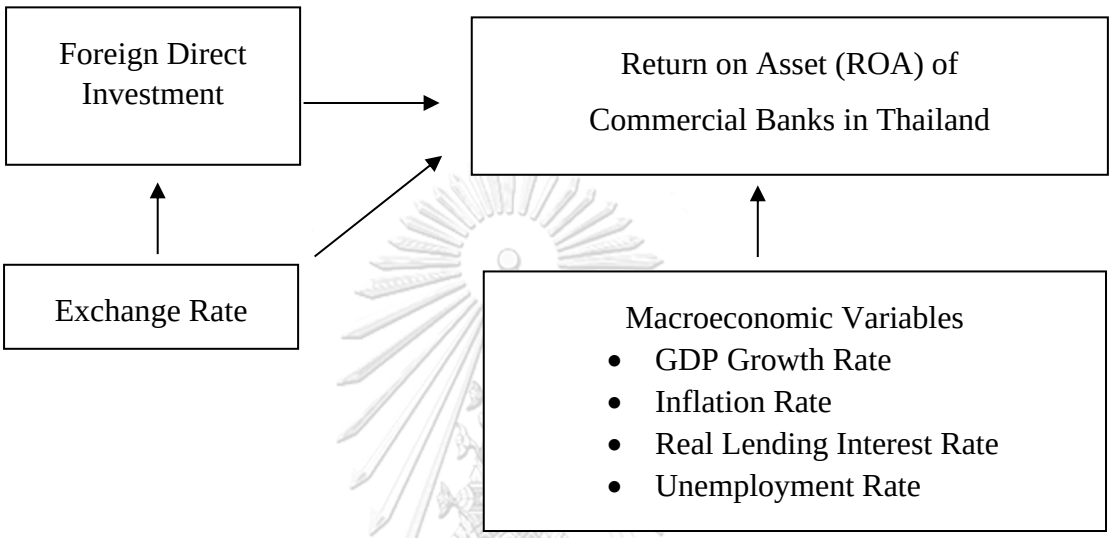
Sghaier and Abida (2013) examined the linkage of FDI and commercial banks behavior in North African Countries over the period of 1980 – 2011 and found a positively direct impact of FDI inflow on their economic growth which also enhanced local bank to improved their efficiency and performance in order to served and maximize benefit of foreign investment enterprises. Also, a work of Kirikkaleli, 2013 additionally added and investigated that after year 2004 in Turkey a large portion of FDI inflow invested through the establishment of multinational banking activities.

To sum up, there are many researchers examined and connected the positive relationship of FDI on economic growth of host countries in various aspects. They also testes and explained the impacted of FDI on banking sectors that FDI play an important role lead to an improvement in their efficiency and performance. However, these studies focused on a general development only, did not explored the effects of FDI on domestic banks profit.

Most previous literatures whose talked about the factor effecting commercial bank profit and the measurement mainly used concept of internal and external factors. Few writings were found using FDI and internal as bank specific to explore commercial bank profit and resulted in positive relationship between FDI and bank's ROA.

This study therefore would like to extend and applied existing literatures by testing the relationship of FDI and key macro variables, instead of internal factors, on commercial banks profitability in Thailand.

2.5 Conceptual Framework



The above conceptual framework is designed to explain the impacted of FDI amount to ROA, a financial ratio that used to represent profit of Thais' commercial banks. One important role of commercial banks is to granting credit to who can create additional wealth to economic thought investment or capital expenditure, while neoclassic growth model explained that FDI lead to an increasing in volume of investment in host countries. However, other factors can influence ROA of commercial banks, including internal factors and macroeconomic variables. In addition, other factors can impact FDI amount, including BOT & Government policies, and domestic demand of goods & products. Finally, I have identified exchange rate as a factor that can influence both FDI amount and ROA of commercial banks.

3. RESEARCH METHODOLOGY

This study divided the research methodology about impact of foreign direct investment and macroeconomic variables on commercial banks performance into 2 sections. First section is about data collection, model specification and the descriptive statistic of collected data by analyzed all data both dependent and independent variables such as their mean, standard variation, and type of each variable. Second section is included the significant econometric test needed before being used, correlation matrix and a unit-root test.

3.1 Data Collection

To investigate this study's model, a set of time-series data of commercial banks performance (dependent variables), the accumulated amount of foreign direct investment and other macroeconomic variables (independent variables) of Thailand that necessary in analysis were collected from year 2007 – 2019, the frequency of data is in quarterly format (total n equal to 52 observations). These data are considered as secondary data, data that already been collected, which provided publicly and derived from Bank of Thailand website and Stock exchange of Thailand (SetSmart). Quantitative approach was adopted from this study because the study uses secondary data to explain a relationship between variables.

For dependent variable, commercial bank performance, there are plenty type of financial ratio analysis that can use to represent and measure the level of commercial bank performance or profit, while ROA is one commonly and mostly used in many literatures that talked about measuring commercial bank profit (see, Musah, Gakpetor, Kyei, & Akomeah, 2018 and Kanwal & Nadeem, 2013).

In Thailand currently there are 14 private commercial banks, but only 8 out of those 14 well-known commercial banks are contained as sample data in this study due to the limited information provided by The Stock Exchange of Thailand. 6 excluded commercial banks that are not in this study because weather they registered into the SET after year 2007 or their data is not stable.

Since the objective of this study is not only to find the significant relationship and its direction among dependent & independent variables, but to compare the impact of independent variables on different categories of dependent variables, based

on characteristic. Therefore, commercial bank's ROA in this study are divided from 8 banks into 2 subgroups, 5 banks and 3 banks respectively, to represent as large and small commercial bank as shown in table 3 below.

Table 3: Group of dependent variables (ROA)

ROA	ROA Large Bank Group (ROA_L)	ROA Small Bank Group (ROA_S)
BBL, SCB, KBANK, KTB, BAY, TCAP, TISCO, KKP,	BBL, SCB, KBANK, KTB, BAY	TCAP, TISCO, KKP

For independent variables, all data are provided by Bank of Thailand. Main independent variable in this study is the accumulated amount of foreign direct investment and other 5 independent variables that will be used as control variables included, GDP growth rate, inflation rate, lending interest rate, unemployment rate and exchange rate (USD as based).

3.2 Econometric Method & Model Specification

There were many previous researches that tried to analyze commercial bank performance and its determinants. They studied about impacted of internal factors and macroeconomic variables on commercial bank performance individually, while some used both internal & macroeconomic variables to explained. However, most of them used the same econometric methodology, Ordinary Least Squares (here after OLS) Regression Model.

To find the answer of how FDI and macro variables affect commercial bank performance in Thailand, the models below were adopted and combined from 2 multiple regression model of Musah, Gakpetor, Kyei, & Akomeah, 2018 (Model A) and Kanwal & Nadeem, 2013 (Model B). Details and objectives of their research models are specific as below in table 3.2.

Table 4: Reviewing Model Specification

	Model A	Model B
Multiple regression	$ROA = \beta_0 + \beta_1 LOGFDI + \beta_2 SIZE + \beta_3 ACOMP + \beta_4 CRISK + \beta_5 AGE$	$ROA = \beta_0 + \beta_1 INF + \beta_2 GDP - \beta_3 INT$
Objective	To determine impact of foreign direct investment and internal factors on commercial banks profit in Ghana during year 2006 - 2015	To determine the relationship of macro variables on commercial bank profit in Pakistan during year 2002 - 2011
Results	LOGFDI (main interested independent variable) has a positive impacted on ROA at 1% significance level.	INF (inflation) has a negative impact and INT (real interest rate) has a positive impact on ROA at 5% significance level.

From above 2 models in table 4, the same dependent variable that they interested was commercial bank ROA, but they modeled differently. Model 1 used internal variables as control variable, while Model 2 used macro variables but not foreign direct investment. And the resulted shown that foreign direct investment and one macro variable had a positive relationship on commercial bank ROA.

Modification of model in line with the study of above literatures, in this analysis, is to consider foreign direct investment amount and macroeconomic variables as independent variables and test its relationship with 3 groups of commercial banks' ROA by using multiple regression model (OLS).

The following multiple regression models that will be used to determine the impact of foreign direct investment and macroeconomic variables on 3 different group of commercial bank profitability in Thailand (Research Question) are specified as:

$$ROA = \beta_0 + \beta_1 FDI + \beta_2 GDP - \beta_3 INF - \beta_4 INT - \beta_5 UNEM - \beta_6 EXC$$

$$ROA\_L = \beta_0 + \beta_1 FDI + \beta_2 GDP - \beta_3 INF - \beta_4 INT - \beta_5 UNEM - \beta_6 EXC$$

$$ROA\_S = \beta_0 + \beta_1 FDI + \beta_2 GDP - \beta_3 INF - \beta_4 INT - \beta_5 UNEM - \beta_6 EXC$$

3.3 Describe Variables

Table 5: Describe Dependent Variable and Their Assessment

Variable	Variable name	Unit	Assessment	Sources
ROA	Return on Asset	%	Net Income/Total Assets	The Stock Exchange of Thailand
ROA_L	Return on Asset of Large Bank Group	%		
ROA_S	Return on Asset of Small Bank Group	%		

Return on Assets (ROA) is one type of financial ratio analysis that widely used as a performance measurement in term of profitability. This ratio indicate how well company utilized its own asset invested by either capital or liability to generate return on investment. It represents the profitability of company relative to its total asset, how much net income they earned according to their asset. The higher the ratio mean higher productive and efficiency.

Table 6: Describe Independent Variable, Their Assessment, Source of data and Expected Relationship

Variable	Variable Name	Assessment	Unit	Sources	Expected Relationship
FDI	Foreign Direct Investment	Percentage growth of accumulated amount of FDI in Thailand	%	Bank of Thailand	+
GDP	Real Gross domestic product	Annual growth rate of Thai's economy	%		+
INF	Inflation	Annual percentage change in Thailand's consumer price	%		+ / -

INT	Real Lending Interest Rate	Real annual lending interest rate in Thailand	%		+
UNEM	Unemployment Rate	Proportion of unemployed of Thais in labor force	%	Bank of Thailand	-
EXC	Exchange Rate	Percentage change exchange rate between USD & Thai Baht	%		-

- Real GDP were calculated by using chain value method concept.
- Real lending interest rate were calculated by using weighted average lending rate for a yearly basis and adjusted with inflation. Fisher equation.

Foreign Direct Investment (FDI) is the accumulated amount of foreign direct investment made by a foreign firm or foreign investor into Thailand. Several studies explain about effected of FDI on banking sectors especially in developing countries. Musah, Gakpetor, Kyei, & Akomeah, 2018, provided an evidence that FDI and commercial bank profit are positively related. Their studies resulted support the argument that the money deposit increased in line with foreign direct investment inflow increased in which commercial banks can convert them into loans and enhance their profitability.

The positive relationship also expected between FDI and commercial bank ROA in this study, since FDI enterprises can influence commercial bank performance by solicited a commercial loan to support their investment or as working capital requirement. In addition, these also provided a new business opportunity to commercial bank to serves their additional services such as international trade service, money transfer, bank guarantee, letter of credit, etc. and resulted in higher non-interest income.

Real Gross Domestic Product (GDP) is an annual growth rate of Thailand economy. This GDP is a key macroeconomic variable that can represent the total

economic activity and a status or condition of economy. The positive relationship of GDP and commercial bank performance was expected. All determinant of GDP, consumption, investment, government spending and Import-export affected amount of supply of money and demand for commercial bank loan. Higher the economic activity lead to an increasing of investment and amount of commercial loan needed. Number of financial transactions are positively impacted by economic growing condition (Sufian and Habibullah, 2010) and strengthen of bank profitability drive by fast economic growth (Demirguc-Kunt & Huizinga, 1999)

Inflation rate (INF) is an annual percentage change in price of goods and services while both direct and indirect effected to commercial bank performance were caused by INF (Staikouras and Wood, 2004). For direct effect, the higher the INF, the higher wage of employees adjusted yearly and lead to lower profit. On the other hand, indirect effect, the asset price bank's hold is increased in respond of INF increased. From studied of Perry, 1992, impact of inflation can either positive or negative to commercial bank profit, depend on inflation policy of each bank. The anticipated or unanticipated policy means commercial bank adjust their interest rate overtime or not.

Real Lending Interest Rate (INT) is a weighted average real lending rate commercial bank offer to their customer, this interest rate is highly depended on policy interest rate determined by Bank of Thailand as one type of tools in monetary policy. Refer to literatures of Samuelson 1945, claimed that commercial bank profit increase when interest rate is in rising trend. The positive relationship is expected.

Unemployment rate (UNEM) is a percentage of jobless people from the Thai's labor force. Louzin, Vouldis and Metaxas (2010) studied the performance of Greek commercial banks about their level of Non-Performing Loans (NPLs) we found the positive relationship of unemployment rate that influence the NPLs to increased. NPLs is a type of commercial bank's asset that could not generate revenue, in addition commercial banks must take it as loss. Therefore, the negative relationship is expected.

Exchange Rate (EXC) is the rate that used to exchange between domestic currency (one) and foreign currency (with another). This study used the historical exchange rate between USD dollar (as based) and Thai Baht, while its fluctuated depend on international trade, demand and supply of goods, services, capital, etc.

internationally. Since Thailand economic, depend more on export sector, an appreciation of Thai Baht would decrease export volume and caused Thai economic decreased. Likewise, if Thai Baht appreciated, that amount of working capital or loan that commercial banks provided to its customer (export business type) will decrease. Therefore, the negative relationship is expected.

3.4 Descriptive Statistic and Interpretation

The summary statistic of all variables during year 2007 – 2019 used in this study was accumulated and present in table 7 below. For dependent variables, on average the listed commercial banks in Thailand had a total return on total asset around 1.70%. In comparison, although in that period of time smaller banks performed slightly better than large banks but the interested point we found in this descriptive analysis is the severed fluctuations of small banks profit, their standard deviation was almost 2 times higher than overall banks.

Table also depicts independent variables, for the accumulated FDI amount had a growth rate around 1.6% quarter to quarter over study period. A large standard deviation 3.15% caused by violate fund flow represent by maximize at 9.2% growth and minimize at -7.5% growth.

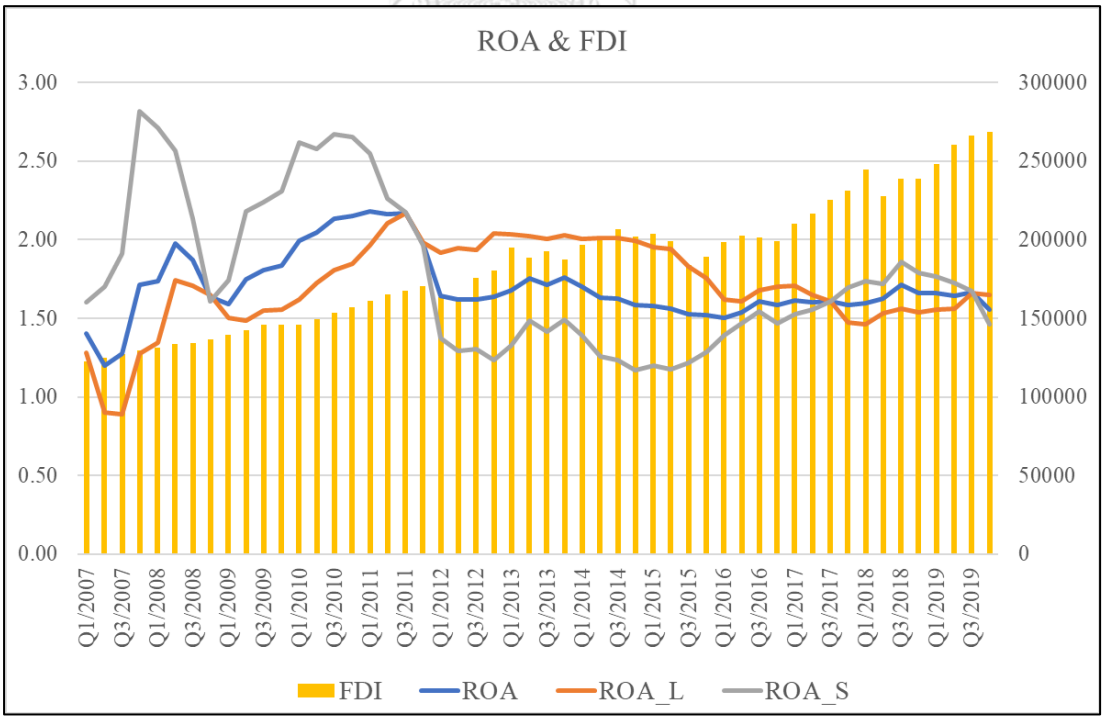
As for economic term, Thai's economy growing on average of 3.3% per year while the percentage change in consumer price equal to around 1.7%. The unstable of Thai's economy during study period was found and presented in form of their standard deviation that almost equal its mean for GDP growth and greater its mean for inflation. As far as real interest rate is concerned, in 14 years, commercial banks in Thailand have been charging around 3.1% when they provided loan to their customers while the maximum rate is around 7.6%. The average unemployment rate is approximately 1% (minimum 0.5% and maximum 2%). For exchange rate, Thai Baht and US Dollar changed approximately 0.3%.

Apart from table 7, figure 7 - 9 displayed the ROA of all banks group along with the accumulated amount of FDI, percentage change of FDI and GDP Growth over the period of this study. The graph can fully support the greatly differ of small banks ROA, especially in the first 5 years, 2007 – 2011, during economic crisis and recovery stated.

Table 7: Summary Statistic

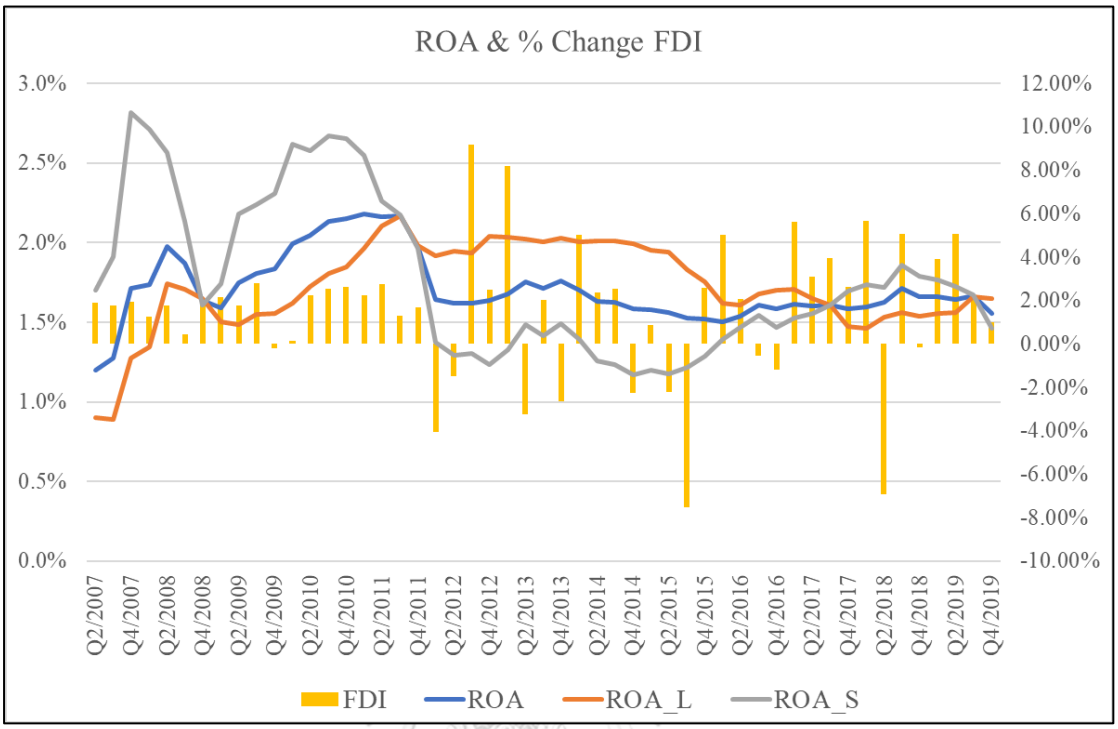
Variables	Mean	SD	Min	Max
Dependent Variables				
ROA (%)	1.70	0.21	1.20	2.18
ROA Large (%)	1.72	0.27	0.89	2.17
ROA Small (%)	1.77	0.48	1.17	2.82
Independent Variables				
FDI (%)	1.60	3.15	(7.53)	9.18
GDP Growth Rate (%)	3.25	3.29	(4.30)	15.50
Inflation Rate (%)	1.74	2.02	(2.73)	7.57
Lending Interest Rate (%)	3.08	0.25	(1.87)	7.61
Unemployment Rate (%)	1.01	0.31	0.47	2.08
Exchange Rate (%)	(0.28)	2.42	(5.19)	5.97
Observations	51			

Figure 7: Average ROA of commercial banks & FDI year 2007 - 2019



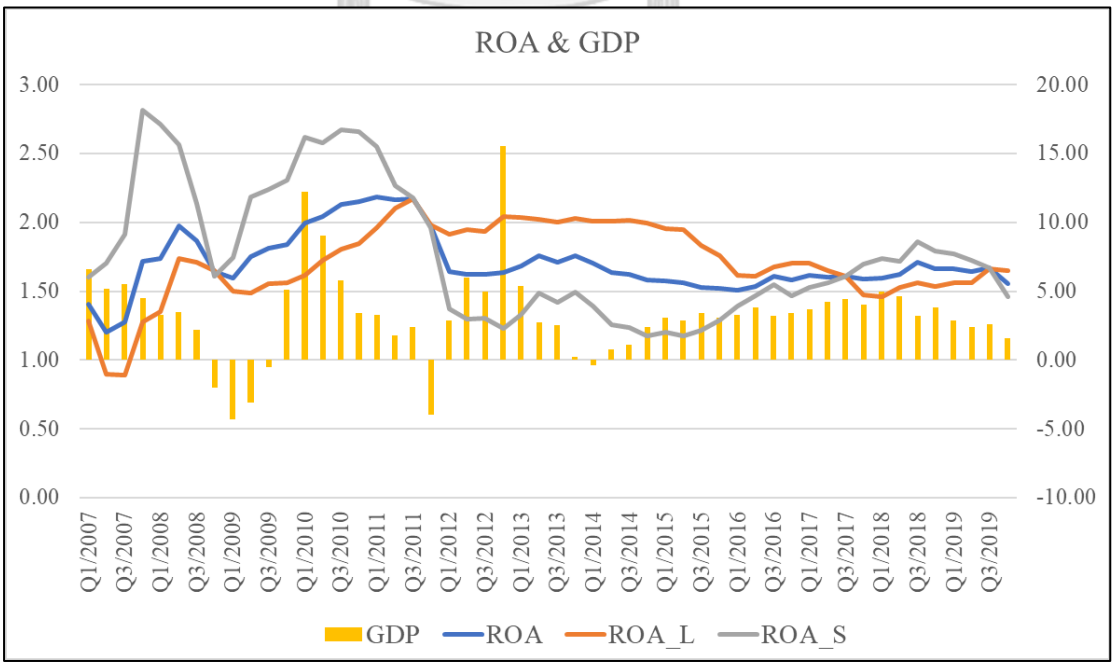
Source: Bank of Thailand & SetSmart

Figure 8: Average ROA of commercial banks & Percentage Change of FDI year 2007 - 2019



Source: Bank of Thailand & SetSmart

Figure 9: Average ROA of commercial banks & GDP Growth year 2007 - 2019



Source: Bank of Thailand & SetSmart

3.5 Multicollinearity (Correlation) Test

Statistic result in table 8, correlation matrix, there are no variables that have neither positive nor negative highly related above 0.50, while the maximum correlation of observed data equal to 0.4769, between INF & INT. Where from a literature of Kennedy (2008), states that multicollinearity occurs when correlation between variables is higher than 0.80 or 0.90. Therefore, from the collected data, multicollinearity problem is not exit.

Table 8: Correlation Matrix

Variables	FDI	GDP	INF	INT	UNEM	EXC
FDI	1.00					
GDP	0.02	1.00				
INF	0.06	0.25	1.00			
INT	-0.03	-0.18	0.47	1.00		
UNEM	-0.07	-0.23	-0.15	0.17	1.00	
EXC	-0.35	-0.31	0.02	0.24	-0.20	1.00

3.6 Stationary test (Unit Root Test)

To study the impact of foreign direct investment and control variables on commercial bank profit, the secondary data use for this analysis is a set of continuous time-series data since year 2007 until year 2019. In general, these time-series data of macroeconomic variables are changed over time and consider as Non-stationary, it often exhibits a trend over time, both upward and downward trend. While using non-stationary data when regressing may lead to spurious or meaningless regression.

To analyze data with time series stationary is an important key because if data is stationary the probability of prediction will be like historical data. For that reason, before applying an estimated model, standard econometric tests such as stationary test of Augmented Dickey-Fuller (ADF) test by Dickey and Fuller (1979) is required. The hypothesis of the test is specific as below.

Ho: unit root presence (data is non-stationary)

Ha: unit root not presence (data is stationary)

Table 9: Result of stationary unit root test (at level)

Variables	At level		At 1st Difference	
	Result		Result	
ROA	Reject Ho	Stationary	Reject Ho	Stationary
ROA_L	Reject Ho	Stationary	Reject Ho	Stationary
ROA_S	Fail to Reject Ho	Non-Stationary	Reject Ho	Stationary
FDI	Reject Ho	Stationary	Reject Ho	Stationary
GDP	Reject Ho	Stationary	Reject Ho	Stationary
INF	Reject Ho	Stationary	Reject Ho	Stationary
INT	Fail to Reject Ho	Non-Stationary	Reject Ho	Stationary
UNEM	Fail to Reject Ho	Non-Stationary	Reject Ho	Stationary
EXC	Reject Ho	Stationary	Reject Ho	Stationary

The results show in table 9 clearly state that at level form there are 3 variables, ROA_S, INT and UNEM that fail to reject the null hypothesis, mean that variables have unit root in their level form and needed to be adjusted before use. While other variables test can significantly reject the null hypothesis. Method that can be used to modify data is to transform data and represent them in first differentiation. While all variables test rejects the null hypothesis when they are in first difference and become stationary. Therefore, all data that will be used in 3 specific multiple regression models to investigate the research question are in first difference form.

4. EMPIRICAL RESULT

To analyze the relationship and find the answer of how FDI and macro variables affect commercial bank performance in Thailand, this study use multiple regression (OLS method) and results from 3 specific models are provided as below.

4.1 Regression Results

Table 10: Result of OLS Model 1 – 3 (N = 50)

Variable	Model I (d_ROA)	Model II (d_ROA_L)	Model III (d_ROA_S)
d_FDI	0.002 0.507	-0.001 -0.287	0.005 0.729
d_GDP	-0.006 -1.191	0.000 0.018	-0.012 -1.232
d_INF	0.039*** 3.287	0.028** 2.421	0.058** 2.459
d_INT	-0.180* -2.009	0.079 0.913	-0.680*** -3.854
d_UNEM	-0.093 -1.460	-0.080 -1.288	-0.102 -0.809
d_EXC	0.001 0.1917	0.000 0.002	0.001 0.109
Observation	50	50	50
Adjusted R-Squared	0.175	0.120	0.208

**** Significant at 1%, **Significant at 5%, * Significant at 10%*

Resulted from Model I shown an Adjusted R-squared equal to 0.1747 which indicated that ~17% changed in dependent variable can explain by independent variables. The result tells that the relationship between accumulated FDI amount and commercial bank profitability (ROA) is not exist. The same outcome goes to other independent variables, except inflation rate and real lending interest rate. While

inflation rate that have a positive relationship with commercial bank ROA at 1% significant level and real lending interest rate have a negative relationship with commercial bank ROA at 10% significant level. The higher the inflation rate, the higher bank's ROA but the higher the real lending interest rate, the lower bank's ROA.

For Model 2, it shown a R-squared equal to 0.2272 and Adjusted R-squared equal to 0.1194 which indicated that ~12% changed in dependent variable can explain by independent variables. The result tells that the relationship between accumulated FDI amount and commercial bank profitability (ROA) is not exist. The same outcome goes to other independent variables, except inflation rate that have a positive relation with commercial bank ROA at 5% significant level. The higher the inflation rate, the higher bank's ROA.

For Model 3, it shown a R-squared equal to 0.3047 and Adjusted R-squared equal to 0.2077 which indicated that ~20% changed in dependent variable can explain by independent variables. The result tells that the relationship between accumulated FDI amount and commercial bank profitability (ROA) is not exist. The same outcome goes to other independent variables, except inflation rate and real lending interest rate. While inflation rate that have a positive relationship with commercial bank ROA at 5% and real lending interest rate have a negative relationship with commercial bank ROA at 1% significant level. The higher the inflation rate, the higher bank's ROA but the higher the real lending interest rate, the lower bank's ROA.

4.2 Condition Checks

To verify the above results provided by multiple regression models (OLS) weather results are appropriated to use or not, 3 common assumptions of the classical linear regression (CLRM) needed to be checked.

First one is Heteroskedasticity Test, one assumption that OLS regression made is that all residuals are drawn from an observation that has a constant variance, error term is constant, known as homoscedasticity. If this assumption is violated, means that error term not constant, heteroskedasticity occur. When heteroskedasticity exits, although model is still unbiased and consistent but the OLS estimator is no longer

BLUE (Best Linear Unbiased Estimators) or less efficient and less reliable. Most general test according to flexibility is White test, where the hypothesis and results are shown in table below.

Ho: Homoscedastic (No Heteroskedasticity)

Ha: Heteroskedasticity

Table 11: Result of Heteroskedasticity test

White test	Model 1	Model 2	Model 3
P-value	0.189323	0.159887	0.446657
Result	Fail to reject Ho	Fail to reject Ho	Fail to reject Ho
	"There is no heteroskedasticity problem in above 3 models"		

Second test is Autocorrelation Test, another important assumption in OLS model is that the covariance between error term overtime is independent. The data would be autocorrelated when same variables are highly correlated across observation. This study applied Breusch-Godfrey test where the hypothesis and results are shown in table below.

Ho: No Autocorrelation

Ha: Autocorrelation

Table 12: Result of Autocorrelation Test

Breusch-Godfrey test	Model 1	Model 2	Model 3
P-value	0.843095	0.369992	0.757078
Result	Fail to reject Ho	Fail to reject Ho	Fail to reject Ho
	"There is no autocorrelation problem in above 3 models"		

Third test is Multicollinearity Test, last assumption in OLS model is that the strong relationship between regressor is not exit. This study already covered the multicollinearity test shown in correlation matrix, table 8. However, another way to detect the multicollinearity problem is VIF (Variance Inflation Factor) Test, where VIF value should not more than 10.

Table 13: Result of Multicollinearity Test

VIF Test	Model 1 - 3		Model 2		Model 3	
VIF Value	d_FDI	1.121	d_FDI	1.121	d_FDI	1.121
	d_GDP	1.274	d_GDP	1.274	d_GDP	1.274
	d_INF	1.210	d_INF	1.210	d_INF	1.210
	d_INT	1.145	d_INT	1.145	d_INT	1.145
	d_UNEM	1.083	d_UNEM	1.083	d_UNEM	1.083
	d_EXC	1.149	d_EXC	1.149	d_EXC	1.149
Result	"There is no multicollinearity problem in above 3 models"					

4.3 Discussion of Finding

Regarding of result of this study, it represent that there is uncorrelation among FDI and 3 dependent variables: ROA of 8 commercial banks (ROA), ROA of large commercial banks (ROA_L) and ROA of small commercial banks (ROA_S), however, there is high significant correlation among inflation rate (INF) and mentioned 3 dependents variations (1% , 5% and 5% respectively) ; while , lending interest rate (INT) correlates to ROA and ROA_S. Resulted harmonizes to studied result of Kanwal & Nadeem, 2013, which stated that INF and INT effecting ROA.

Uncorrelation among FDI and ROA of commercial banks in Thailand as result of this study is different from studied result of Musah, Gakpetor, Kyei, & Akomeah, 2018, which states that FDI had positive significant (1%) with ROA of commercial banks in Ghana. Even though, Thailand and Ghana are both developing countries; but different studied results might occur from different objectives of FDI inflow. In addition, even though, FDI inflow value in Thailand has been in growth trend for over 10 years; but it might still not significant enough to impact performance of commercial banks in Thailand. Another possible reason might be, major customers of commercial banks in Thailand are domestic enterprises, which also made uncorrelation among FDI and performance of commercial banks in Thailand.

Positive relation among inflation rate (INF) and mentioned 3 dependents variations harmonizes to studied result of Sufian, 2011, which states that commercial banks would adjust their interest rate charged correlated to variation of inflation rate for increasing their profitability.

Real lending interest rate (INT) correlates to ROA and ROA_S with 10% and 1% significant level respectively, which represents that interest rate effects to ROA of small commercial banks but not for large commercial banks due to large commercial banks. have higher efficiency to hedge cost in variation of interest rate with more deposit base, liquidity, and bargaining power, which made small commercial banks have lower efficiency to hedge cost in variation of interest rate.

These regression result also provide a guideline that external variables impact small commercial banks more than large commercial banks. In addition, result of various studies state that each commercial bank would have its own emphasized specific internal factors, which is major factor effecting its performance.

5. CONCLUSION & RECOMMENDATION

Impact of FDI have been research and observed in various direction, but mainly focus on effect of FDI on economic growth in receiving countries and found that recently higher porportion of FDI flow into developing countires. In addition, FDI was used to studied as an independent variable motivating development of both financial and banking system in various countires. In the past decade, Thailand was considered as a target investment destination from aboard.

Currently, Thailand is still consider as bank-based financial system, commercial banks play an important role promoting economic growth via supporting and driving both domestic and foreign investment. Therefore, this study, would like to explore relationship of FDI and macroeconomic variables in Thailand to commercial banks profit (ROA) during year 2007 – 2019 by applying one econometric tool: multiple regression (OLS). Furthermore, this study aims to provide guideline to commercial banks in Thailand by applying resulted to determine their policy and adjust their both short-term and long-term strategy to maximize their profit.

Regression results present insignificant relationship between FDI and commercial banks' ROA, while, 2 major macroeconomic variables: Inflation and Real Lending Interest Rate are found significant. Inflation is positively related to 3 dependent variables (ROA, ROA_L, ROA_S), on the other hand, Real Lending Interest Rate is negatively related on ROA and ROA_S of commercial bank; but not related to ROA_L.

For future research, limitation of this study is scoping only performance of commercial banks in Thailand during last 13 years (Y2007 – Y2019). Moreover, limitation in access data made uneable to emphasize specific of FDI and objective of investment in each sectors. Hence, further studies is better to extend the studying by using more specific data such as investigating an impact of internal variables instead of external variables, changing dependent variables from combine them as a group but test them individually and changing dependent variables from Thai commercial banks to Foreign commercial banks.

The empirical resulted provides a guideline to commercial banks and policymakers in Thailand that they should focus and pay more attention on inflation rate and real lending interest rate to maximizing their profit.

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APPENDIX

Appendix 1: Unit-Root test (ROA)

```
Augmented Dickey-Fuller test for ROA
testing down from 10 lags, criterion BIC
sample size 49
unit-root null hypothesis: a = 1

  with constant and trend
  including one lag of (1-L)ROA
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -0.307521
  test statistic: tau_ct(1) = -4.17973
  asymptotic p-value 0.004732
  1st-order autocorrelation coeff. for e: 0.039
```

Appendix 2: Unit-Root test (ROA_L)

```
Augmented Dickey-Fuller test for ROA_L
testing down from 10 lags, criterion BIC
sample size 49
unit-root null hypothesis: a = 1

  with constant and trend
  including one lag of (1-L)ROA_L
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -0.196101
  test statistic: tau_ct(1) = -3.90748
  asymptotic p-value 0.01176
  1st-order autocorrelation coeff. for e: 0.083
```


Appendix 3: Unit-Root test (ROA_S)

```
Augmented Dickey-Fuller test for ROA_S
testing down from 10 lags, criterion BIC
sample size 47
unit-root null hypothesis: a = 1

  with constant and trend
  including 3 lags of (1-L)ROA_S
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -0.161867
  test statistic: tau_ct(1) = -2.30136
  asymptotic p-value 0.4326
  1st-order autocorrelation coeff. for e: 0.025
  lagged differences: F(3, 41) = 3.322 [0.0289]
```

Appendix 4: Unit-Root test (FDI)

```
Augmented Dickey-Fuller test for FDI
testing down from 10 lags, criterion BIC
sample size 50
unit-root null hypothesis: a = 1

  with constant and trend
  including 0 lags of (1-L)FDI
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e
  estimated value of (a - 1): -1.12411
  test statistic: tau_ct(1) = -7.76397
  p-value 1.591e-007
  1st-order autocorrelation coeff. for e: 0.005
```

Appendix 5: Unit-Root test (GDP)

```
Augmented Dickey-Fuller test for GDP
testing down from 10 lags, criterion BIC
sample size 47
unit-root null hypothesis: a = 1

  with constant and trend
  including 3 lags of (1-L)GDP
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -0.969203
  test statistic: tau_ct(1) = -5.66696
  asymptotic p-value 7.071e-006
  1st-order autocorrelation coeff. for e: 0.019
  lagged differences: F(3, 41) = 5.491 [0.0029]
```

Appendix 6: Unit-Root test (INF)

```
Augmented Dickey-Fuller test for INF
testing down from 10 lags, criterion BIC
sample size 49
unit-root null hypothesis: a = 1

  with constant and trend
  including one lag of (1-L)INF
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -0.44879
  test statistic: tau_ct(1) = -5.66356
  asymptotic p-value 7.198e-006
  1st-order autocorrelation coeff. for e: 0.041
```

Appendix 7: Unit-Root test (INT)

```
Augmented Dickey-Fuller test for INT
testing down from 10 lags, criterion BIC
sample size 49
unit-root null hypothesis: a = 1

  with constant and trend
  including one lag of (1-L)INT
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -0.157277
  test statistic: tau_ct(1) = -3.06592
  asymptotic p-value 0.1146
  1st-order autocorrelation coeff. for e: 0.085
```

Appendix 8: Unit-Root test (UNEM)

```
Augmented Dickey-Fuller test for UNEM
testing down from 10 lags, criterion BIC
sample size 48
unit-root null hypothesis: a = 1

  with constant and trend
  including 2 lags of (1-L)UNEM
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -0.163643
  test statistic: tau_ct(1) = -1.49544
  asymptotic p-value 0.8315
  1st-order autocorrelation coeff. for e: -0.095
  lagged differences: F(2, 43) = 7.028 [0.0023]
```


Appendix 9: Unit-Root test (EXC)

```
Augmented Dickey-Fuller test for EXC
testing down from 10 lags, criterion BIC
sample size 50
unit-root null hypothesis: a = 1

  with constant and trend
  including 0 lags of (1-L)EXC
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e
  estimated value of (a - 1): -0.714555
  test statistic: tau_ct(1) = -5.14728
  p-value 0.0005697
  1st-order autocorrelation coeff. for e: 0.024
```

Appendix 10: Unit-Root test (d_ROA)

```
Augmented Dickey-Fuller test for d_ROA
testing down from 10 lags, criterion BIC
sample size 49
unit-root null hypothesis: a = 1

  with constant and trend
  including 0 lags of (1-L)d_ROA
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e
  estimated value of (a - 1): -0.782313
  test statistic: tau_ct(1) = -5.40677
  p-value 0.0002662
  1st-order autocorrelation coeff. for e: -0.034
```

Appendix 11: Unit-Root test (d_ROA_L)

```
Augmented Dickey-Fuller test for d_ROA_L
testing down from 10 lags, criterion BIC
sample size 49
unit-root null hypothesis: a = 1

  with constant and trend
  including 0 lags of (1-L)d_ROA_L
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e
  estimated value of (a - 1): -0.862545
  test statistic: tau_ct(1) = -5.94129
  p-value 4.943e-005
  1st-order autocorrelation coeff. for e: 0.034
```


Appendix 12: Unit-Root test (d_ROA_S)

```
Augmented Dickey-Fuller test for d_ROA_S
testing down from 10 lags, criterion BIC
sample size 49
unit-root null hypothesis: a = 1

  with constant and trend
  including 0 lags of (1-L)d_ROA_S
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e
  estimated value of (a - 1): -0.708254
  test statistic: tau_ct(1) = -5.02508
  p-value 0.0008479
  1st-order autocorrelation coeff. for e: -0.047
```

Appendix 13: Unit-Root test (d_FDI)

```
Augmented Dickey-Fuller test for d_FDI
testing down from 10 lags, criterion BIC
sample size 49
unit-root null hypothesis: a = 1

  with constant and trend
  including 0 lags of (1-L)d_FDI
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e
  estimated value of (a - 1): -1.58063
  test statistic: tau_ct(1) = -13.1571
  p-value 2.947e-020
  1st-order autocorrelation coeff. for e: -0.077
```

Appendix 14: Unit-Root test (d_GDP)

```
Augmented Dickey-Fuller test for d_GDP
testing down from 10 lags, criterion BIC
sample size 49
unit-root null hypothesis: a = 1

  with constant and trend
  including 0 lags of (1-L)d_GDP
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e
  estimated value of (a - 1): -1.11049
  test statistic: tau_ct(1) = -7.57172
  p-value 2.103e-007
  1st-order autocorrelation coeff. for e: -0.001
```


Appendix 15: Unit-Root test (d_INF)

```
Augmented Dickey-Fuller test for d_INF
testing down from 10 lags, criterion BIC
sample size 49
unit-root null hypothesis: a = 1

  with constant and trend
  including 0 lags of (1-L)d_INF
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e
  estimated value of (a - 1): -0.549668
  test statistic: tau_ct(1) = -4.17762
  p-value 0.00946
  1st-order autocorrelation coeff. for e: 0.199
```

Appendix 16: Unit-Root test (d_INT)

```
Augmented Dickey-Fuller test for d_INT
testing down from 10 lags, criterion BIC
sample size 49
unit-root null hypothesis: a = 1

  with constant and trend
  including 0 lags of (1-L)d_INT
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e
  estimated value of (a - 1): -0.446346
  test statistic: tau_ct(1) = -3.73143
  p-value 0.02941
  1st-order autocorrelation coeff. for e: 0.155
```

Appendix 17: Unit-Root test (d_UNEM)

```
Augmented Dickey-Fuller test for d_UNEM
testing down from 10 lags, criterion BIC
sample size 48
unit-root null hypothesis: a = 1

  with constant and trend
  including one lag of (1-L)d_UNEM
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -1.66962
  test statistic: tau_ct(1) = -9.30415
  asymptotic p-value 4.465e-017
  1st-order autocorrelation coeff. for e: -0.122
```


Appendix 18: Unit-Root test (d_EXC)

```
Augmented Dickey-Fuller test for d_EXC
testing down from 10 lags, criterion BIC
sample size 48
unit-root null hypothesis: a = 1

  with constant and trend
  including one lag of (1-L)d_EXC
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -1.70852
  test statistic: tau_ct(1) = -7.46282
  asymptotic p-value 1.023e-010
  1st-order autocorrelation coeff. for e: -0.014
```

Appendix 19: Regression Result Model 1 (d_ROA)

```
Model 1: OLS, using observations 2007:3-2019:4 (T = 50)
Dependent variable: d_ROA

            coefficient    std. error    t-ratio    p-value
  ------------------------------------------------------------
  const      -1.04250e-05   0.000146581   -0.07112   0.9436
  d_FDI       0.00160184    0.00315864     0.5071    0.6147
  d_GDP      -0.00610643    0.00512890    -1.191     0.2403
  d_INF       0.0395915     0.0120459      3.287     0.0020   ***
  d_INT      -0.179659      0.0894360     -2.009     0.0509   *
  d_UNEM     -0.0934019     0.0639619     -1.460     0.1515
  d_EXC       0.00100562    0.00524698     0.1917    0.8489

Mean dependent var    0.000071   S.D. dependent var    0.001097
Sum squared resid     0.000043   S.E. of regression    0.000997
R-squared             0.275730   Adjusted R-squared    0.174669
F(6, 43)              2.728351   P-value(F)            0.024620
Log-likelihood        278.3691   Akaike criterion     -542.7382
Schwarz criterion    -529.3541   Hannan-Quinn         -537.6415
rho                  -0.060039   Durbin-Watson         2.073851
```

Appendix 20: Regression Result Model 2 (d_ROA_L)

```
Model 2: OLS, using observations 2007:3-2019:4 (T = 50)
Dependent variable: d_ROA_L

            coefficient    std. error     t-ratio    p-value
  -------------------------------------------------------------
  const       0.000182666   0.000142616    1.281      0.2071
  d_FDI      -0.000883674   0.00307322    -0.2875     0.7751
  d_GDP       9.26245e-05   0.00499019     0.01856    0.9853
  d_INF       0.0283799     0.0117201      2.421      0.0197   **
  d_INT       0.0794098     0.0870172      0.9126     0.3666
  d_UNEM     -0.0801770     0.0622320     -1.288      0.2045
  d_EXC       8.85267e-06   0.00510507     0.001734   0.9986

Mean dependent var    0.000150   S.D. dependent var    0.001034
Sum squared resid     0.000040   S.E. of regression    0.000970
R-squared             0.227251   Adjusted R-squared    0.119426
F(6, 43)              2.107586   P-value(F)            0.071961
Log-likelihood        279.7400   Akaike criterion     -545.4801
Schwarz criterion    -532.0959   Hannan-Quinn         -540.3833
rho                   0.100922   Durbin-Watson         1.795159
```

Appendix 21: Regression Result Model 3 (d_ROA_S)

```
Model 3: OLS, using observations 2007:3-2019:4 (T = 50)
Dependent variable: d_ROA_S

             coefficient    std. error    t-ratio   p-value
  ---------------------------------------------------------
  const      -0.000344336   0.000289179   -1.191    0.2403
  d_FDI       0.00454175    0.00623146     0.7288   0.4700
  d_GDP      -0.0124686     0.0101184     -1.232    0.2245
  d_INF       0.0584329     0.0237644      2.459    0.0180   **
  d_INT      -0.680077      0.176442      -3.854    0.0004   ***
  d_UNEM     -0.102133      0.126186      -0.8094   0.4227
  d_EXC       0.00113124    0.0103514      0.1093   0.9135

Mean dependent var  -0.000048   S.D. dependent var   0.002209
Sum squared resid    0.000166   S.E. of regression   0.001967
R-squared            0.304762   Adjusted R-squared   0.207752
F(6, 43)             3.141556   P-value(F)           0.012113
Log-likelihood       244.3957   Akaike criterion    -474.7914
Schwarz criterion   -461.4073   Hannan-Quinn        -469.6947
rho                 -0.065281   Durbin-Watson        2.086079
```

Appendix 22: Heteroskedasticity Test Model 1 (d_ROA)

```
White's test for heteroskedasticity -
  Null hypothesis: heteroskedasticity not present
  Test statistic: LM = 33.2382
  with p-value = P(Chi-square(27) > 33.2382) = 0.189323
```

Appendix 23: Heteroskedasticity Test Model 2 (d_ROA_L)

```
White's test for heteroskedasticity -
  Null hypothesis: heteroskedasticity not present
  Test statistic: LM = 34.215
  with p-value = P(Chi-square(27) > 34.215) = 0.159887
```

Appendix 24: Heteroskedasticity Test Model 3 (d_ROA_S)

```
White's test for heteroskedasticity -
  Null hypothesis: heteroskedasticity not present
  Test statistic: LM = 27.3196
  with p-value = P(Chi-square(27) > 27.3196) = 0.446657
```

Appendix 25: Autocorrelation Test Model 1 (d_ROA)

```
LM test for autocorrelation up to order 4 -
  Null hypothesis: no autocorrelation
  Test statistic: LMF = 0.349026
  with p-value = P(F(4, 39) > 0.349026) = 0.843095
```

Appendix 26: Autocorrelation Test Model 2 (d_ROA_L)

```
LM test for autocorrelation up to order 4 -
  Null hypothesis: no autocorrelation
  Test statistic: LMF = 1.10053
  with p-value = P(F(4, 39) > 1.10053) = 0.369992
```

Appendix 27: Autocorrelation Test Model 3 (d_ROA_S)

```
LM test for autocorrelation up to order 4 -
  Null hypothesis: no autocorrelation
  Test statistic: LMF = 0.470417
  with p-value = P(F(4, 39) > 0.470417) = 0.757078
```

Appendix 28: Multicollinearity Test

```
Variance Inflation Factors
Minimum possible value = 1.0
Values > 10.0 may indicate a collinearity problem

       d_FDI     1.121
       d_GDP     1.274
       d_INF     1.210
       d_INT     1.145
      d_UNEM     1.083
       d_EXC     1.149
```

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