# DETERMINANTS OF BANKS PERFORMANCE IN BRAZIL

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DECLARATION

We hereby declare that:

(1) This undergraduate FYP is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the FYP.

(4) The word count of this research report is 15, 224 .

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# DEDICATION

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| | |
|---|---|
| BG | Breusch-Godfrey Test |
| BLUE | Best, Linear, Unbiased, Efficient |
| BPLM | Breusch-Pagan Lagrange Multiplier |
| CPI | Consumer Price Index |
| FEM | Fixed Effect Model |
| GDP | Gross Domestic Product |
| LSDV | Least-Square Dummy Variable |
| REM | Random Effect Model |
| ROA | Return on Asset |
| ROE | Return on Equity |
| TOL | Tolerance Factor |
| VIF | Variance Inflation Factor |

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# PREFACE

This paper is conducted under the title of “DETERMINANTS OF BANKS PERFORMANCE IN BRAZIL”. The performance of bank is an issue which every country is concerned about how it will influence the economy of the country. The economy of a country always correlated with financial sector. So, the performance of bank will influence the financial industry in a country.

We hope that the results and findings in our study will be useful for the investors, consumers, policy makers, or the future researchers. The content of this research will able to help readers to be more understanding about banking industry.

ABSTRACT

This purpose of this research is to identify the significance of the macroeconomics and bank-specific variables that will be affect the bank performance. Asset growth, liquidity, and leverage are the bank-specific factors, while gross domestic product (GDP), and inflation are the macroeconomic factors which selected to conduct this research. The five banks we chosen to do this research are Banco Bradesco S.A., Banco do Brasil S.A., Banco do Estado do Rio Grande do Sul S/A, Itau Unibanco, and Citigroup Inc. The data was collected on yearly basis from 1997 to 2017. The total sample size is 21. In this research, the variables that influence the banks' performance will be tested by using EVIEWS.

# CHAPTER 1: RESEARCH OVERVIEW

## 1.0 Introduction

This research purpose is to examine the determinants that affect the bank performance in Brazil from 1997 until 2017. The independent variables that we used in bank-specific which is liquidity, assets growth, leverage and also macroeconomic is gross domestic product (GDP) and inflation. For the dependent variable, we had chosen return on asset (ROA) to evaluate the bank performance. First of all, this study of research background will be discussed the background of the Brazilian banking sector. In problem statement, the main research problem and will briefly talk about objectives to achieve the aim of the study. There are some of the questions and hypothesis will be identified as a guidance to carry out this study. Last but not least, the significance of study was constructed how the independent can affect the bank's profitability of this study.

## 1.1 Research Background

The financial sector is one of the most vital parts towards developed economy of the world. It is offering financial services to retail customers and commercial which is one of the economy category. It includes investment funds, real estate, banks and insurance companies. The bank-based segment which in the Brazil of the financial sector is same as other banking sector that plays a critical role in economic development and financial sector development. According to Nyasha and Odhiambo (2013), the bank that in financial sector had been played as a special role in Brazil is due to their critical role in promoting payments and also channeling the credit to businesses and households.

According to Gul, Irshad and Zaman (2011), the banking sectors role as the life blood of modern commerce and trade in order to offer them with a major source of finance. The banks are vital entities as they are to preserve and promote the development of economics sectors in the economy. The Brazilian banking sector is one of the most developed banking sectors in the emerging market world. Despite the banking sector of development is outstanding such as other emerging economies' systems, it still confront some challenges which included high level of non-performing loans (Nysha & Odhiambo, 2013). The banking system is to maintain the allocation of resources more efficiency in economy such as by lending to individual and businesses which using the credit-scoring systems. Besides, the banks also facilitate the business through the provision of credit and settlement of funds to consumers. They provide facilitate and funds which can access 24-hour in order to individuals or institutions can invest and save safety. Brazilian banking provide a wide variety financial services and products. It also operates all the best run across the world and efficient because of the latest and high technology backed.

In addition, the bank performance is which in term of its capacity to generate profitability. Bank's profitability is a first line of defense toward unexpected losses because it has enhances the profitability through the investment of retained surplus and reinforce the capital position (European Central Bank, 2010). According to Lartey, Antwi and Boadi (2013), bank profitability is normally represent as a function of external and internal factors. The independents are classifying into bank-specific and macroeconomics in order to evaluate the bank's profitability. The bank-specific variables are classified as internal factors which that may influence in term of banking units.

On the other hands, the macroeconomics variables arise form from external factors which that affect the economy as a whole of Brazil. Macroeconomics variables are GDP and inflation. The measurement that have been chosen to determine the influence on the bank's profitability is ROA which is most related and significance. Macroeconomics variables are GDP and inflation. The research is concentrate on the bank's profitability in Brazil which have used the most recent data set from 1997 to

2017 to provide the latest findings. The five banks in Brazil is being chosen in this research is due to the trend of bank performance of the last five years were downward sloping. Next, the data of the bank in the Brazil is more complete compare to other banks. There are also less researchers doing the research about the banking sector in Brazil. In conclusion, this research is to investigate the internal and external determinants towards profitability of bank in Brazil since 1997 till 2017.

Table 1.1 Total Asset of Banks in 2017

| BANK | Total Assets (2017) US$Billion |
|---|---|
| Banco do Estado | 22.1265 |
| Banco Bradesco SA | 365.7001 |
| Banco do Brasil SA | 408.5125 |
| Itau Unibanco Holding SA | 433.2374 |
| Citigroup Inc | 1,842.4650 |

Source: Bloomberg

## 1.2 Problem Statement

The banking sectors' performance in the world is negatively affected by the global financial crisis (Mirzaei, 2013). The financial crisis in 2008 had gave rises to financial distress in institutions around the world. Banking sector always played a significant role to maintain the stability of economy in a country. It promotes the financial growth and maintains the economy that related with monetary aspects (Kalpana & Rao, 2017). The banks' function is collecting the deposits from the general public and advancing the loan to other people. The financial intermediation does affect the savings allocation, hence, helps to improve productivity, technical change and economic growth (Nyasha & Odhiambo, 2013). There were many journals also proved that the importance of banks in a country's development and financial sector. The banking performance need to be strengthen hence to increase the stability and profitability of banks. The banks who have a better performance are more capable to handle the negative shock (Mirzaei,

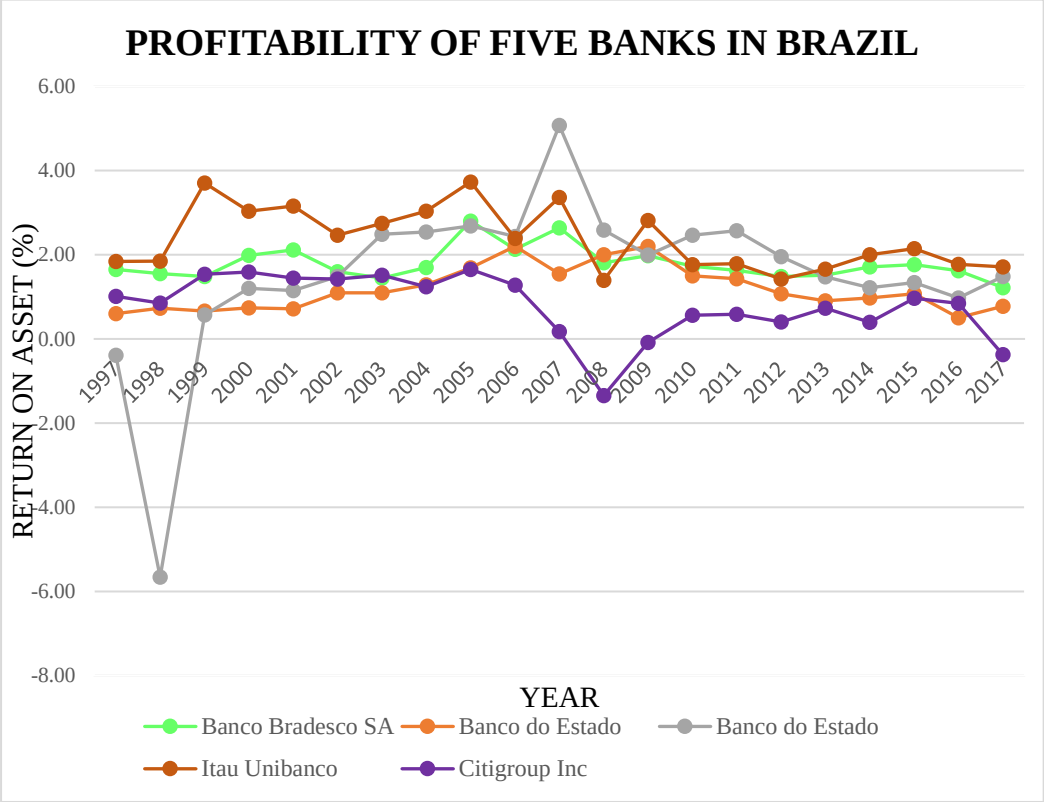
2013). Therefore, this research is conducted to find out what are the potential bank-specific and macroeconomic factors that can cause a significant changes to the profitability of bank in Brazil.

Nowadays, the profitability of banks is not the only issues that need to consider in the banking sectors but the efficiency and effectiveness of banks. The macroeconomic factors also will affect the banks performance. In this study, asset growth, liquidity, leverage, GDP, and inflation are chosen to assess the performance of banks in Brazil. The asset growth, liquidity, and leverage are bank-specific factors while the GDP, and inflation are the macroeconomic factors. Bank-specific factors are the factors within the control of bank while macroeconomic factors are the factors that are not related to the management of banks but related with the economic issues that will cause an effect to the performance of banks (Antwi, Boadi & Lartey, 2013).

The primary goal of the business ventures is profitability. The profitability is chosen to measure the performance of banks. Profitability refer to the business' ability to gain a profit or produce a return on investment. There were differences between the profitability and profit. Profit is the number calculated after the total revenue minus total expenses. The investors will not rely on the profit of a business, investors will view the profitability of a business before entering into an investment. In the long run, the business will not continue without the profitability of business. This research will focus on studying the bank performance in profitability term. The ROA is used as the indication. ROA showed the management ability of a banks to produce profits on the assets of bank (Ameur & Mhiri, 2013). This ratio shows how efficient of the bank's management using its assets.

| ROA = Net Income/ Total Assets |
|---|

Figure 1.1: Profitability of Five Banks in Brazil




Source: Bloomberg

The ROA of the five banks in Brazil we chosen to do this research were dropped over the recent years. The five banks chosen to use in this research are Banco Bradesco S.A., Banco do Brasil S.A., Banco do Estado do Rio Grande do Sul S/A, Itau Unibanco, and Citigroup Inc. According to the Figure 1.1, the ROA of five banks experienced a drop from 2015.

Brazil experienced an economic crisis from 2015 until 2017. Economic crisis happened in Brazil is associated with the political crisis which caused by the former president Dilma Rousseff. She became the president of Brazil in 2011. The former President Dilma Rousseff was convicted for transferring funds among the government budget. The political uncertainty due to the presidential election. The uncertainty about the fiscal reforms made the confidence of investors decline. Most of the investors unwilling to take the risk. The investors avoid to invest during the damaging financial conditions

and caused the profitability of banks in Brazil dropped.

Furthermore, Dilma Rousseff lowering the gasoline price during her tenure. The profits of the oil company decreased due to the price control. The investors curtailed the investment in oil company when the government intervened by controlling the price. The economic conditions in Brazil became more exacerbation when the interventions of banking industry. The primary export product in Brazil is oil. The oil prices of Brazil fell as the dollar strengthened in 2015. The Brazil currency experienced a weak conditions and the prices of imports increased, thus inflation also increased. This situation affected the profitability of banks in Brazil. The price of goods and services increased as the inflation rise, this situations decrease the purchasing power of individuals. Thus, increased inflation increase the living cost of the people in Brazil. The profitability of banks was reduced because when the amount of saving reduced, the banks had less money can be used to make investment and reduce the investment opportunities.

The central bank real interest rate also known as discount rate and called Special System of Liquidation and Custody (SELIC). The central bank real interest rate in Brazil is among the highest compared with other countries. The economic activities of a country will increase or decrease when a central banks make a decision to change the interest rate. The central banks will reduce the central bank interest rate when the economy is stagnant. The banks in Brazil can earn more profit when the real interest rate is high. The reduction of central bank interest rate in 2017 caused many uncertainty to the economic and also banking sector. This action taken was due to the inflation of Brazil has a dramatic drop in 2017. There was a relationship between the change of central bank interest rate and the banks' profitability. When the central bank interest rate decrease, the interest rate charge on the loan reduced. Therefore, the profitability of banks on the loan also decrease. The decrease in the central bank interest rate affect the profitability of banks in Brazil which the bank's profitability reduced in recent years.

In conclusion, this research wants to investigate to how the bank-specific and macroeconomic determinants can give effect on a profitability of bank.

## 1.3 Research Objectives

Research objectives state the purposes of this study. All the research objectives should be gained at the end of the research.

### 1.3.1 Main Objective

- To investigate the bank-specific and macroeconomic factors that can give an effect on the performance of banking sector in Brazil from 1997 to 2017. The research is conducted based on the study of five banks in Brazil.

### 1.3.2 Specific Objectives

- To examine there is any relationship between the asset growth and banking sector performance.
- To examine there is any relationship between the liquidity and the banking sector performance.
- To examine there is any relationship between the leverage and the banking sector performance.
- To examine there is any relationship between the GDP of Brazil and the banking sector performance.
- To examine there is any relationship between the inflation of Brazil and the banking sector performance.

## 1.4 Research Question

### 1.4.1 Main Research Question:

- What are the determinants that affect the performance of banking sector in Brazil?

### 1.4.2 Specific Research Question:

- Is there any relationship between the asset growth and the banking sector performance?
- Is there any relationship between the liquidity and the banking sector performance?
- Is there any relationship between the leverage and the banking sector performance?
- Is there any relationship between the gross domestic product of Brazil and the banking sector performance?
- Is there any relationship between the inflation of Brazil and the banking sector performance?

## 1.5 Hypothesis of the study

### 1.5.1 Bank-Specific Factors

#### 1.5.1.1 Asset Growth

$H_0$ : No significant relationship between asset growth and bank's profitability.

$H_1$ : Significant relationship between asset growth and bank's profitability.

#### 1.5.1.2 Liquidity

$H_0$ : No significant relationship between liquidity and bank's profitability.

$H_1$ : Significant relationship between liquidity and bank's profitability.

#### 1.5.1.3 Leverage

$H_0$ : No significant relationship between leverage and bank's profitability.

$H_1$ : Significant relationship between leverage and bank's profitability.

### 1.5.2 Macroeconomic Factors

#### 1.5.2.1 Gross Domestic Product

$H_0$ : No significant relationship between GDP and bank's profitability.

$H_1$ : Significant relationship between GDP and bank's profitability.

#### 1.5.2.2 Inflation

$H_0$ : No significant relationship between inflation and bank's profitability.

$H_1$ : Significant relationship between inflation and bank's profitability.

## 1.6 Significance of Study

The main purpose of this study is identifying whether the macroeconomics and bank-specific factors will make an impact the profitability of banks in Brazil. ROA is chosen as the dependent variable in this research. Asset growth, liquidity, leverage, GDP, and inflation are the independent variable used in this research. The variables are calculated by fixed formula in resulted to obtain more precise results.

This study can help to improve the awareness on how the independent variables affect the banks performance. The banks will be more understanding about the factors affect the financial performance. Also, the banks can improve their performance and make future plan when they are more understanding about the impacts of each factors. Thus, the banks can make profit by knowing will on the changing variables.

Furthermore, investors and shareholders can benefit from this research. It can help to develop a common understanding in the banking sectors. When the investors have a deeply understanding about the factors, they can make correct decision to earn return.

They also can invest with fewer risk and less uncertainty to earn a desirable return. Means that they can choose to invest in the right bank to reduce the failure risk.

In addition, the government also can get benefit from this research when making a decision, choosing an investment even implementing a new policy related with banking sector. When government can better understand about the factors that affecting the banks' performance, the government can make some amendments on the existing policy that make the policy become more complete and integrity.

Other than that, this research also useful for the internal users of the banks such as the managers and employees. They can calculate the financial ratio like leverage and liquidity ratio to understand how the factors affecting the bank's profitability. When the banks understand about the impact of each factors, the management of banks can improve and modify the future plans like the explanation of business and operational activities.

In conclusion, this research will provides the information and detail of the determinants that affecting the bank's performance. Also, we can be more understand on the impacts bring by the determinants that will affect the banks' performance, economy and society.

# CHAPTER 2: LITERATURE REVIEW

## 2.0 Introduction

In this chapter, there will be a discussion on the journals related to the variables under the research topic. It will highlights the relevant literature done by previous researchers, follow by a study on the theoretical model in order to construct the fundamental for the conceptual framework. After that, there will be a part in stating the testable relationships between the variables in this research. This chapter is ended with a short conclusion.

## 2.1 Reviews of Literature

Banking sector plays a crucial role in stabilize the economy. The performance of the banking sector can be assessed in several ways and there are various determinants that affect the performance of bank. The determinants can be classified into two main groups, bank-specific determinants and macroeconomics determinants. In the bank-specific determinants, the variables are controllable because those determinants are bank-specific in nature. While in the macroeconomic determinants, the changes affect the economy in a whole.

### 2.1.1 Dependent Variables: Bank's Profitability

#### 2.1.1.1 Return on Assets (ROA)

ROA is chosen as the indicator for measuring bank's profitability. ROA indicates the ability of the company to generate incomes by its resources. ROA is a common measurement for bank's profitability among the researchers like Alper and Anbar (2011), Alkhazaleh and Almsafir (2014), Jureviciene, Skvarciany and Titko (2015), Abdul Jamal, Hamidi and Abdul Karm (2012) and Bikker (2010). Another common measurement for bank's profitability is return on equity (ROE). ROE measures the efficiency of the company in generating profit from the shareholders' capital. ROE is more appropriated in other financial related field. Doorasamy (2016) used ROE as the indicator to evaluate the financial performance of companies in food industry.

In the research done by Muda, Shaharuddin and Embaya (2013), the ability of the bank's management to make profit from the bank's financial and investment resources is disclosed and evaluated by the use of ROA. Bashir (2003) outlined ROA is able to influenced by factors, disregard the nature and the policy decisions of the bank. Moreover, he also stated the fact which some of the banks used financial leverage such as loans and borrowings deliberately as a method to raise their ROE for competitive purpose. Sufian and Habibullah (2009) defined ROE as the return on average total shareholder equity of the bank and take into account on the utilization of shareholder's equity but not the liabilities of the banks to finance its operation. Thus, ROE does not precisely indicates high profit when the ratio is high. Davydenko (2010) pointed out that drawback of using ROA as a measurement for bank's profitability as it excludes off-balance sheet items. He was supported by Alexiou and Sofoklis (2009) and Goddard, Molyneux and Wilson (2004). They argued that off-balance sheet items have noteworthy to determine bank's profitability. Off-balance sheet

items is those assets and liabilities that are not recorded in the company's balance sheet like securitized loans sold as an investments and operating lease.

## 2.1.2 Independent Variables: Bank-Specific Determinants

### 2.1.2.1 Asset Growth

Asset growth is used as an indicator to evaluate and estimate the growth of an investment or asset in term of its price and its value. Gray and Johnson (2010) determined the relationship between the asset growth and the cross-section of stock returns in Australian stock market over 25 years and their result supported Cooper, Gulen and Schill (2008). Large size of banks is assumed to get advantage from economies of scale and decrease their cost of operation (Boyd and Runkle, 1993) and offering diversified financial facilities to their customer at a lower cost (Hassan and Bashir, 2005).

Bashir (1999) pointed out the effect of size of banks in relation with its operation as well as risk associated in the operation. Normally, small banks are able to operate with high ROA, low leverage multiplier and a low ROE while large banks are opposite with low ROA, high leverage multiplier and high ROE. However, big size banks are more favourable due to its policy decisions and regulatory requirements. High ROA often associated with high risk, small banks forced to operate under high level of equity among its capital and limited to diversify their portfolio in order adhere to certain level of capital adequacy requirements in as preventing over aggressive risk-taking behaviour. In contrast, large banks are often operate with diversified portfolio which further mobilize their funds to increase the returns for their depository and shareholders. Another advantage is the ability to utilize large amount of arbitrage transactions which enable them to exploit the underneath profits of these transactions. In addition,

large banks expose themselves to a large amount of profitable investment opportunities through the low cost of collecting and processing information and access the investment activities by the advantage of economies of scale.

Hann and Poghosyan (2011) concluded that large banks significantly affected the financial stability of a country through their stable earnings. Their result had robustly supported the inverse relationship between earnings volatility and bank size, especially during the recent financial crisis. They included the 'too big to fail' by using leverage to control its impact. The superior advantage for large banks to enjoy economic of scale has been further emphasized in the research done by Kozubovska (2017). In his research, 'too big to fail' is discussed in the perspective of splitting those large banks. Large banks are able to control and decrease their costs through economies of scale. He highlighted the advantage of technological and investment activities result from bank's tremendous size of resources. Daley, Matthews and Whitfield (2006) used the banking industry in Jamaica in comparison with the developed economies in detecting the arise of bank failure. Surprisingly, the determinants are able to predict the potential distress and failure. They further discussed the reason which mainly caused by the inefficiency mobilization of capital received by the banks. It can be simplified as the sacrifice quality for the quantity in order to speed up their business expansion. Davydenko (2010) argued the increase of bank's size may negatively affected the bank's profitability in the concern of rising regulatory requirements. As the capital increases, the allocation of the resources will be increase proportionally to ensure the compliance of law. Regulatory requirements and restrictions is mandatory for warning and prevention purpose for the possible financial distress.

#### 2.1.2.2 Liquidity

Liquidity can be defined as how quickly an asset can be purchase or sell without heavily hindering the price of that asset. This research use liquidity ratio to assess the performance of banking industry. Liquidity ratio determine the company's ability to meet its short term financial obligations. It is a norm that a high liquidity ratio or standard industry average liquidity ratio for a company implies a good and stable financial position which can avoid financial distress or even insolvency when the environment become unfavourable.

In Abduh and Idrees (2013)'s research, liquidity ratio is computed by including loan as they claimed that loan management is critical when evaluating the performance of bank and emphasized on the rise in profits for the banks when convert deposits into loans. They further stated that loaning activities is one of the core business for banking industry. Alper and Anbar (2011) calculated the liquidity ratio by using liquid assets divided by total assets in order to find out the total proportion of liquid assets inside the particular bank. In the research, it strengthen the significant effect of liquidity problem is among the major reasons behind the bank insolvency. They also mentioned the inconsistency of the relationship between bank's liquidity and bank's performance in the previous studies like Bourke (1989) and Molyneus and Thorton (1992). In the research done by Bashir (2003), he stated a strong positive relationship between the liquidity and the bank's profitability was found in previous studies in the United State. Some of the studies suggest that profitable banks are in a healthy capital level which enable the advantage of acquiring high quality of financial resources. It is constructed under the view of utilizing equity capital where loans management has the same positive relationship with bank's profitability.

Regarding loan activities, Vong and Chan (2006) have stated that the effect on the profitability of banks varies from the consequences of bank's management performance. They used asset composition as their proxy which is more precise

and solely based on the effect of loaning. They outlined the fact that cost of funds management increase proportionately with the growth of loan size which negatively affect the bank's profitability. The result of their research supported their findings which stated the importance of spread and quality of the loans, disregard the size of the loans. Hassan and Bashir (2005) emphasized the critical role of liquidity in the recent financial crises and solvency problem. It is essential and critical to manage the liquidity in a day-by-day basis with regularly update, monitor and review the current system or indicators as a prevention for any potential liquidity problems. Poor management on liquidity might lead to insufficient capital to run the operation or even insolvency when it becomes severe.

#### 2.1.2.3 Leverage

Leverage is the use of equity or borrowed capital as a source of funds for financing their operation and compensate the risk associated with their investments.

Bashir (2003)'s research stated that in the past studies based on United State, it is a statistically significant and positive relationship between leverage and bank's profitability. He further strengthen that if a bank is profitable as long as it remain well capitalized. Generally, a well-capitalized bank is able to access low risk source of funds which improve the overall profit level of the bank with the support of Bourke (1998). He also highlighted that loan activities represent the core profits for the banking industry. In the research done by Beltratti and Stulz (2012), those banks performed better during the crisis are those banks with a low financial leverage and lower returns before the crisis. Low financial leverage suggests that the banks have sufficient capitals to meet its short term financial obligations which is critical especially during financial depression to prevent insolvency.

Awunyo-Vitor and Badu (2012) found that listed bank on the Ghana Stock Exchange was extremely geared which suggest that the banks are over relying on the short term debt to finance their operation. They also outlined one of the reason which is the high lending rate in the country which forced the citizens to engage in short term debts. Another reason that was highlighted by Awunyo-Vitor and Badu (2012) was the lack of development in the local stock market which discourage the banks to engage in the long term debts due to the associated high risk within the financial instrument. They found a negative significant effect on the bank's profitability. It is extremely dangerous for the bank that is operating under high gearing due to the high demand for the deposits arise during financial depression.

In the research done by Kiema and Jokivuolle (2014), the effect of leverage on bank's profitability is discussed by using Basel III. Basel III has presented the non-risk-weighted leverage ratio requirement (LRR) for the purpose of providing a more strong capital buffer against the "model risk". Model risk can be roughly define as a type of risk that happens when a failure of financial model used to evaluate the risk associated with the firm's market. LRR is the complements for the internal rating based (IRB) capital requirements. They found out that LRR encourages the bank with low risk portfolio to engage in high risk portfolios until LRR is no longer a restrictions. It is negatively undesirable for the banking industry due to the diversification shapes the bank's portfolio to be similar as the industry. Thus, the bank is more exposed and sensitive to the model risk which further affect the stability of the industry as well as the profitability of individual banks.

## 2.1.3 Independent Variables: Macroeconomic Determinants

### 2.1.3.1 Gross Domestic Products (GDP)

GDP indicates the economy's performance of the country. It defined as the total monetary value of the final products and services in the geographical area of the country's borders within a specific period of time. If the country performs relatively well within the time period, banking industry will take advantages from the increasing demand of their products and services which trigger several advantages for the country like enhance the development of the country and the standard living of their citizens.

In the past researches, several proxies are used by different researchers in order to suit with their research's topics like GDP growth rate, real GDP, nominal GDP and GDP per capita. Davydenko (2010) and Sufian and Chong (2008) used logarithm of GDP for the measurement of GDP in his research that concerned about the bank's profitability in Ukraine. Logarithm is used to serve better measurement and clear comparison on the changes of the data. It proven as more meaningful and robust in comparison with the raw data. Acaravci and Calim (2013) set their proxy for GDP as the real GDP in their research which focus on the Turkey banking's profitability. Real GDP is free from the effect of the inflation occurs in the country. Research done by Riaz and Mehar (2013) which study the impacts of the bank specific and macroeconomic variables on the bank's profitability in Pakistan use GDP growth rate as the proxy in the research because they are concerned with economy's performance in yearly term.

Bashir (2003) stated that GDP will positively affect the bank's profitability. He highlighted on the relationship of individual, bank and economy's growth rate. A soundly managed and well organized bank is likely to benefits during the

expansion of economy as the banks is able to handle the increasingly high demand and widen portfolio that the banks is willing to commit. Roman and Danuletiu (2003) outlined the positive relationship between the economy performance and bank's profitability in Romania with the same view with Bashir (2003). In the research, the increase in the economy's performance is being related with the demand for loans because loan lending is arguably the most important activities for the banks. Davydenko (2010) hold the same view as the positive relationship between variables in the Ukraine's banks. Growth of economy enhance the debt servicing capacity of domestic borrowers which ascertain the collection of bank's debtor further lead to the introduction of new loans. However, Staikouras and Wood (2004) who are concerned with the European bank's profitability stated that GDP growth is negatively affect the bank's profitability. It is due to high level of competition in interest rate. When return on equity and net interest margin are being used as the proxies for bank's profitability, the research conducted by Ameur and Mhiri (2013) showed a negative relationship of bank's performance and GDP in Tunisia. Negative relationship of GDP and bank's performance is supported by the research done by Francis (2013) as he highlighted the relationship is caused by the unfavourable and negative performance of country's economy within the study period. It is notable that some of the researchers have concluded that GDP is insignificant to the bank's profitability like Abduh and Idrees (2013) and Ramadan, Kilani and Kaddumi. (2011). Ramadan, Kilani and Kaddumi (2011) stated that the reason for GDP is insignificantly related due to the increasing competitive condition in the industry that cause by the new entrants.

#### 2.1.3.2 Inflation

Inflation defined as the rise in goods and services' price that cause the decline in the purchasing power of individuals. Among the proxies use for the variable, consumer price index (CPI) is the most common proxy. CPI indicates the changes of percentage annually in the cost to the average consumer acquiring a

basket of goods and services which might determined or adjusted within a specific time period (Vejzagic & Zarafat, 2014).

Positive relationship between inflation and bank's profitability is expected when the growth in income is faster than the cost incurred, vice versa. The effect of inflation on the banking industry has been highlighted by Staikouras and Wood (2004) and stated that inflation is capable to challenge the stability of financial system and the ability of the regulators to control the bankruptcy of financial intermediaries. The effect of inflation impacts the industry indirectly by influencing the demand of the individuals through the changes in their purchasing power. Moreover, bank profitability is influenced through the assessment of loan decisions because the anticipated rate of inflation might be lower than its expected figures and lead to an agreement on high interest rate.Thus, problems arise from the planning and negotiation of loans which is influenced by the uncertainty on future inflation rates.

The effect of inflation on the bank's profitability is discussed by Guru, Staunton and Shanmugam (2002) based on Malaysia's commercial banks. Their research in line with Vejzagic and Zarafat (2014). The consequences of bank's profitability is influenced by the inflation are depend on either the inflation is anticipated or unanticipated. The bank's profitability is positively affected by the inflationary condition in the economy when it is fully anticipated follow by the necessary adjustment on the interest rates. Inflation reduce the value of the real income of the consumers which lead to the encouragement on consumers to seek for investment or high return financial instruments. This situation challenges the bank's profitability by increase competition to the tradition core lending activities of the banks (Pan & Pan, 2014). It is supported by Tan and Floros (2012) as the impacts of inflation depend solely on the bank's awareness and consumer behaviour. Gul, Irshad and Zaman (2001) reviewed the effect of inflation on bank's profitability through the company's pricing behaviour towards the potential changes in inflation.

Among the past researchers, the results on the relationship are inconsistent. Pan and Pan (2014) stated that inflation is positively related to bank's profitability in China which same with Tan and Floros (2012), Garcia-Her rero, Gavila and Santabarbara (2009) and Sufian (2009). In the Southeast Asia region, Guru, Staunton and Shanmugam (2002) found a positive relationship between inflation and bank's profitability in commercial banks of Malaysia while Sufian and Chong (2008) stated inflation is negatively related with bank's profitability in Philippines. The positive relationship is supported by popular past studies like Bourke (1989) and Molyneux and Thornton (1992). Particularly in Brazil, Afanasieff, Lhacer and Nakane (2001) found a significant but negatively impacts on the pure spread of the bank. Vejzagic and Zarafat (2014) stated inflation has insignificant impacts on Malaysian bank's profitability except for Public Bank and Hong Leong Bank which are significantly negative affected by inflation.

## 2.2 Review of Relevant Theoretical Models

Theoretical model can be described as the theories which include the philosophies that are related to the topic of the research. Theoretical model assists in the formation of the relationship between practical application and theoretical aspects. In this particular sub-section, theoretical models from previous studies are being review in order to evaluate and enhance our understanding on the relationship between variables to assist in formulating the proposed theoretical or conceptual framework.

### 2.2.1 Economies of Scale Theory

In brief, economies of scale defines as the point when a company or enterprise achieves and able to enjoy the decrease in cost per unit with the increase in the scale of production. The relationship of the quantity of productions and fixed costs per unit is negatively related under this theory. Large banks are expected to utilize the benefits arise from its size and take advantage of the economies of scale by decreasing the costs of gathering and processing information in order to assess the market conditions as well as individual's financial soundness. In extend, large banks are also anticipated to be more diversified by aggressive expansion on its business. Diversification enables the mobilization of funds and enhancing the returns on events like depository activities and its shareholders' wealth. The advantage arise from the economies of scale greatly boosts the return from investments due to its enhance the bank's ability to assess the potential profitability from the large number of investment opportunities (Bashir, 1999). Ultimately, large banks which achieved economies of scales have a superior impacts on the economy of the country. Thus, asset growth and bank's profitability are positively related under this theory.

### 2.2.2 Bank Liquidity Creation Hypothesis

According to Berger and Bouwman (2007), the standard explanation for liquidity creation is that liquidity is created by the banks through transforming illiquid assets into liquid liabilities. Despite that, some of the researchers argue that the liquidity creation can be simply done by changing their funding mix or the liability side. Berger and Bouwman (2007) further concluded in their research that liquidity creation by banks happen through either alternation in the mix of the both side in the balance sheet or off-balance sheet activities. In extend, there are two core reasons behind the existence of banking industry in the economy which include the banks create liquidity and transform risk from one

party to another party. For example, in mortgage loans, bank accepts property from the public which pledged as collateral. In exchange, bank settles the payments for the public and offers a long term repayment obligation for the public. Through it, banks assumed certain degree of risk and enhance the flow of funds in the economy. It is important to emphasize that Berger and Bouwman (2007) assess the bank performance through the view of investors. They found a positively significantly relationship between liquidity creation and bank performance.

### 2.2.3 Financing Theory (Risk-return trade off)

In the theoretical aspects, risk is increasing alongside with increasing usage of leverage. Thus, high expected return are required from the bank's profitability to compensate or else the banks are refuse to absorb the high risk (Aremu, Ekpo & Mustapha, 2013). Risk-return trade off is basically the decision or the 'trade off' for investors who willing to absorb the risk for the expected return. In the research done by Olweny and Shipho (2011), they proposed that capital adequacy negatively related with the bank profitability in the view that banks seek for high return through the high level of leverage in financing its operation in order to increase their profitability through borrowing and lending activities as their source of funds instead of equity financing. It is mostly credit risk which arise when borrowers fail to meet their obligations on the repayment. Curak, Poposki and Pepur (2012) stated banks are encourage to increase their lending activities which expose themselves to a decent level of credit risk and required high return to compensate the banks' willingness as highly leveraged financing operation. However, credit risk is not able to be offset by the high return from the repayment of loans due to the increasing numbers in non-performing loan when it is negatively related. Based on the theory, bank's profitability and leverage is negatively related.

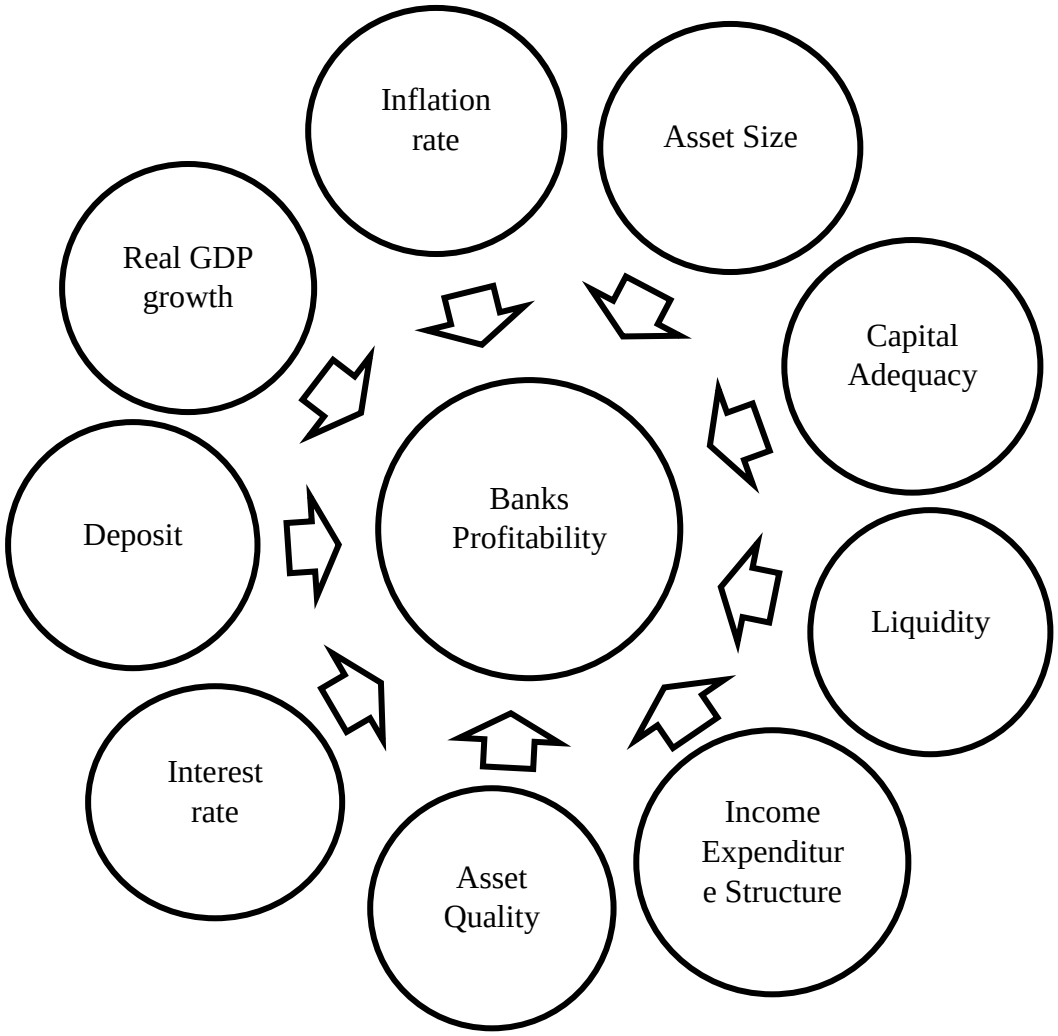
### 2.2.4 Financial Intermediation Theory

As mentioned in research from Wasiuzzaman and Tarmizi (2010) which concerned on profitability of Malaysian banking industry, the likelihood of credit default is higher when the individual purchasing power is lower during recession while the demand for financial facilities increase proportionally with the growth of GDP as individual tends to enhance their standard of living with excess income. The rise in the flow of funds act as a catalyst in boosting the business activities and financial activities like investment in the economy, further drive up the GDP. The relationship of GDP and bank profitability can be explained by financial intermediation theory in a view that the theory concerns about the information asymmetry and agency theory (Andries, 2009). Both elements contribute in developing a perfect market with low transaction cost, perfect information and adequate regulation. Existence of financial intermediaries aims to achieve optimal allocation of resources and mobilization of funds from the cash surplus unit to cash deficit unit through their business which is mainly attracts deposit and grants loan as they alternate the nature of financial assets and issue their own products or services. Thus, the banks as financial intermediaries are able to realize an increase in profitability in a boom economy or bank's profitability increase proportionally with the GDP.

## 2.3 Conceptual Frameworks

### 2.3.1 Previous Conceptual Frameworks

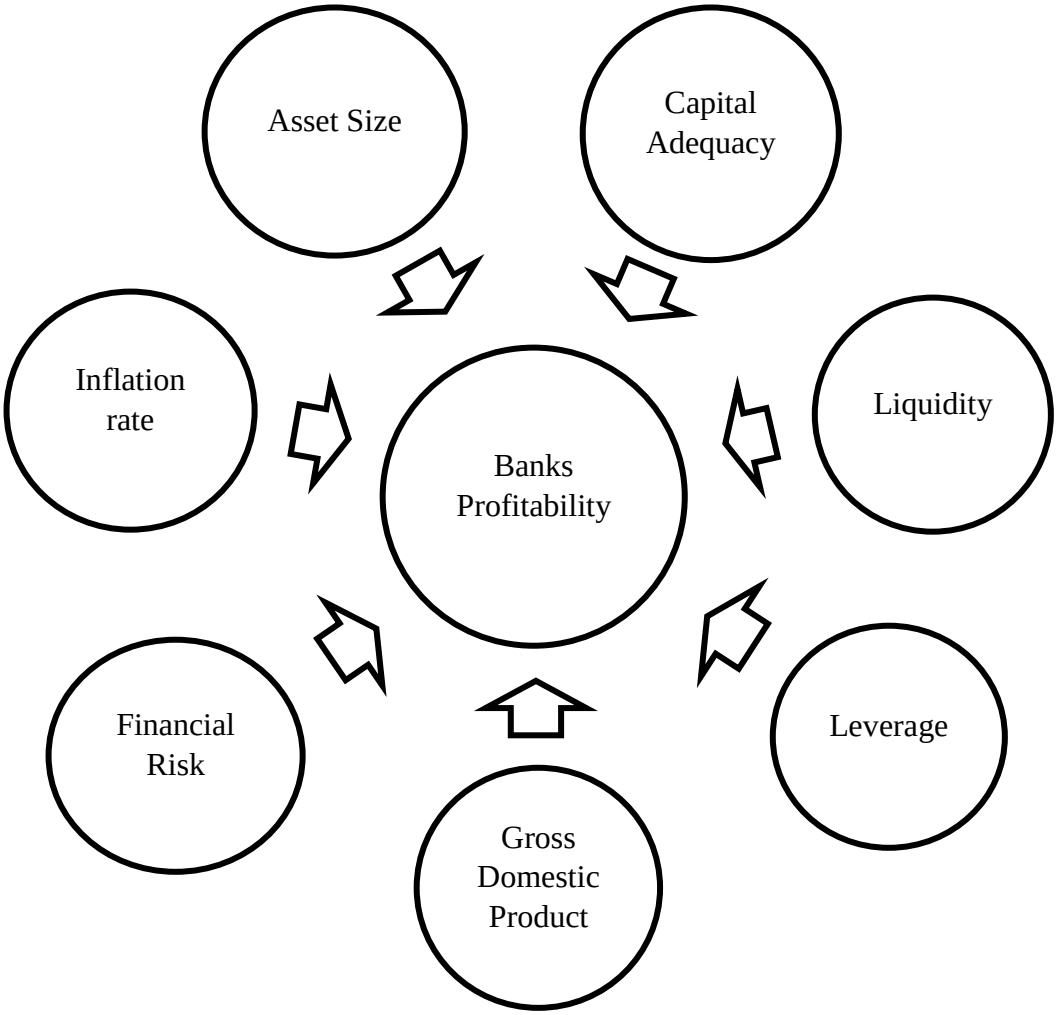
Figure 2.1: Bank Specific and Macroeconomic Determinants of Commercial Bank Profitability: Empirical Evidence from Turkey (2011).




The authors study on the bank-specific and macroeconomic determinants of the bank profitability in Turkey, the variables included in this research is inflation, asset size, capital adequacy, liquidity, income-expenditure structure, asset quality, deposit and GDP. The panel data set and fixed effects model used in this research.

In this Turkey research found that the asset size is positive significant affect banks' profitability and this prove the economies of scale theory. The weak asset quality and credit portfolio volume have negative impact on profitability. The relationship between loans and profitability is negative relationship. The non-interest income/asset ratio which under the income expenditure structure have positive and significant consequent on profitability. There is just real interest rate have positive impact on profitability in the macroeconomic factor. The remaining determinants such as liquidity, capital adequacy, deposits/asset ratio, inflation rate and real GDP have not significant impact on the profitability.

Figure 2.2: Bank Specific and Macroeconomic Determinants Impact on Banks Profitability: Evidence from Asian Countries (2017).



The determinants used by authors to study the profitability of bank is capital adequacy, liquidity, leverage, financial risk, asset size, inflation rate and GDP. The regression model techniques is use to regress the panel data. This research found that liquidity and leverage have positive significant impacts on banks' profitability. Next, the financial risk have negative impact on profitability. Besides that, the asset size have positive impact on banks' profitability. The capital adequacy have positive insignificant effects on banks' profitability. There is negative influence on banks' profitability from the GDP and inflation rate.

### 2.3.2 Proposed Conceptual Frameworks

Figure 2.3: Determinants of bank's profitability in Brazil

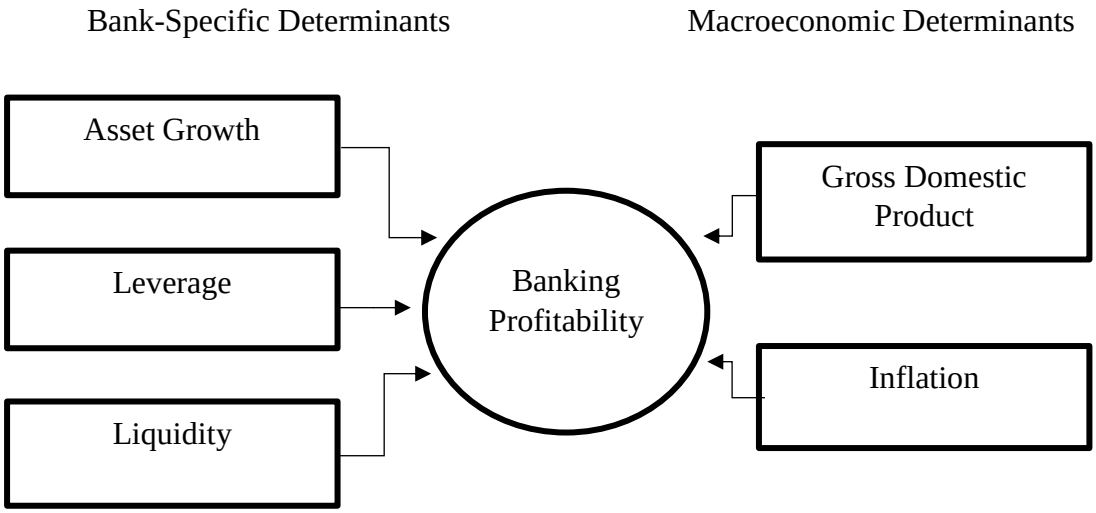



Figure 2.1 is the conceptual framework for this research, the bank-specific determinants included asset growth, leverage and liquidity, the macroeconomic determinants consists of inflation and GDP.

## 2.4 Hypotheses Development

### 2.4.1 Asset Growth

$H_0$ : There is no significant relationship between asset growth and bank's profitability

$H_1$ : There is significant relationship between asset growth and bank's profitability.

### 2.4.2 Liquidity

$H_0$ : There is no significant relationship between liquidity and bank's profitability

$H_1$ : There is significant relationship between liquidity and bank's profitability.

### 2.4.3 Leverage

$H_0$ : There is no significant relationship between leverage and bank's profitability

$H_1$ : There is significant relationship between leverage and bank's profitability.

### 2.4.4 Gross Domestic Product

$H_0$ : There is no significant relationship between GDP and bank's profitability

$H_1$ : There is significant relationship between GDP and bank's profitability.

### 2.4.5 Inflation

$H_0$ : There is no significant relationship between inflation and bank's profitability.

$H_1$ : There is significant relationship between inflation and bank's profitability.

## 2.5 Conclusion

In short, this chapter consists of literature review done by previous researcher, theoretical model and it will support the conceptual framework, then is the testable relationship within the dependent variable and independent variable.

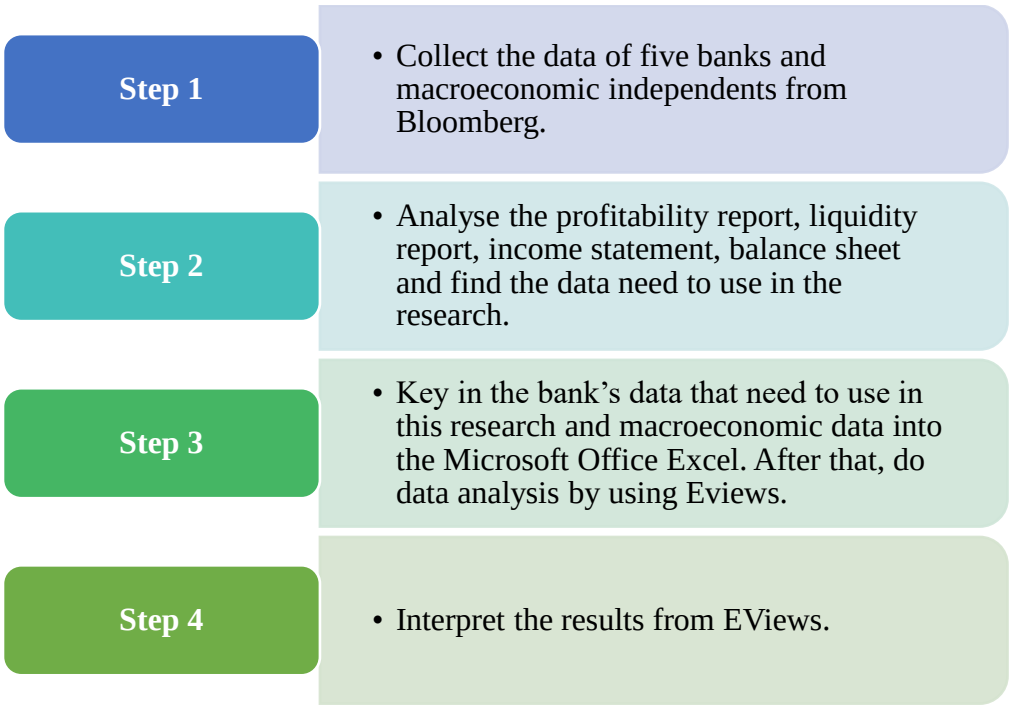
# CHAPTER 3: METHODOLOGY

## 3.0 Introduction

We are discussed about the research methodology that apply the information and data that are related to this study in order to conduct a successful research. The objective is to find the model test that use to evaluate the relationship between the bank's profitability and the five independent variables which is asset growth, liquidity, leverage, GDP, and inflation. The quantitative and secondary data is collected to carry out this research. Five banks in Brazil are chosen and the sample periods are 10 years which are started from the year 1997 to 2017. The main source that we collected the data are Bloomberg.

## 3.1 Data Processing

Figure 3.1: Step of Data Processing




## 3.2 Research Design

In this paper, we have been used the quantitative data which defined as numerical data that can be counted or measured to analyse the profitability of bank. The research objectives are to investigate the relationship of macroeconomics variables and bank-specific variables towards the profitability of the bank. In this research, ROA is a measurement for profitability of bank that the dependent variable used. Besides, asset growth, liquidity, leverage are categories as independent variable of bank-specific while macroeconomics independent variables are GDP and inflation. Furthermore, there was the data collected of the five banks in Brazil since 1997 until 2017. The five banks that chosen in this research which are listed below:

1. Banco Bradesco S.A.
2. Banco do Brasil S.A.
3. Banco do Estado do Rio Grande do Sul S/A
4. Itau Unibanco Holding S.A
5. Citigroup Inc

In this research, the five banks are time series data which based on the period since 1997 till 2017, so the sample size is 21. Moreover, the cross-sectional data are based on the five banks in Brazil. Hence, the data collected is the combination of time series data and cross-sectional data so it defined as panel data that consists of (21×5=105) sample size.

## 3.3 Data Collection Method

Data that used in this research is secondary data. Secondary data can be classified into bank-specific factors and also macroeconomics factors. Each of the data of bank-specific factors and macroeconomics factors of banks were collected from Bloomberg. Moreover, this paper that had chosen the period from 1997 to 2017 which is 21 years. All the dependent and independent variables are measured by ratios to calculate the financial ratio. In addition, the financial ratios are calculated based on financial report such as the balance sheets, income statement and etc.

Table 3.1: Unit Measurement of Variables

| **Variables** | **Proxy** | **Unit Measurement** | **Source** |
|---|---|---|---|
| **Dependent Variable** | | | |
| ROA | Total net income/ Total assets | USD | Bloomberg |
| **Independent Variables** | | | |
| **Bank-specific factors** | | | |
| Asset growth | Total assets | USD | Bloomberg |
| Liquidity | Total loans/Total assets | USD | Bloomberg |
| Leverage | Total debts/Equity | USD | Bloomberg |
| **Macroeconomics factors** | | | |
| GDP | GDP per capita | USD | Bloomberg |
| Inflation | Consumer Price Index (CPI) | USD | Bloomberg |

Source: Bloomberg

## 3.4 Variables Specifications of Measurements

### 3.4.1 Return on Assets (ROA)

ROA is a financial indicator that used to access the relationship between bank profitability and total asset. The value of ROA is the net profit divided by total assets (Alper and Anbar, 2011; Bashir, 2000). According to Jahan (2012) ROA is the best indicator to measure bank profitability compare to return on equity (ROE) and return on deposits (ROD). Research show that

ROA use to measure how the revenue and expenses efficiently manage by bank and bank's ability to earn profit by utilize the available assets (Jahan, 2012). Beside ROA is positive indicates that the total assets used to utilize to earn profit so if a bank has higher ROA and positive then the bank has an opportunity to improve the growth of capital, vice versa (Alghifari, Triharjono and Juhaeni, 2013). ROA is efficient than ROE to measure the bank profitability because the analysis of ROE disregards financial leverage and risks that related to it (Flamini *et al.*, 2009).

$$\text{Return On Asset} = \frac{\text{Total net income}}{\text{Total Asset}}$$

### 3.4.2 Asset Growth

According to Fungacova, Solanko and Weill (2014), commercial bank's core function is extension of loans and the larger proportion of banks' asset is formed by loans. Volume of asset also can consider the size of bank and it is one of the variable and component to measure the banks performance. According to Aladwan (2015), effect of asset volume on bank profitability for Jordanian for year 2017 to year 2012 had been study by him. The result show that bank size have negative relationship to bank profitability, meaning the more asset growth the lower the bank profitability. Based on this result he stated that larger banks have poor performance compare to smaller banks. On the other, in the research of Arif, Khan, and Iqbal (2013), their result show that bank profitability have positive relationship with bank size for the Pakistan's commercial bank. Based on the research of Kumbirai and Webb (2010), the bank profitability of South African commercial banking sector remained favourable during year 2015 to year 2016 because have strong asset growth as the grew of asset around 25.3%

Asset Growth = Total Asset

### 3.4.3 Liquidity

Financial markets liquidity have 3 types of aspects such as market liquidity, funding liquidity and central bank liquidity. A liquidity of market could be defined as the ability to convert an asset in short notice at lower cost with few impact on its price. Based on Fernandez (1999) market liquidity had include 3 dimensions that are depth, tightness and resiliency to make sure amount of assets can be sold anytime within market hours, quickly, by having least loss of value and aggressive price. The lack of liquidity show banks are shortage of money to withdrawals of depositors, fulfil the payments unable to finance loans to customers. These issues will spoil the bank's business (Antwi, Boadi & Lartey, 2013). According to Bourke (1989), a bank that holding bigger numbers of liquid assets will get benefit from superior awareness in funding market at the same time their financing costs will reduce and increase in profitability. Bourke (1989) prove that from 1972 to 1981, there was a positive relationship between liquidity asset and bank profitability by found evidence for 90 banks in Australia, Europe and North America. By holding adequate number of liquidity asset could help bank to reduce the liquidity risk and financial crises but on the other hand if liquidity asset hold excessively the bank profitability will be decrease (Lartey, Antwi & Boadi, 2013).

$$\text{Debt-to-Asset Ratio} = \frac{\text{Total Debt}}{\text{Total Asset}}$$

### 3.4.4 Leverage

Leverage ratio is a financial indicator that calculate how many debt that company borrow as capital and also could be assesses the ability of bank to fulfill its financial obligations. According to Alkhatib (2012), firms will end up with high leverage with high risk of bankruptcy by likely to pay off mature debts when they borrow large amounts of money during a business

recession. On the other hand, the lower the borrowing of loan by firms and the leverage value, and the r isk of bankruptcy will lower. Financial leverage could be calculate by total debt that firm owe and total assets which firm own. Firm can know how many money that need to borrow to finance its capital structure by calculate financial leverage ratio. There have two ways to calculate leverage ratio such as debt to equity and debt to assets. Both of the formula is a measurement for the relationship between capital and asset that utilized by shareholders to fulfil company's obligations to creditors.

$$\text{Debt-to-Equity Ratio} = \frac{\text{Total Debt}}{\text{Total Equity}}$$

### 3.4.5 Gross Domestic Product

GDP is one of the country's economic growth indicator based on the all final goods and services market value that produced at a period of time (normally one year). The GDP's evaluation process is include the every intermediate stage's total value of all final commodities produced in a year. In study of Albertazzi and Gamnacorta (2009), they have determined that GDP and bank profitability have positive relationship. The first reason is when there is a good economic cycle as decrease of risk there will be rising of credit demand. The second reason is banks could set wider of interest margin when the loans demand increase. By rising of the bank revenue from lending activities can be faster than rising of expenses and cost that related with bank financing (Naruševičius, 2017). During the economic boom will cause the increasing of customers demand for bank transactions that lead bank will charge for higher fee and commission income and influence the earning of bank profitability (Naruševičius, 2017). When the economic become worst the bank revenue will be drop same as economic activity.

Gross Domestic Product Growth = Growth Rate (Annual %)

### 3.4.6 Inflation

Inflation could be defined as increase continuously in the general price level or continuous decrease of money value over a period that longer than a day, week, or month. According to Labonte & Makinen (2011), there have two different view that cause of inflation. In the first view is Federal Reserve subordinates itself to the federal government's fiscal requirements and finance budget deficit by money creation cause the rate of money growth increase. The second view is the activities that produce a fall in real output causes the upward pressure on the price will lead to increase of unemployment. By prevent the rise of unemployment, the Federal Reserve will rising the demand by loose the growth of money and credit supply to rise increase the movement in the price level (Labonte & Makinen, 2011). In the introduce of Revell (1979), the inflation affect bank profitability based on the operating and wages costs that provide by bank increase at a high rate than inflation. In order bank to earn higher profit by increase the revenue faster than the expenses at the same time affect by inflation, bank could adjust the interest rate by assess good management implies that could predicted the inflation rate (Perry, 1992). The relationship between bank profitability and inflation is uncertainty and depends on bank to predict the inflation rate because inflation give the much effect in banking sector such as operating cost, interest rate and principle price of asset ( Haron, 1997). By having the rate of inflation, the value could be calculate by subtract the Consumer Price Index of last year's prices from the Consumer Price Index value of this year, and divide by last year's CPI.

Inflation Growth = Consumer Prices Index(Annual %)

## 3.5 Data Analysis

### 3.5.1 Ordinary Least Square Method

The Ordinary Least Square (OLS) Method was introduced by a German mathematician that name Carl Friedrich Gauss (Gujarati & Porter, 2009). The OLS method is a constant coefficients model that is a type of panel regression model that use to analyses unknown parameters. The OLS estimator could be the best estimator once the model fulfil the three classical normal linear regression model assumptions and there are intercepts across companies, time invariant and constant slopes across companies (Gujarati & Porter, 2009). OLS normally is using in the fields as economics, statistics finance and psychology to predict skill known to applications (Ecology Dictionary, n.d.).

According to Gujarat and Porter (2009), OLS model is commonly to use as primary regression analysis because it is easier to use compare to maximum likelihood. The three properties of OLS model are unbiased, efficient and consistent make this regression analysis popular. According to Monti (2014), compare to other regression analysis OLS model is easier to implement, interpret, understand and analyse the mathematical efficiently on computer.

The relationship between bank's profitability and other independent variables is examined by using OLS could appropriate to use to regress data by assume all banks have constant intercepts, time invariant and constant slopes.

### 3.5.2 Model Specification

**Extended Model :**

$ROA_{it} = \alpha + \beta_1(ASSETGWTH)_{it} + \beta_2(LQD)_{it} + \beta_3(LVR)_{it} + \beta_4(INF)it + \beta_5 (GDP)_{it} + \mathscr{E}_{it}$

ROA= f (ASSETGWTH, LQD,LVR, INF, GDP)

Table 3.2: Variables Specifications of Measurements

| Symbol | Definition | Unit Measurement |
|---|---|---|
| ROA | Return on Asset | Total Net Income / Total Asset |
| $\alpha$ | Intercept | - |
| $\beta i$ ( i = 1,2,3,4,5) | Coefficient of each independent variables | - |
| ASSETGWTH | Asset Growth | Total Asset |
| LQD | Liquidity | $\frac{\text{Total Debt}}{\text{Total Assets}}$ |
| LVR | Leverage | Debt-to-Equity Ratio = $\frac{\text{Total Debt}}{\text{Total Equity}}$ |
| INF | Inflation | Consumer Prices Index (Annual %) |
| GDP | Gross Domestic Product | GDP Growth Rate (Annual %) |
| $\mathscr{E}_{it}$ | Error Terms | - |

## 3.6 Economic Diagnosis Tests

The objective for having diagnosis testing is to detect and find out whether the research model is consisting of economic problems such as heteroscedasticity, multicollinearity, autocorrelation and so on. By running the diagnosis testing we can make sure that our research model is fulfil the classical linear regression model assumptions. Lastly the research model will achieve Best, Linear, Unbiased and Efficient (BLUE) properties when fulfil all of the assumptions and the significant results for the study will be provided by the research model.

### 3.6.1 Multicollinearity

Multicollinearity appear as there are correlation between more than two independent variables with one another in the regression model. According to Gujarati & Porter (2009), multicollinearity can be define both independent variables have an exact relationship with each other in a regression model. The few reasons why multicollinearity occur because there are mistakes in data collection method, model specification and over determined model. Multicollinearity can be distinguish in two type and there are perfect multicollinearity and imperfect multicollinearity. Multicollinearity problem will be more serious once two or more independent variables are perfectly correlated.

There have some ways to detect multicollinearity. The first method to detect is due to high $R^2$ but few significant *t* ratios. Once the $R^2$ is higher than 0.8, the hypothesis will reject by the F-test that the partial slope coefficients are simultaneously equal to zero. Beside the T-test show that none of partial coefficients are different from zero (Gujarati & Porter, 2009).

The second is the regression model has high pair-wise correlation among the independent variables and it can prove multicollinearity problem. However this method have few limitation and hard to prove the multicollinearity since it is not a condition for multicollinearity although high zero-order correlations but there still probably to exist multicollinearity (Gujarati & Porter, 2009).

Beside there still have two ways to identify multicollinearity in an auxiliary regression model and there are Tolerance factors (TOL) and Variance inflation factor (VIF). VIF can be referred to $\frac{1}{1-R^2}$ . According to Gujarati & Porter (2009), when VIF is infinite then there will be perfect collinearity. On the other hand there will be no collinearity once the VIF is 1 but when the VIF is higher than 10 there will be highly collinearity. The second way is TOL= $\frac{1}{VIF}$ and there is serious multicollinearity when TOL is closing to 0. By applying these two methods can easily to measure the degree of multicollinearity and it can work to determine the relationship between explanatory variables and treat each of them as the dependent variable (Gujarati & Porter, 2009).

### 3.6.2 Heteroscedasticity

Heteroscedasticity is an econometric problem occur when there is homoscedasticity violated in one of the classical linear regression model. There have few reasons for the nature of heteroscedasticity. The first reason is human learn as errors of human behaviour will getting lower as the typing practice increase, the probability of typing errors will decrease. The second reason is there are omitted of the important variables from the model (Gujarati & Porter, 2009).

By the occurrence of heteroscedasticity, the coefficients will no longer the best estimator and not BLUE (not minimum variance hence not efficient). Beside heteroscedasticity will lead to higher t-statistic and f-statistic and causes the rejection of $H_0$.

According to Gujarati & Porter (2009), if there is the present of heteroscedasticity in the regression model, we can change the OLS to weight least squares when the standard deviation is known. The second way is using the White's approach to adjust the standard error when there is unknown standard deviation. White General's heteroscedasticity test use to determine the present of pure heteroscedasticity and specification error. When there is present of cross-product terms, will test for pure heteroscedasticity and specification error but if absent then will only test for pure heteroscedasticity problem.

Lastly, by achieve BLUE properties for OLS estimators the model should be achieve homoscedasticity, as the result for the hypothesis testing will become valid.

$H_0$: Heteroscedasticity problem do not occurs in the model.
$H_1$: Heteroscedasticity problem occurs in the model.

Decision Rule : If the p-value of the test is less than significance level $\alpha = 0.05$, reject $H_0$. Otherwise, do not reject $H_0$.
Decision: P-value of is more than significance level of 0.05, so do not reject $H_0$.
Conclusion: Insufficient evidence to conclude that the model has heteroscedasticity problem.

### 3.6.3 Autocorrelation

The problem of autocorrelation defined as correlation between error terms for any observation. There have some reason that causes this problem which are omitting of variables, measurement systematic error and misspecification of the model. According to Gujarati & Porter (2009), there are two type of autocorrelations and there are impure autocorrelation and pure autocorrelation. The present of the pure autocorrelation is due to the classical assumption had assumes in a correctly specified equation is violated by the uncorrelated observations of the error term. There are two form of pure autocorrelation and there are first order autocorrelation and higher order of autocorrelation. Secondly the impure autocorrelation can be known as serial correlation that caused by specification error such like omitting of variable and wrong functional form.

There are two consequences of autocorrelation and the first is the unbiased and consistent of the estimators that ensures by E (u) = 0. The second consequence is the inefficient estimators that able to get estimators with lower variance. Once the independent variables do not have correlation with other independent variables, BLUE properties will be achieved by OLS estimator at the same time the hypothesis testing will become valid (Gujarati & Porter, 2009).

According to Gujarati & Porter (2009), there is a test that developed by Breusch and Godfrey that name Breusch-Godfrey test (BG) that use to detect the autocorrelation problem. The reason to develop this test is to avoild the pitfalls of the Durbin-Watson d test of autocorrelation. BG test generally can allow for nonstochastic regressor such like the regressand's lagged values, higher- order autoregressive schemes such like AR (1), AR (2) and white noise error terms 's higher-order moving averages.

$H_0$: Autocorrelation problem do not occurs in the model.
$H_1$: Autocorrelation problem occurs in the model.
Decision Rule : If the p-value of the test is less than significance $\alpha = 0.05$, reject $H_0$. Otherwise, do not reject $H_0$.
Decision: P-value of is more than significance level of 0.05, so do not reject $H_0$.
Conclusion: Insufficient evidence to conclude that the model has autocorrelation problem.

### 3.6.4 Causality Test

Granger-causality problem can be define that independent of one variable Granger-causes on other dependent variable. According to Gujarati & Porter (2009), the causation is not necessarily imply although regression model deals with the dependence of one variable to other variables but if the regressions involve time series data the situation may be different. In the econometrics literatures, the variable will be say to Granger cause to the other variables if the variable help to access the accurate prediction of the other variables than using the past latter as predictor. Normally real causal relationship cannot use to be interpreted for the Granger causality between

two variables since it less to prove that one variable can good in predict to another.

In the pairwise Causality test is to analyse the two variables together then test for their interaction. The possible results can be Unidirectional Granger can be unidirectional granger causality from variable X to variable Y, Unidirectional Granger causality from variable Y to X, Bi-directional causality and no causality (Awe, 2012).

$H_0$: Granger Causality problem do not occurs in the model.
$H_1$: Granger Causality problem occurs in the model.
Decision Rule : If the p-value of the test is less than significance level $\alpha = 0.05$, reject $H_0$. Otherwise, do not reject $H_0$.
Decision: P-value of is more than significance level of 0.05, so do not reject $H_0$.
Conclusion: Insufficient evidence to conclude that the model has Granger Causality problem.

### 3.6.5 Hausman Test

Hausman test is using to choose either fixed effect model (FEM) or random effect model (REM) in the panel studies that should perform a great interest. Since our research studies is based on the panel datasets and normally to estimate panel datasets will use fixed effects regression model or random effects regression models. FEM is suitable in situations where the individual-specific intercept can correlated with more than one regressor. According to Gujarati & Porter (2009), to take the different intercepts into the account, FEM can use dummy variables that also known as least-squares dummy variable (LSDV) model. The disadvantages of LSDV is it consumes

many degrees of freedom when there is the large number of cross sectional units. REM is appropriate in situations which the random intercept of each cross-sectional unit is uncorrelated to the regressors. The advantage in estimate by REM is the number of unknown parameters have been reduced compared to FEM so there will less possibility of multicollinearity problem exists in the model.

In the research of Knezevic & Dobromirov (2016), they have determinants the profitability of Serbian banking industry by perform Hausman test whether they should use FEM or REM. After they had performance the Hausman test and they reject the null hypothesis and use fixed effects estimation.

$H_0$: REM are consistent and efficient.
$H_1$: FEM are consistent and efficient.
Decision Rule : If the p-value of the test is less than significance level of 0.05, reject $H_0$. Otherwise, do not reject $H_0$.
Decision: P-value of is more than significance level of 0.05, so do not reject $H_0$.
Conclusion: Sufficient evidence to conclude that REM is more appropriate than FEM.

### 3.6.6 Breusch Pagan Lagrange Multiplier Test

Breusch and Pagan (1980) were proposed a Lagrange multiplier (LM) test to detect any cross-sectional dependence. BPLM test is perform according to the average of the squared pair-wise sample correlation coefficients of the residuals and can be apply when N is fixed and T is infinity. According to Pesaran, Ullah and Yamagata (2008), the BPLM test can suffer the serious

distortion of size when N or T is bigger that based on asymptotic critical values from the relevant chi square distribution.

By apply the BPLM test there are some econometrics problem that is a particle of diagnostic testing by provide that between the error terms there is autocorrelation problem (Arellano, 2002). Without the consequence whether there are lagged dependent variable BPLM can be tested the higher order ARMA error. BPLM test also could be test for the greatest of the likelihood by impose hypothesis on the first order condition. According to Breusch and Pagan (1980), when BPLM test are nondisclosure models that need to be approximated as same as sample size, they will perform efficiently and effectively.

According to Greene & MCKenzie (2012), there have few advantages when performing BPLM test. The first is BPLM test is easily to compute and some cases include sall sampel distribution when least square residual are required. Beside Lagrange Multiplier test. Secondly when the tested parameter remain on the border of the parameter under the null hypothesis.

## 3.7 Conclusion

In summary, these chapter had fully explained the methodologies that will used in completing this research. Five independent variables (asset growth, liquidity, leverage, inflation and Gross Domestic Product) used to examine their relationship with bank profitability. We adopted diagnostic testing like Causality Test, Hausman Test and Breusch Pagan Lagrange Multiplier Test that used to run the data and the result of data analysis that will explained in Chapter 4.

# CHAPTER 4: DATA ANALYSIS

## 4.0 Introduction

In Chapter 4, there will be an examination about the relationship between the profitability of banks, asset growth, liquidity, leverage, GDP, and inflation. This chapter describes about the empirical data analysis results and interpretation of the study on the bank-specific and macroeconomic factors that affecting the bank profitability in Brazil. In order to examine the variables, this chapter had include descriptive statistics, hypothesis testing, economic diagnosis tests, and selection procedure for best model.

## 4.1 Descriptive Statistics

### 4.1.1 Granger Causality Test

Table 4.1: Result of Pairwise Granger Causality Test

| **Direction of Causality** | **W-Stat** |
|---|---|
| LOG(GWTH) → ROA | 3.E-12*** |
| ROA→ LOG(GWTH) | 0.0019*** |
| LQD → ROA | 0.0002*** |
| ROA → LQD | 0.0083*** |
| LVG → ROA | 5.E-11*** |
| ROA → LVG | 0.0036*** |
| GDP → ROA | 0.9111 |
| ROA → GDP | 0.6446 |
| INF → ROA | 0.4302 |
| ROA → INF | 0.6350 |

Note: *, ** and *** denoted that the reject the null hypothesis at 10%, 5% and 1% significant level respectively

#### 4.1.1.1 Asset Growth

$H_0$: There is no granger causality from ROA to asset growth.
$H_1$: There is granger causality from ROA to asset growth.

From the Table 4.1 show that there is bidirectional causal relationship between ROA and Asset Growth, where ROA granger causes asset growth at 1% significant level with a p-value of 0.0019 and reverse causality from asset growth to ROA at 1% with p-value of 3.E-12 which both of them are smaller than 0.01. Thus, reject the null hypothesis. This can be means that the changes of asset growth of the bank will affect the ROA of bank since asset growth can be mean the size of bank while increase of bank size are more capable to offer a wide range of financial services and products so the performance could be increase. The result prove that interaction of asset growth of the bank are positive and significant relationship with the bank performance (ROA).

#### 4.1.1.2 Liquidity

$H_0$: There is no granger causality from ROA to liquidity.
$H_1$: There is granger causality from ROA to liquidity.

From the Table 4.1 show that there has a bidirectional causal relationship between ROA and liquidity, where ROA granger causes liquidity at 1% significant level with a p-value of 0.0083 and reverse causality from liquidity to ROA at 1% with p-value of 0.0002 which both of them are smaller than 0.01. Thus, reject the null hypothesis. This can be means that the higher liquidity of the bank will affect the ROA of bank since bank hold more liquid asset could reduce liquidity risk and improve the business of

bank such like money withdrawals of depositors, fulfil the payments of finance loans to customers. The result prove that interaction of bank liquidity are positive and significant relationship with the bank performance (ROA).

#### 4.1.1.3 Leverage

$H_0$: There is no granger causality from ROA to leverage.
$H_1$: There is granger causality from ROA to leverage.

From the Table 4.1 show that there has a bidirectional causal relationship between ROA and leverage, where ROA granger causes leverage at 1% significant level with a p-value of 0.0036 and reverse causality from leverage to ROA at 1% with p-value of 5.E-11 which both of them are smaller than 0.01. Thus, reject the null hypothesis. This can be means that the lower the borrowing of loan by firms, the lower the value of leverage, and the risk of bankruptcy will lower. The result prove that interaction of bank liquidity are positive and significant relationship with the bank performance (ROA).

### 4.1.2 Conclusion

In conclusion, asset growth, leverage and liquidity have the bidirectional relationship with ROA but at the same time inflation and GDP do not causal relationship with ROA since the p-value is greater than 1%, 5% and 10%.

## 4.2 Hypothesis Testing

### 4.2.1 T-test

#### 4.2.1.1 Asset Growth

$H_0$: $\beta_1 = 0$

$H_1$: $\beta_1 \neq 0$

Decision Rule : If the p-value of the test is less than significant level $\alpha$ = 0.05, reject $H_0$. Otherwise, do not reject $H_0$.
Decision: Reject $H_0$ since p-value (0.0005) is less than significant level of 0.05.
Conclusion: There is sufficient evidence to conclude that the asset growth is significant in explaining the ROA.

#### 4.2.1.2 Liquidity

$H_0$: $\beta_1 = 0$

$H_1$: $\beta_1 \neq 0$

Decision Rule : If the p-value of the test is less than significant level $\alpha$ = 0.05, reject $H_0$. Otherwise, do not reject $H_0$.
Decision: Reject $H_0$ since p-value (0.0455) is less than significant level of 0.05.
Conclusion: There is sufficient evidence to conclude that the liquidity is significant in explaining the ROA.

#### 4.2.1.3 Leverage

$H_0$: $\beta_1 = 0$

$H_1$: $\beta_1 \neq 0$

Decision Rule : If the p-value of the test is less than significant level $\alpha$ = 0.05, reject $H_0$. Otherwise, do not reject $H_0$.
Decision: Reject $H_0$ since p-value (-0.0036) is less than significant level of 0.05.

Conclusion: There is sufficient evidence to conclude that the leverage is significant in explaining the ROA.

#### 4.2.1.4 Gross Domestic Product (GDP)

$H_0$: $\beta_1 = 0$

$H_1$: $\beta_1 \neq 0$

Decision Rule : If the p-value of the test is less than significant level $\alpha$ = 0.05, reject $H_0$. Otherwise, do not reject $H_0$.
Decision: Do not reject $H_0$ since p-value (0.0763) is more than significant level of 0.05.

Conclusion: There is insufficient evidence to conclude that the GDP is significant in explaining the ROA.

#### 4.2.1.5 Inflation

$H_0$: $\beta_1 = 0$

$H_1$: $\beta_1 \neq 0$

Decision Rule : If the p-value of the test is less than significant level $\alpha$ = 0.05, reject $H_0$. Otherwise, do not reject $H_0$.
Decision: Reject $H_0$ since p-value (0.0331) is less than significant level of 0.05.

Conclusion: There is sufficient evidence to conclude that the inflation is significant in explaining the ROA.

Table 4.2: T-test Summary

| **Independent Variables** | **α** | **P-Value** | **Decision** | **Conclusion** |
|---|---|---|---|---|
| Asset Growth | 0.05 | 0.0005 | Reject $H_0$ | Significant Relationship |
| Liquidity | 0.05 | 0.0455 | Reject $H_0$ | Significant Relationship |
| Leverage | 0.05 | -0.0036 | Reject $H_0$ | Significant Relationship |
| GDP | 0.05 | 0.0763 | Do not reject $H_0$ | Insignificant Relationship |
| Inflation | 0.05 | 0.0331 | Reject $H_0$ | Significant Relationship |

Source: Develop for the research.

### 4.2.2 R-Square

When a result have high R-squared with less amount of significant of t-ratio, this situation means that multicollinearity problem is occur in the result. Based on Eview result, $R^2 = 0.5363$ which is consider low because it is less than 0.9. Asset growth, liquidity, leverage, and inflation are the four variables which the p-value is less than significant level of 0.05. These indicate that four independent variables have significant relationship and one are insignificant relationship with ROA.

### 4.2.3 F-Test

$H_0$: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$

$H_{1:}$ At least one of $\beta_i$ is not equal to zero, where i= 1,2,3,4,5

Decision Rule: Reject $H_0$ if the F-statistic is less than significant level $\alpha$ = 0.05. Otherwise, do not reject $H_0$.

Decision: Reject $H_0$ since F-statistic is (0.0000) which is less than significant level of 0.05.

Conclusion: There is sufficient evidence to conclude that at least one of the $\beta_i$ is not equal to zero where, i = 1,2,3,4,5 at 5% of significant level.

## 4.3 Economic Diagnosis Tests

The aim of diagnosis checking is to ensure the data analysis results are valid and reliable by find out the economic problems of research model such like heteroscedasticity, multicollinearity, autocorrelation and so on.

### 4.3.1 Multicollinearity

#### 4.3.1.1 Pair-Wise Correlation Coefficient

Table 4.3: Correlation Among The Independent Variables

| | ROA | LOG(GWTH) | LQD | LVG | GDP | INF |
|---|---|---|---|---|---|---|
| ROA | 1.0000 | -0.2450 | -0.5038 | -0.6551 | 0.2282 | 0.1322 |
| LOG(GWTH) | -0.2450 | 1.0000 | 0.4920 | 0.1222 | -0.0611 | -0.1277 |
| LQD | -0.5038 | 0.4920 | 1.0000 | 0.8032 | -0.1377 | -0.0413 |
| LVG | -0.6551 | 0.1222 | 0.8033 | 1.0000 | -0.0855 | -0.0747 |
| GDP | 0.2282 | -0.0611 | -0.1377 | -0.0856 | 1.0000 | -0.1770 |
| INF | 0.1322 | -0.1277 | -0.0413 | -0.0747 | -0.1770 | 1.0000 |

The Pair-wise correlation coefficient is using to detect the correlation between independent variable with another independent variable. Based on the Table 4.3, correlation between the liquidity and leverage is the highest among all independent variables which is 0.8033. For the left of the correlations are below 0.50 so it can be conclude that the independent variables do not exist serious multicollinearity problem.

#### 4.3.1.2 Variance Inflation Factor (VIF) and Tolerance Factor (TOL)

Table 4.4: Result of VIF and TOL

| Variables | $R^2$ | VIF= $\frac{1}{(1-r^2)}$ | TOL= $\frac{1}{VIF}$ | Conclusion |
|---|---|---|---|---|
| ROA | 0.5363 | 2.1567 | 0.4637 | No Serious multicollinearity |
| LOG(GWTH) | 0.5326 | 2.1396 | 0.4674 | No Serious multicollinearity |
| GDP | 0.1264 | 1.1446 | 0.8737 | No serious multicollinearity |
| INF | 0.0821 | 1.0895 | 0.9179 | No Serious multicollinearity |
| LQD | 0.8248 | 5.7089 | 0.1752 | No serious multicollinearity |
| LVG | 0.8345 | 6.0430 | 0.1655 | No serious multicollinearity |

Based on the table 4.4, all variables have the VIF that below 10 and TOL that is not nearby with 0, so there is no serious multicollinearity problem among of them.

### 4.3.2 Heteroskedasticity

Table 4.5: Result of Heteroskedasticity

| | | | |
|---|---|---|---|
| F-statistic | 1.1138 | Prob. F(5,98) | 0.3581 |
| Obs*R-squared | 5.5922 | Prob.Chi-Square(5) | 0.3479 |

$H_0$: There is no heteroskedasticity problem.

$H_1$: There is heteroskedasticity problem.

Decision Rule : If the p-value of the test is less than significant level $\alpha = 0.05$, reject $H_0$. Otherwise, do not reject $H_0$.

P-Value: 0.3479

Decision: Do not reject $H_0$ since p-value (0.3479) is more than significance level $\alpha = 0.05$.

Conclusion: Sufficient evidence to conclude that the model do not have heteroskedasticity problem at significance level $\alpha = 0.05$.

### 4.3.3 Autocorrelation

Table 4.6: Breusch-Godfrey Serial Correlation LM Test

| | | | |
|---|---|---|---|
| F-statistic | 5.9589 | Prob. F(2,97) | 0.0036 |
| Obs*R-squared | 11.4891 | Prob. Chi-Square(2) | 0.0032 |

$H_0$: No autocorrelation problem occurs in the model.

$H_1$: Autocorrelation problem occurs in the model.

Decision Rule : If the p-value of the test is less than significant level $\alpha = 0.05$, reject $H_0$. Otherwise, do not reject $H_0$.

Decision: Reject $H_0$ since p-value (0.0032) is less than significance level $\alpha = 0.05$.

Conclusion: Sufficient evidence to conclude that the model has autocorrelation problem. Therefore, the model does contain autocorrelation problem at significance level $\alpha = 0.05$.

## 4.4 Selection Procedure for Best Model

### 4.4.1 Poolability Test

Table 4.7: Poolability Test

| **Effects Test** | **Statistic** | **d.f.** | **Prob.** |
|---|---|---|---|
| Cross-section F | 4.2868 | (4,95) | 0.0031 |
| Cross-section Chi-square | 17.4236 | 4 | 0.0016 |

$H_0$: Common intercept on all the banks (Pooled OLS is better).

$H_1$: No common intercept on all the banks (FEM is better).

Decision Rule: If the p-value of the test is less than significant level $\alpha = 0.05$, reject $H_0$. Otherwise, do not reject $H_0$.
Decision: Reject $H_0$ since the p-value (0.0031) is less than significance level $\alpha = 0.05$.

Conclusion: Sufficient evidence to conclude there is no common intercept between all banks. Therefore, FEM is better and it is valid at significance level $\alpha = 0.05$.

### 4.4.2 Hausman Test

This research is studying about how the microeconomic determinants and macroeconomic determinants will influence the Brazilian banking sector during the period from year 1997 to year 2017, and test the performance of bank over the time span by using panel-data sample.The aim of Hausman test used to determine FEM or REM is more prefer to this research.

Table 4.8: Result of Hausman Test

| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
|---|---|---|---|
| Period Random | 0.1018 | 3 | 0.9916 |

$H_0$: REM are consistent and efficient

$H_1$: FEM are consistent and efficient

Decision Rule : If the p-value of the test is less than significant level $\alpha = 0.05$, reject $H_0$. Otherwise, do not reject $H_0$.

Decision: Do not reject $H_0$ since p-value (0.9916) of is more than significance level $\alpha = 0.05$.

Conclusion: Sufficient evidence to conclude that REM is more appropriate than FEM at significant level $\alpha = 0.05$

### 4.4.3 Breusch Pagan Lagrange Multiplier Tests

The aim of BPLM test used to determine whether POLS or REM is more prefer to this research.

Table 4.9: Lagrange Multiplier Tests for Random Effects

| | Test Hypothesis | | |
|---|---|---|---|
| | Cross-section | Time | Both |
| Breusch-Pagan | 6.35552 | 0.091981 | 6.447533 |
| | (0.0117) | (0.7617) | (0.0111) |

$H_0$: POLS are consistent and efficient

$H_1$: REM are consistent and efficient

Decision Rule : If the p-value of the test is less than significant level $\alpha = 0.05$, reject $H_0$. Otherwise, do not reject $H_0$.

Decision: Reject $H_0$ since p-value (0.0111) is less than significance level $\alpha = 0.05$.

Conclusion: Sufficient evidence to conclude REM is more appropriate than POLS at significant level $\alpha = 0.05$.

### 4.4.4 Pooled Ordinary Least Square Method

$ROA_{it} = \alpha + \beta_1 (ASSETGWTH)_{it} + \beta_2 (LQD)_{it} + \beta_3 (LVR)_{it} + \beta_4 (INF)_{it} + \beta_5 (GDP)_{it} + \mathscr{E}_{it}$

$ROA_{it} = \alpha - 0.2189 (ASSETGWTH)_{it} + 0.0455 (LQD)_{it} - 0.0036 (LVR)_{it} + 0.0331 (INF)_{it} + 0.0763 (GDP)_{it} + \mathscr{E}_{it}$

Where,

ROA = Return on Asset

ASSETGWTH = Asset Growth

LQD = Liquidity

LVR = Leverage

INF = Inflation

GDP = Gross Dosmetic Product

$\mathscr{E}_{it}$ = Error Term

Table 4.10: Eview Result

| Variables | Coefficient | Standard Error | T-Statistic | P-Value |
|---|---|---|---|---|
| C | 3.8529 | 0.0610 | 5.8800 | 0.0000 |
| LOG(GWTH) | -0.2189 | 0.0150 | -3.4892 | 0.0005 |
| LQD | 0.0455 | 0.0005 | 3.0311 | 0.0031 |
| LVR | -0.0036 | 0.0265 | -7.0959 | 0.0000 |
| GDP | 0.076270 | 0.032767 | 2.8786 | 0.0049 |
| INF | 0.033100 | 0.655263 | 1.0102 | 0.3149 |
| R-squared = 0.5363<br>Prob(F-statistic) = 0.0000 | | | | |

Sources: Eview

Based on the Hausman test and Breusch–Pagan Lagrange Multiplier test, show that REM is the best model compare to POLS and FEM.

## 4.5 Conclusion

In conclusion, diagnosis checking show that the data analysis results have autocorrelation problem but do not have multicollinearity and heteroskedasticity problems. By using the Poolability test, Hausman test BPLM test, REM is the best model to use rather than POLS and FEM. On the other hand, based on the Granger Causality test, ROA have the bidirectional relationship with asset growth, liquidity and leverage but do not have causal relationship with GDP and inflation. According to hypothesis testing, there was only one independent variable have insignificant relationship with ROA, while other four independent variables have significant relationship with ROA. The F-test showed that the model is significant and have low R-squared result.

# CHAPTER 5: IMPLICATION, DISCUSSION, AND CONCLUSION

## 5.0 Introduction

In chapter 5, the statistical analyses from previous chapter will be summarized. Next, the major findings will be discussed and compared to hypotheses that written in chapter one. In the following section, the practical implication will be suggested. There are some limitations that have been found in the progress of this research will be stated. Hence, there will be some recommendations to solve the limitations mentioned. Conclusion will be made to summarize this chapter at the end.

## 5.1 Summary of Statistical Analyses

Table 5.1: Statistical Analysis Result

| **Pooled OLS Model:** | **P-Value** | **Decision** | **Result** |
|---|---|---|---|
| **Asset Growth** | 0.0005 | Reject $H_0$. | Significant |
| **Liquidity** | 0.0455 | Reject $H_0$. | Significant |
| **Leverage** | -0.0036 | Reject $H_0$. | Significant |
| **Gross Domestic Product** | 0.0763 | Do not Reject $H_0$. | Insignificant |
| **Inflation** | 0.0331 | Reject $H_0$. | Significant |

| **Diagnosis Checking:** | | | |
|---|---|---|---|
| **Autocorrelation (Breush- Godfrey Serial Correlation LM Test)** | 0.0032 | Reject $H_0$. | Significant |

| | | | |
|---|---|---|---|
| **Heteroscedasticity (Breusch-Pagan Godfrey)** | 0.3479 | Do not Reject $H_0$. | Insignificant |
| **Multicollinearity** | - | - | VIF is below 10 and TOL is not near the 0, Thus, there is no serious multicollinearity |
| **Poolability Test (POLS&FEM)** | 0.0031 | Reject $H_0$. | FEM is better. |
| **Hausman Test (REM&FEM)** | 0.9916 | Do not Reject $H_0$. | REM is better. |
| **Breusch Pagan Lagrange Multiplier Tests (POLS&REM)** | 0.0111 | Reject $H_0$. | REM is better. |

∴Based on the result, the REM is the best model among the 3 tests.

## 5.2 Major Findings

### 5.2.1 Asset Growth

Based on the result in previous chapter, there is negative significant relationship between asset growth and bank's profitability. It indicates that every one unit raise in asset growth, ROA will drop 0.218946 unit, ceteris paribus. This result correspondent with Ameur & Mhiri (2013), Almazari (2014), Tan (2016), Alkhazaleh and Almsafir (2014) which they agree asset growth and bank's profitability have an inverse relationship. This call "diseconomies of scale" theory stated by the researcher, when bank size is growing and bank fail to gain cost advantage then this situation will occur. Moreover, the problems like agency costs, and managerial inefficiencies also will occur when bank become too large. The bank's profit will eventually not sufficient to cover the operation costs when large bank have high bank operation costs. Besides, asset growth and bank's profitability have inverse relationship might because the enforcement of power and information advantage could not increase large banks' profits anymore.

### 5.2.2 Liquidity

The result showed positive and significant relationship resulted in the relationship of liquidity and bank's profitability, when liquidity increase by one unit, the ROA will increase 0.045544 unit, ceteris paribus. This result parallel with Lartey, Antwi and Boadi (2013), Al-Qadi and Khanji (2018), Adebayo, David and Samuel (2011), Shahchera (2012), Ahmad (2016), Terraza (2015). Bank should have well planning and careful consideration because it is one of the ways to increase efficiency. Bank's profitability would improve when banks have enough liquid assets, it helps to decrease the financial crises and liquidity risk. The unforeseen shock caused by unexpected need for grow in asset or drop in liabilities able to absorb by the bank that have adequate liquidity. However, bank not recommended to hold too much of liquid asset because normally its interest generating capacity was little. There is a point to hold liquid asset, if exceed will diminishes the profit of a bank

### 5.2.3 Leverage

Negative significant is shown in the relationship of leverage and the bank's profitability, this show that when leverage increase in one unit, ROA will decrease by 0.003614 unit, ceteris paribus. This result similar with Alkhazaleh and Almsafir (2014), Alper and Anbar (2011), Awunyo-Vitor and Badu (2012), Hutchison and Cox (2006), their result also shows leverage and bank's profitability have inverse relationship. As the banks have higher proportion of debt, they have high cost of debt, this make interest payment raise and finally profit level of the banks drop. Besides, if banks have more debt means they indirectly incur bankruptcy cost like loss of sales and goodwill, this will make bank hard to attract additional funds. The new client may not be able to attract and the current customer may be

will leave when the bank was perceived near to bankrupt because they worry they may lose their savings.

### 5.2.4 Gross Domestic Product (GDP)

From the result shown in chapter four, there is a positive but insignificant relationship between GDP and ROA. This result similar with Ayadi and Boujelbene (2012), Athanasoglou, Delis and Staikouras (2006), Ongore and Kusa (2013), Alper and Anbar (2011), Akani, Nwanna and Mbachu (2016). This is because when increased of economic growth in a country, the consumer spending also will increase, then they will need more funds to finance their spending, but there is not only bank could provide the financial service, when the capital market and the non-bank financial institutions are well developed in a country, the bank will no longer be the main channel to saving surplus and get financing. Moreover, bank was not gain benefit from the increased in GDP is because there are competition in the market. Bank could not charge higher loan rates and lower deposit rates because they need to compete with other bank and non-bank financial institution.

### 5.2.5 Inflation

Positive significant is resulted in relationship of inflation and bank's profitability. This result shows that when inflation increase one unit will contribute 0.033100 unit increase in ROA, ceteris paribus. This result consistent with Rover, Tomazzia and Favero (2013), Frederick (2014), Davydenko (2010), Kasman, Tunc, Varder and Okan (2010), Alexiou and Sofoklis (2009), Athanasoglou, Delis and Staikouras (2006), Khan et al

2014, they agree that there is positive relationship between inflation and bank's profitability. This result suggest that bank costs increased less than bank income. Bank could get higher profit when they predict the inflation correctly and accordingly adjust the interest rates, or bank customer not able to predict the inflation correctly. During inflation period, banks get comparatively high rate for deposit but because prices of consumer goods increase, the consumer finance also increase, people ready to borrow at high rate.

## 5.3 Implications of the Study

### 5.3.1 Bank-Specific Factors

#### 5.3.1.1 Asset Growth

Based on our result, the bank profitability have negative significant relationship with the asset growth. Normally, the bank size is used to study diseconomies or economies of scale in area of banking. The larger of the bank, the decline of the cost due to the scope and economies of scale. Thus, the bank should not over widen the bank size. According to Regehr and Sengupta (2016), the small banks also can build stronger relationships with clients and local businesses as compare to larger banks by set up contract term with permitting them access proprietary messages and so on. In addition, policy maker also can controlled the bank size. The regulator can restrict the bank to expand too large which imply central bank can required that large banks to have a higher capital requirement. In order to avoid the larger banks under "too big to fail", the bank sizes declined is the advantages for the regulator.

#### 5.3.1.2 Liquidity

According to finding above, the liquidity variable has positive significant relationship with the bank profitability. Actually, liquidity of the bank was impacted by all single transactions in the bank which imply assets, off-balance sheet and liabilities are monitoring the liquidity. Thus, banks should maintain an adequate liquid cushion to prevent the liquidity risk and keep the financial stable. In addition, the management of the liquidity risks are vital to avoid the liquidity risks. The inability of the bank to meet its undertaking of financial without adversely influencing any assets or expense is known as liquidity risk (Sharma&Singh, 2016). It is ordinary part of banking. The liquidity risk management also can facilitate the capability of bank to achieve its obligations and decrease the possibility of bad circumstance occur. When banks faced scarcity of cash assets, it may sell the securities of the portfolio to conquer cashless but will increase the transaction cost simultaneously.

#### 5.3.1.3 Leverage

Leverage variable is implication for policy maker and practitioners as well. In this research, the findings has showed that leverage is negative significant related to profitability of bank. Regulators has imposed to limit on leverage which using the leverage ratio to conquer the bank's leverage is overly. The higher the leverage ratio, the more the bank's capital has utilize which must at least the amount of lending fund. In general, bank has high leverage ratio means it is safe. The bank should utilize its capital to investment or sell off most risky or leveraged assets and also make loans.

### 5.3.2 Macroeconomics Factors

#### 5.3.2.1 Gross Domestic Product

Since GDP has found that it had positive but insignificant relationship with ROA. The central bank can also performs the expansionary monetary policy which objective is to boost the economic growth. The rises money supply, rises aggregate demand and low interest rates. The GDP goal is a 2% to3% growth rate. It can helps the banks generate more profitability and also promote the bank financial intermediary. For instances, government can rise its spending and decline of taxes through carry out the expansionary fiscal policy.

#### 5.3.2.2 Inflation

Based on the findings, the inflation has positive significant relationship related to the bank's profitability. The political trend of governments is the effect of inflation that respond with the price controls and wages. There is dual for implication of government response: First of all, the government had it highly responsibility which search for transform the inflation. Next, the price controls and wages are not the reason of inflation that serve as symptoms (Chioma, Adanma & Clementina, 2014). Furthermore, the bank should implement an expansionary monetary policy in order to decrease the inflation and the unemployment will rise simultaneously. It is proposed to rein in the inflation to prevent asset values become worsen. The bank also can set the higher interest rates that make the investment and consumption frustrated to let market select to keep their money as compare in the economy.

## 5.4 Limitations of the Study

As mentioned previously, despite the facts that our research is focus on 5 banks which are large in size, the finding of this paper might not reflect the actual situation of the banking industry. It is due to the limitation and constrained of resources to access the data.

Furthermore, this research has several issues when acquiring data from the database. For example, some data for the in several years are missing in the Bloomberg and some of the data are inconsistent in term of its measurement and highly volatile.

Finally, this research does not include any qualitative variables like the risk appetite of the directors which are rather important to determine bank's profitability.

## 5.5 Recommendation for Future Research

For a more precise research to study the bank's profitability, future researchers should consider to include a data sample of banks disregard their ownership and size. It is to ensure the research has take into account of the effect and whether the result is consistent across different bank's ownership and size. The inclusion of foreign banks in future research also ensure that the result is more precise to reflect the real situation of bank's profitability in Brazil.

It is recommend to include qualitative variables like the risk appetite of the directors in the future research as it play a significant role in determining the profitability of banks. Qualitative variables or dummy variables play an important role in determining bank's profitability.

Lastly, data collection method is recommended to improve to ensure the completeness of data. It can be improved by provide more training to the users of Bloomberg to understand its complex function and provide access to various data source website

## 5.6 Conclusion

The objective for this research project is to determine the determinants that influence the Brazilian bank's profitability from 1997 to 2017. The research has identified three bank-specific determinants and two macroeconomic determinants as the potential key drivers of bank's profitability which are asset growth, liquidity, leverage, GDP and inflation. After review and evaluate the model through econometric aspects, REM is chosen as the model for this research in order to regress the data. As summarize, only GDP has an insignificant relationship while other variables are significant related with bank's profitability. Apart from that, asset growth and leverage is negatively related with bank's profitability while other variables are positively related. It is noteworthy that the hypothesis testing is valid and reliable as the econometric problems are absence.

It is recommended to diversify and cover larger size of data sample and take into account of qualitative variables as well as improve the data collection method for the future research.

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# APPENDICES

## Appendix 1: Data of Each Variables

| | | ROA | ASSETGWTH | LQD | LVG | GDP | INF |
|---|---|---|---|---|---|---|---|
| Banco Bradesco SA | 1997 | 1.65 | 55,306.0 | 33.12 | 334.20 | 3.74 | 5.22 |
| | 1998 | 1.55 | 56,736.2 | 27.57 | 288.81 | -1.43 | 1.65 |
| | 1999 | 1.48 | 44,649.0 | 24.09 | 274.21 | 2.17 | 8.94 |
| | 2000 | 1.99 | 48,655.6 | 30.11 | 348.80 | 4.6 | 5.97 |
| | 2001 | 2.12 | 47,658.9 | 30.08 | 334.36 | -0.53 | 7.67 |
| | 2002 | 1.60 | 40,331.4 | 25.37 | 325.80 | 5.17 | 12.53 |
| | 2003 | 1.45 | 60,933.5 | 28.53 | 367.82 | 0.59 | 9.3 |
| | 2004 | 1.70 | 69,625.9 | 23.89 | 289.04 | 6.21 | 7.6 |
| | 2005 | 2.80 | 89,352.6 | 22.85 | 244.98 | 2.15 | 5.69 |
| | 2006 | 2.13 | 124,337.3 | 25.90 | 278.48 | 4.8 | 3.14 |
| | 2007 | 2.64 | 191,784.4 | 29.84 | 333.65 | 6.64 | 4.46 |
| | 2008 | 1.81 | 188,070.9 | 31.21 | 364.54 | 1.02 | 5.9 |
| | 2009 | 1.98 | 285,198.0 | 33.64 | 362.50 | 5.33 | 4.31 |
| | 2010 | 1.73 | 374,465.1 | 39.20 | 461.22 | 5.69 | 5.91 |
| | 2011 | 1.63 | 387,531.2 | 9.49 | 115.42 | 2.57 | 6.5 |
| | 2012 | 1.48 | 390,305.4 | 10.81 | 121.10 | 2.49 | 5.84 |
| | 2013 | 1.51 | 354,851.7 | 11.19 | 130.05 | 2.52 | 5.91 |
| | 2014 | 1.71 | 349,931.9 | 43.18 | 488.36 | -0.22 | 6.41 |
| | 2015 | 1.77 | 257,248.0 | 43.62 | 497.72 | -5.58 | 10.67 |
| | 2016 | 1.62 | 366,260.0 | 17.09 | 193.13 | -2.49 | 6.29 |
| | 2017 | 1.22 | 365,700.1 | 36.13 | 394.24 | 2.12 | 2.95 |
| Banco do Brasil SA | 1997 | 0.60 | 97,594.6 | 28.51 | 517.29 | 3.74 | 5.22 |
| | 1998 | 0.73 | 107,228.4 | 34.28 | 670.00 | -1.43 | 1.65 |
| | 1999 | 0.66 | 70,291.2 | 25.65 | 446.10 | 2.17 | 8.94 |
| | 2000 | 0.74 | 70,955.6 | 33.80 | 587.08 | 4.6 | 5.97 |
| | 2001 | 0.71 | 71,465.1 | 38.07 | 718.61 | -0.53 | 7.67 |
| | 2002 | 1.10 | 57,795.1 | 35.53 | 790.32 | 5.17 | 12.53 |
| | 2003 | 1.10 | 79,634.8 | 31.04 | 586.81 | 0.59 | 9.3 |
| | 2004 | 1.29 | 89,990.3 | 35.60 | 603.22 | 6.21 | 7.6 |
| | 2005 | 1.69 | 108,318.1 | 21.05 | 316.04 | 2.15 | 5.69 |
| | 2006 | 2.20 | 138,763.1 | 23.40 | 334.11 | 4.8 | 3.14 |
| | 2007 | 1.55 | 201,096.3 | 29.05 | 428.29 | 6.64 | 4.46 |
| | 2008 | 2.00 | 225,220.5 | 26.64 | 463.83 | 1.02 | 5.9 |
| | 2009 | 2.20 | 403,313.4 | 35.07 | 608.06 | 5.33 | 4.31 |
| | 2010 | 1.50 | 483,626.4 | 33.32 | 491.59 | 5.69 | 5.91 |
| | 2011 | 1.43 | 518,876.8 | 35.67 | 545.08 | 2.57 | 6.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2012 | 1.07 | 554,555.8 | 39.79 | 646.73 | 2.49 | 5.84 |
| | 2013 | 0.91 | 491,943.7 | 46.23 | 703.45 | 2.52 | 5.91 |
| | 2014 | 0.97 | 482,899.0 | 52.25 | 781.61 | -0.22 | 6.41 |
| | 2015 | 1.07 | 353,748.9 | 49.58 | 852.00 | -5.58 | 10.67 |
| | 2016 | 0.50 | 426,232.3 | 55.09 | 848.46 | -2.49 | 6.29 |
| | 2017 | 0.78 | 408,512.5 | 54.61 | 729.84 | 2.12 | 2.95 |
| Banco do Estado | 1997 | -0.38 | 10,728.5 | 69.17 | 2,217.15 | 3.74 | 5.22 |
| | 1998 | -5.66 | 12,386.8 | 66.53 | 2,068.54 | -1.43 | 1.65 |
| | 1999 | 0.57 | 3,479.4 | 20.48 | 252.59 | 2.17 | 8.94 |
| | 2000 | 1.20 | 3,933.4 | 21.26 | 298.15 | 4.6 | 5.97 |
| | 2001 | 1.15 | 3,879.0 | 24.66 | 376.69 | -0.53 | 7.67 |
| | 2002 | 1.48 | 3,166.8 | 26.29 | 425.03 | 5.17 | 12.53 |
| | 2003 | 2.49 | 4,055.7 | 19.86 | 290.23 | 0.59 | 9.3 |
| | 2004 | 2.54 | 4,565.6 | 16.32 | 192.68 | 6.21 | 7.6 |
| | 2005 | 2.69 | 6,032.8 | 17.35 | 213.66 | 2.15 | 5.69 |
| | 2006 | 2.43 | 7,327.1 | 15.40 | 185.91 | 4.8 | 3.14 |
| | 2007 | 5.07 | 11,512.3 | 15.54 | 113.96 | 6.64 | 4.46 |
| | 2008 | 2.59 | 10,890.2 | 14.35 | 117.31 | 1.02 | 5.9 |
| | 2009 | 1.99 | 16,695.8 | 12.03 | 102.61 | 5.33 | 4.31 |
| | 2010 | 2.46 | 19,691.8 | 8.97 | 73.42 | 5.69 | 5.91 |
| | 2011 | 2.57 | 20,171.5 | 9.40 | 80.23 | 2.57 | 6.5 |
| | 2012 | 1.96 | 23,219.8 | 10.27 | 100.85 | 2.49 | 5.84 |
| | 2013 | 1.47 | 22,906.8 | 14.24 | 144.51 | 2.52 | 5.91 |
| | 2014 | 1.22 | 22,503.3 | 22.52 | 802.50 | -0.22 | 6.41 |
| | 2015 | 1.34 | 16,900.1 | 23.76 | 256.19 | -5.58 | 10.67 |
| | 2016 | 0.97 | 21,212.6 | 18.41 | 197.29 | -2.49 | 6.29 |
| | 2017 | 1.48 | 22,126.5 | 15.95 | 166.18 | 2.12 | 2.95 |
| Itau Unibanco | 1997 | 1.84 | 41,568.1 | 33.29 | 348.41 | 3.74 | 5.22 |
| | 1998 | 1.84 | 40,549.0 | 26.23 | 259.64 | -1.43 | 1.65 |
| | 1999 | 3.71 | 28,855.5 | 26.20 | 215.50 | 2.17 | 8.94 |
| | 2000 | 3.03 | 35,669.1 | 30.59 | 296.05 | 4.6 | 5.97 |
| | 2001 | 3.16 | 35,406.6 | 30.76 | 307.37 | -0.53 | 7.67 |
| | 2002 | 2.46 | 31,395.9 | 28.64 | 315.99 | 5.17 | 12.53 |
| | 2003 | 2.74 | 41,085.8 | 29.24 | 267.72 | 0.59 | 9.3 |
| | 2004 | 3.03 | 49,073.3 | 24.12 | 207.32 | 6.21 | 7.6 |
| | 2005 | 3.73 | 64,757.6 | 23.64 | 214.29 | 2.15 | 5.69 |
| | 2006 | 2.39 | 98,183.8 | 26.27 | 221.63 | 4.8 | 3.14 |
| | 2007 | 3.36 | 165,753.9 | 30.94 | 293.50 | 6.64 | 4.46 |
| | 2008 | 1.39 | 173,417.6 | 35.24 | 396.95 | 1.02 | 5.9 |
| | 2009 | 2.82 | 343,908.2 | 34.36 | 250.96 | 5.33 | 4.31 |
| | 2010 | 1.77 | 438,001.2 | 42.38 | 456.10 | 5.69 | 5.91 |
| | 2011 | 1.79 | 439,079.1 | 40.77 | 442.73 | 2.57 | 6.5 |
| | 2012 | 1.42 | 467,246.3 | 45.67 | 575.21 | 2.49 | 5.84 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2013 | 1.66 | 434,853.1 | 43.85 | 535.07 | 2.52 | 5.91 |
| | 2014 | 2.00 | 425,873.9 | 43.03 | 482.06 | -0.22 | 6.41 |
| | 2015 | 2.14 | 322,261.9 | 46.06 | 515.40 | -5.58 | 10.67 |
| | 2016 | 1.77 | 415,793.3 | 42.96 | 431.26 | -2.49 | 6.29 |
| | 2017 | 1.71 | 433,237.4 | 37.71 | 365.66 | 2.12 | 2.95 |
| Citigroup Inc | 1997 | 1.01 | 697,384.0 | 42.77 | 660.97 | 3.74 | 5.22 |
| | 1998 | 0.85 | 668,641.0 | 33.05 | 468.49 | -1.43 | 1.65 |
| | 1999 | 1.54 | 795,584.0 | 38.21 | 480.96 | 2.17 | 8.94 |
| | 2000 | 1.59 | 902,210.0 | 39.53 | 501.47 | 4.6 | 5.97 |
| | 2001 | 1.45 | 1,051,450.0 | 37.96 | 451.63 | -0.53 | 7.67 |
| | 2002 | 1.42 | 1,097,190.0 | 38.30 | 484.56 | 5.17 | 12.53 |
| | 2003 | 1.51 | 1,264,032.0 | 40.28 | 519.43 | 0.59 | 9.3 |
| | 2004 | 1.24 | 1,484,101.0 | 44.47 | 603.83 | 6.21 | 7.6 |
| | 2005 | 1.65 | 1,494,037.0 | 48.12 | 638.83 | 2.15 | 5.69 |
| | 2006 | 1.28 | 1,884,318.0 | 47.48 | 746.99 | 4.8 | 3.14 |
| | 2007 | 0.18 | 2,187,480.0 | 52.34 | 1,009.17 | 6.64 | 4.46 |
| | 2008 | -1.34 | 1,938,470.0 | 47.97 | 656.62 | 1.02 | 5.9 |
| | 2009 | -0.08 | 1,856,646.0 | 36.63 | 438.90 | 5.33 | 4.31 |
| | 2010 | 0.56 | 1,913,902.0 | 40.26 | 464.81 | 5.69 | 5.91 |
| | 2011 | 0.58 | 1,873,878.0 | 37.51 | 391.39 | 2.57 | 6.5 |
| | 2012 | 0.40 | 1,864,660.0 | 33.44 | 326.46 | 2.49 | 5.84 |
| | 2013 | 0.73 | 1,880,382.0 | 31.84 | 290.49 | 2.52 | 5.91 |
| | 2014 | 0.39 | 1,842,181.0 | 31.37 | 273.02 | -0.22 | 6.41 |
| | 2015 | 0.97 | 1,731,210.0 | 27.87 | 216.27 | -5.58 | 10.67 |
| | 2016 | 0.85 | 1,792,077.0 | 28.93 | 229.27 | -2.49 | 6.29 |
| | 2017 | -0.37 | 1,842,465.0 | 30.34 | 277.22 | 2.12 | 2.95 |

## Appendix 2: Pairwise Granger Causality Test

Pairwise Granger Causality Tests
Date: 06/12/18 Time: 17:51
Sample: 1 105
Lags: 2

| Null Hypothesis: | Obs | F-Statistic | Prob. |
|---|---|---|---|
| LOG(GWTH) does not Granger Cause ROA | 103 | 35.4505 | 3.E-12 |
| ROA does not Granger Cause LOG(GWTH) | | 6.66741 | 0.0019 |
| LQD does not Granger Cause ROA | 103 | 9.12087 | 0.0002 |
| ROA does not Granger Cause LQD | | 5.03694 | 0.0083 |
| LVG does not Granger Cause ROA | 103 | 30.6231 | 5.E-11 |
| ROA does not Granger Cause LVG | | 5.98973 | 0.0035 |
| GDP does not Granger Cause ROA | 103 | 0.09322 | 0.9111 |
| ROA does not Granger Cause GDP | | 0.44117 | 0.6446 |
| INF does not Granger Cause ROA | 103 | 0.85078 | 0.4302 |
| ROA does not Granger Cause INF | | 0.45626 | 0.6350 |
| LQD does not Granger Cause LOG(GWTH) | 103 | 6.14718 | 0.0031 |
| LOG(GWTH) does not Granger Cause LQD | | 9.76871 | 0.0001 |
| LVG does not Granger Cause LOG(GWTH) | 103 | 6.03338 | 0.0034 |
| LOG(GWTH) does not Granger Cause LVG | | 8.96781 | 0.0003 |
| GDP does not Granger Cause LOG(GWTH) | 103 | 1.20437 | 0.3043 |
| LOG(GWTH) does not Granger Cause GDP | | 3.29445 | 0.0412 |
| INF does not Granger Cause LOG(GWTH) | 103 | 3.48456 | 0.0345 |
| LOG(GWTH) does not Granger Cause INF | | 1.35724 | 0.2622 |
| LVG does not Granger Cause LQD | 103 | 6.86400 | 0.0016 |
| LQD does not Granger Cause LVG | | 5.97408 | 0.0036 |
| GDP does not Granger Cause LQD | 103 | 2.23674 | 0.1122 |
| LQD does not Granger Cause GDP | | 5.21568 | 0.0070 |
| INF does not Granger Cause LQD | 103 | 0.16677 | 0.8466 |
| LQD does not Granger Cause INF | | 0.75950 | 0.4706 |
| GDP does not Granger Cause LVG | 103 | 2.50860 | 0.0866 |
| LVG does not Granger Cause GDP | | 5.58273 | 0.0051 |
| INF does not Granger Cause LVG | 103 | 0.21536 | 0.8066 |
| LVG does not Granger Cause INF | | 0.16443 | 0.8486 |
| INF does not Granger Cause GDP | 103 | 2.87233 | 0.0613 |
| GDP does not Granger Cause INF | | 3.98434 | 0.0217 |

## Appendix 3: Panel Least Squares

Dependent Variable: ROA
Method: Panel Least Squares
Date: 06/12/18 Time: 17:00
Sample: 1997 2017
Periods included: 21
Cross-sections included: 5
Total panel (balanced) observations: 105

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GWTH) | -0.218946 | 0.061001 | -3.589240 | 0.0005 |
| LQD | 0.045544 | 0.015026 | 3.031070 | 0.0031 |
| LVG | -0.003614 | 0.000509 | -7.095918 | 0.0000 |
| GDP | 0.076270 | 0.026496 | 2.878577 | 0.0049 |
| INF | 0.033100 | 0.032767 | 1.010154 | 0.3149 |
| C | 3.852950 | 0.655263 | 5.880002 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.536332 | Mean dependent var | 1.525316 |
| Adjusted R-squared | 0.512914 | S.D. dependent var | 1.152621 |
| S.E. of regression | 0.804432 | Akaike info criterion | 2.458084 |
| Sum squared resid | 64.06397 | Schwarz criterion | 2.609739 |
| Log likelihood | -123.0494 | Hannan-Quinn criter. | 2.519538 |
| F-statistic | 22.90297 | Durbin-Watson stat | 1.359212 |
| Prob(F-statistic) | 0.000000 | | |

## Appendix 4: Correlation Among The Independent Variables

| | ROA | LOG(GWTH) | LQD | LVG | GDP | INF |
|---|---|---|---|---|---|---|
| ROA | 1.000000 | -0.245021 | -0.503765 | -0.655057 | 0.228234 | 0.132151 |
| LOG(GWTH) | -0.245021 | 1.000000 | 0.492034 | 0.122223 | -0.061066 | -0.127706 |
| LQD | -0.503765 | 0.492034 | 1.000000 | 0.803296 | -0.137691 | -0.041257 |
| LVG | -0.655057 | 0.122223 | 0.803296 | 1.000000 | -0.085518 | -0.074684 |
| GDP | 0.228234 | -0.061066 | -0.137691 | -0.085518 | 1.000000 | -0.176954 |
| INF | 0.132151 | -0.127706 | -0.041257 | -0.074684 | -0.176954 | 1.000000 |

## Appendix 5: Heteroskedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|---|---|---|---|
| F-statistic | 9.671271 | Prob. F(5,99) | 0.0000 |
| Obs*R-squared | 34.45672 | Prob. Chi-Square(5) | 0.0000 |
| Scaled explained SS | 65.82793 | Prob. Chi-Square(5) | 0.0000 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/12/18 Time: 17:25
Sample: 1 105
Included observations: 105

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 2.274477 | 0.869758 | 2.615068 | 0.0103 |
| LOG(GWTH) | -0.137429 | 0.080969 | -1.697312 | 0.0928 |
| LQD | -0.024214 | 0.019944 | -1.214084 | 0.2276 |
| LVG | 0.002754 | 0.000676 | 4.073687 | 0.0001 |
| GDP | -0.011366 | 0.035169 | -0.323175 | 0.7472 |
| INF | -0.068545 | 0.043494 | -1.575982 | 0.1182 |

| | | | |
|---|---|---|---|
| R-squared | 0.328159 | Mean dependent var | 0.610133 |
| Adjusted R-squared | 0.294228 | S.D. dependent var | 1.270983 |
| S.E. of regression | 1.067756 | Akaike info criterion | 3.024441 |
| Sum squared resid | 112.8702 | Schwarz criterion | 3.176095 |
| Log likelihood | -152.7831 | Hannan-Quinn criter. | 3.085894 |
| F-statistic | 9.671271 | Durbin-Watson stat | 1.496555 |
| Prob(F-statistic) | 0.000000 | | |

## Appendix 6: Heteroskedasticity (With D)

Heteroskedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|---|---|---|---|
| F-statistic | 1.113798 | Prob. F(5,98) | 0.3581 |
| Obs*R-squared | 5.592168 | Prob. Chi-Square(5) | 0.3479 |
| Scaled explained SS | 29.37595 | Prob. Chi-Square(5) | 0.0000 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/12/18 Time: 17:36
Sample: 2 105
Included observations: 104

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.792647 | 0.264481 | 2.996993 | 0.0035 |
| D(LOG(GWTH)) | -0.500319 | 0.704572 | -0.710103 | 0.4793 |
| D(LQD) | 0.026567 | 0.051805 | 0.512836 | 0.6092 |
| D(LVG) | -0.002356 | 0.001680 | -1.402061 | 0.1641 |
| D(GDP) | -0.103987 | 0.067965 | -1.530011 | 0.1292 |
| D(INF) | -0.068735 | 0.096697 | -0.710828 | 0.4789 |

| | | | |
|---|---|---|---|
| R-squared | 0.053771 | Mean dependent var | 0.779481 |
| Adjusted R-squared | 0.005494 | S.D. dependent var | 2.694213 |
| S.E. of regression | 2.686802 | Akaike info criterion | 4.870542 |
| Sum squared resid | 707.4528 | Schwarz criterion | 5.023103 |
| Log likelihood | -247.2682 | Hannan-Quinn criter. | 4.932349 |
| F-statistic | 1.113798 | Durbin-Watson stat | 1.825314 |
| Prob(F-statistic) | 0.358105 | | |

## Appendix 7: Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 5.958902 | Prob. F(2,97) | 0.0036 |
| Obs*R-squared | 11.48912 | Prob. Chi-Square(2) | 0.0032 |

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 06/12/18 Time: 17:40
Sample: 1 105
Included observations: 105
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GWTH) | -0.000392 | 0.058157 | -0.006742 | 0.9946 |
| LQD | -0.004623 | 0.014397 | -0.321128 | 0.7488 |
| LVG | 5.28E-05 | 0.000488 | 0.108212 | 0.9141 |
| GDP | -0.003220 | 0.025328 | -0.127121 | 0.8991 |
| INF | 0.013590 | 0.031537 | 0.430928 | 0.6675 |
| C | 0.042242 | 0.624922 | 0.067596 | 0.9462 |
| RESID(-1) | 0.243553 | 0.103609 | 2.350694 | 0.0208 |
| RESID(-2) | 0.189562 | 0.103803 | 1.826177 | 0.0709 |

| | | | |
|---|---|---|---|
| R-squared | 0.109420 | Mean dependent var | -6.77E-16 |
| Adjusted R-squared | 0.045152 | S.D. dependent var | 0.784856 |
| S.E. of regression | 0.766933 | Akaike info criterion | 2.380297 |
| Sum squared resid | 57.05408 | Schwarz criterion | 2.582504 |
| Log likelihood | -116.9656 | Hannan-Quinn criter. | 2.462235 |
| F-statistic | 1.702543 | Durbin-Watson stat | 1.990870 |
| Prob(F-statistic) | 0.117289 | | |

## Appendix 8: Poolability Test

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

| Effects Test | Statistic | d.f. | Prob. |
|---|---|---|---|
| Cross-section F | 4.286811 | (4,95) | 0.0031 |
| Cross-section Chi-square | 17.423259 | 4 | 0.0016 |

Cross-section fixed effects test equation:
Dependent Variable: ROA
Method: Panel Least Squares
Date: 02/11/19 Time: 14:47
Sample: 1997 2017
Periods included: 21
Cross-sections included: 5
Total panel (balanced) observations: 105

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 3.852950 | 0.655263 | 5.880002 | 0.0000 |
| GDP | 0.076270 | 0.026496 | 2.878577 | 0.0049 |
| INF | 0.033100 | 0.032767 | 1.010154 | 0.3149 |
| LNGWTH | -0.218946 | 0.061001 | -3.589240 | 0.0005 |
| LQD | 0.045544 | 0.015026 | 3.031070 | 0.0031 |
| LVG | -0.003614 | 0.000509 | -7.095918 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.536332 | Mean dependent var | 1.525316 |
| Adjusted R-squared | 0.512914 | S.D. dependent var | 1.152621 |
| S.E. of regression | 0.804432 | Akaike info criterion | 2.458084 |
| Sum squared resid | 64.06397 | Schwarz criterion | 2.609739 |
| Log likelihood | -123.0494 | Hannan-Quinn criter. | 2.519538 |
| F-statistic | 22.90297 | Durbin-Watson stat | 1.359212 |
| Prob(F-statistic) | 0.000000 | | |

## Appendix 9: Hausman Test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
|---|---|---|---|
| Period random | 0.101793 | 3 | 0.9916 |

Period random effects test comparisons:

| Variable | Fixed | Random | Var(Diff.) | Prob. |
|---|---|---|---|---|
| LOG(GWTH) | -0.228734 | -0.221510 | 0.000681 | 0.7820 |
| LVG | -0.003611 | -0.003614 | 0.000000 | 0.9868 |
| LQD | 0.046817 | 0.045888 | 0.000021 | 0.8394 |

Period random effects test equation:
Dependent Variable: ROA
Method: Panel Least Squares
Date: 06/13/18 Time: 14:46
Sample: 1997 2017
Periods included: 21
Cross-sections included: 5
Total panel (balanced) observations: 105
WARNING: estimated coefficient covariance matrix is of reduced rank

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 4.309280 | 0.619570 | 6.955274 | 0.0000 |
| LOG(GWTH) | -0.228734 | 0.067045 | -3.411633 | 0.0010 |
| LVG | -0.003611 | 0.000527 | -6.851680 | 0.0000 |
| LQD | 0.046817 | 0.015676 | 2.986555 | 0.0037 |
| GDP | NA | NA | NA | NA |
| INF | NA | NA | NA | NA |

Effects Specification

Period fixed (dummy variables)

| | | | |
|---|---|---|---|
| R-squared | 0.636990 | Mean dependent var | 1.525316 |
| Adjusted R-squared | 0.533913 | S.D. dependent var | 1.152621 |
| S.E. of regression | 0.786901 | Akaike info criterion | 2.556204 |
| Sum squared resid | 50.15633 | Schwarz criterion | 3.162824 |
| Log likelihood | -110.2007 | Hannan-Quinn criter. | 2.802018 |
| F-statistic | 6.179745 | Durbin-Watson stat | 1.285353 |
| Prob(F-statistic) | 0.000000 | | |

## Appendix 10: Lagrange Multiplier Test for Random Effects

Lagrange Multiplier Tests for Random Effects
Null hypotheses: No effects
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

| | Test Hypothesis | | |
|---|---|---|---|
| | Cross-section | Time | Both |
| Breusch-Pagan | 6.355552<br>(0.0117) | 0.091981<br>(0.7617) | 6.447533<br>(0.0111) |
| Honda | 2.521022<br>(0.0059) | 0.303284<br>(0.3808) | 1.997086<br>(0.0229) |
| King-Wu | 2.521022<br>(0.0059) | 0.303284<br>(0.3808) | 2.425183<br>(0.0077) |
| Standardized Honda | 4.309537<br>(0.0000) | 0.743565<br>(0.2286) | -1.158075<br>(0.8766) |
| Standardized King-Wu | 4.309537<br>(0.0000) | 0.743565<br>(0.2286) | 0.297004<br>(0.3832) |
| Gourieroux, et al.* | -- | -- | 6.447533<br>(0.0155) |

## Appendix 11: Panel Least Square (Asset Growth)

Dependent Variable: LNGWTH
Method: Panel Least Squares
Date: 01/22/19 Time: 17:43
Sample: 1997 2017
Periods included: 21
Cross-sections included: 5
Total panel (balanced) observations: 105

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| ROA | -0.525902 | 0.146522 | -3.589240 | 0.0005 |
| INF | -0.070861 | 0.050546 | -1.401922 | 0.1641 |
| LQD | 0.170634 | 0.017278 | 9.875683 | 0.0000 |
| LVG | -0.005894 | 0.000768 | -7.678739 | 0.0000 |
| GDP | 0.040535 | 0.042553 | 0.952573 | 0.3431 |
| C | 10.13098 | 0.595633 | 17.00875 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.532621 | Mean dependent var | 11.84151 |
| Adjusted R-squared | 0.509016 | S.D. dependent var | 1.779261 |
| S.E. of regression | 1.246732 | Akaike info criterion | 3.334374 |
| Sum squared resid | 153.8797 | Schwarz criterion | 3.486028 |
| Log likelihood | -169.0546 | Hannan-Quinn criter. | 3.395827 |
| F-statistic | 22.56394 | Durbin-Watson stat | 0.625815 |
| Prob(F-statistic) | 0.000000 | | |

## Appendix 12: Panel Least Square (Liquidity)

Dependent Variable: LQD
Method: Panel Least Squares
Date: 01/22/19 Time: 17:47
Sample: 1997 2017
Periods included: 21
Cross-sections included: 5
Total panel (balanced) observations: 105

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| GDP | -0.277603 | 0.174263 | -1.593011 | 0.1143 |
| INF | 0.202672 | 0.209751 | 0.966251 | 0.3363 |
| LNGWTH | 2.908326 | 0.294494 | 9.875683 | 0.0000 |
| LVG | 0.033486 | 0.002167 | 15.45110 | 0.0000 |
| ROA | 1.864579 | 0.615155 | 3.031070 | 0.0031 |
| C | -20.66457 | 4.404994 | -4.691167 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.824834 | Mean dependent var | 31.75783 |
| Adjusted R-squared | 0.815987 | S.D. dependent var | 11.99880 |
| S.E. of regression | 5.147098 | Akaike info criterion | 6.170188 |
| Sum squared resid | 2622.769 | Schwarz criterion | 6.321843 |
| Log likelihood | -317.9349 | Hannan-Quinn criter. | 6.231642 |
| F-statistic | 93.23534 | Durbin-Watson stat | 1.063441 |
| Prob(F-statistic) | 0.000000 | | |

## Appendix 13: Panel Least Square (Leverage)

Dependent Variable: LVG
Method: Panel Least Squares
Date: 01/22/19 Time: 17:48
Sample: 1997 2017
Periods included: 21
Cross-sections included: 5
Total panel (balanced) observations: 105

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| GDP | 8.012164 | 4.357288 | 1.838796 | 0.0689 |
| LNGWTH | -63.32978 | 8.247420 | -7.678739 | 0.0000 |
| LQD | 21.10945 | 1.366210 | 15.45110 | 0.0000 |
| ROA | -93.27872 | 13.14541 | -7.095918 | 0.0000 |
| INF | -3.417233 | 5.279977 | -0.647206 | 0.5190 |
| C | 657.8763 | 102.8571 | 6.396025 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.834520 | Mean dependent var | 432.5927 |
| Adjusted R-squared | 0.826163 | S.D. dependent var | 309.9542 |
| S.E. of regression | 129.2316 | Akaike info criterion | 12.61654 |
| Sum squared resid | 1653381. | Schwarz criterion | 12.76819 |
| Log likelihood | -656.3681 | Hannan-Quinn criter. | 12.67799 |
| F-statistic | 99.85221 | Durbin-Watson stat | 1.204139 |
| Prob(F-statistic) | 0.000000 | | |

## Appendix 14: Panel Least Square (Gross Domestic Product)

Dependent Variable: GDP
Method: Panel Least Squares
Date: 01/22/19 Time: 17:45
Sample: 1997 2017
Periods included: 21
Cross-sections included: 5
Total panel (balanced) observations: 105

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LNGWTH | 0.224062 | 0.235218 | 0.952573 | 0.3431 |
| INF | -0.237579 | 0.117612 | -2.020025 | 0.0461 |
| LQD | -0.090030 | 0.056515 | -1.593011 | 0.1143 |
| LVG | 0.004122 | 0.002242 | 1.838796 | 0.0689 |
| ROA | 1.012649 | 0.351788 | 2.878577 | 0.0049 |
| C | 0.646041 | 2.772644 | 0.233006 | 0.8162 |

| | | | |
|---|---|---|---|
| R-squared | 0.126361 | Mean dependent var | 2.264762 |
| Adjusted R-squared | 0.082238 | S.D. dependent var | 3.059691 |
| S.E. of regression | 2.931180 | Akaike info criterion | 5.044133 |
| Sum squared resid | 850.5900 | Schwarz criterion | 5.195788 |
| Log likelihood | -258.8170 | Hannan-Quinn criter. | 5.105586 |
| F-statistic | 2.863831 | Durbin-Watson stat | 1.872078 |
| Prob(F-statistic) | 0.018562 | | |

## Appendix 15: Panel Least Square (Inflation)

Dependent Variable: INF
Method: Panel Least Squares
Date: 01/22/19 Time: 17:46
Sample: 1997 2017
Periods included: 21
Cross-sections included: 5
Total panel (balanced) observations: 105

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| GDP | -0.166620 | 0.082484 | -2.020025 | 0.0461 |
| LNGWTH | -0.274705 | 0.195949 | -1.401922 | 0.1641 |
| LQD | 0.046097 | 0.047707 | 0.966251 | 0.3363 |
| LVG | -0.001233 | 0.001905 | -0.647206 | 0.5190 |
| ROA | 0.308217 | 0.305119 | 1.010154 | 0.3149 |
| C | 8.556235 | 2.157534 | 3.965748 | 0.0001 |

| | | | |
|---|---|---|---|
| R-squared | 0.082126 | Mean dependent var | 6.326667 |
| Adjusted R-squared | 0.035768 | S.D. dependent var | 2.499837 |
| S.E. of regression | 2.454723 | Akaike info criterion | 4.689350 |
| Sum squared resid | 596.5407 | Schwarz criterion | 4.841005 |
| Log likelihood | -240.1909 | Hannan-Quinn criter. | 4.750803 |
| F-statistic | 1.771577 | Durbin-Watson stat | 1.544327 |
| Prob(F-statistic) | 0.125639 | | |

Appendix 16: VIF Value and Indication

| **VIF Value** | **Indication** |
|---|---|
| **VIF=** $\infty$ | Perfect multicollinearity problem |
| **VIF≥10** | Serious multicollinearity problem |
| **1< VIF < 10** | No serious multicollinearity problem |