THE DETERMINANTS INFLUENCING LIQUIDITY OF MALAYSIA COMMERCIAL BANKS, AND ITS IMPLICATION FOR RELEVANT BODIES: EVIDENCE FROM 15 MALAYSIA COMMERCIAL BANKS

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DECLARATION

We hereby declare that:

(1) This undergraduate research project 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 research project 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 research project.

(4) The word count of this research report is 19,664 words.

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LIST OF ABBREVIATIONS

BIS   Bank for International Settlement

LCR   Liquidity Coverage Ratio

HQLA   High Quality Liquid Asset

HSBC   Hong Kong and Shanghai Bank Corporation

BNM   Bank Negara Malaysia

CDO   Collateralize Debt Obligation

MBS   Mortgage Back Securities

PIDM   Perbadanan Insuraan Deposit Malaysia

FISS   Financial Institution Statistical System

RLFM   Report on Liquidity Framework

GDP   Gross Domestic Product

U.S.A   United State of America

ALCO   Asset Liability Committee

RHB   Rashid Hussain Berhad

BSN   Bank Simpanan Nasional

NPL   Non-performing Loan

REPO   Repurchase Agreement

BAFIA   Banking and Financial Institution Act 1989

GTA   Gross Total Asset

ROE   Return on Equity

NIM   Net Interest Margin

ROA   Return on Asset

MLR	Minimum Liquidity Ratio
BLR	Bank Liquidity Ratio
GCC	Gulf Cooperation Council
LOLR	Lender of Last Resort
FEM	Fixed Effect Model
LIQ	Liquidity Ratio (loan to deposit ratio)
CAP	Capital Adequacy Ratio
SIZE	Bank's Size
INTERB	Interbank Rate
FC	Financial Crisis
IMF	International Monetary Fund
OLS	Ordinary Least Square
VIF	Variance Inflating Factors
TOL	Tolerance
CLRM	Classical Linear Regression Model
ADF	Augmented Dickey Fuller
REM	Random Effect Model
CPI	Consumer Price Index

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PREFACE

This research paper is submitted in partial fulfillment of the requirement for Bachelor of Business Administrations (Hons) Banking and Finance. Our Supervisor on the project is Cik Noorfaiz Binti Purhanudin. The final year project is made solely by the authors yet it is based on the research of others and the resources are quoted as in references.

There are a lot of researches and studies conclude on this topic but yet, there is only limited number of research studies about the variables that affect the commercial bank liquidity in Malaysia. We are interested to know more about the model of the variables that will influences the bank's liquidity.

Thus, we choose the topic 'the determinants influencing liquidity of Malaysia commercial banks, and its implication for relevant bodies: evidence from 15 Malaysia commercial banks'. Writing this thesis has been difficult but during the process we have learned how to deal with the conditions of some commercial banks and their liquidity ratio. We strongly felt that the knowledge we learned from this research will help us in our future career.

ABSTRACT

The purpose of this research is to identify the factors significant to explain Malaysia commercial Banks liquidity. This study has categorized the independent factors into bank specific factors and macroeconomic factors. The bank specific factors include Bank Size, Capital Adequacy, Profitability, Non-Performing Loans, while the macroeconomic factors include Gross Domestic Product, Inter-Bank Rate and Financial Crisis. This study obtained secondary data from 15 Malaysia commercial banks from the year 2003 to 2012. Some factors were expressed in ratios, while some were in percentage and the dummy variable was qualitative in form. This study concludes the results based on panel data, fixed effect model using annual data. The empirical findings state that all the factors included are significant except inter-bank rates. The factors with positive influence on bank liquidity are Non-Performing Loan, Profitability and Gross Domestic Product. On the other hand, factors to bring negative effect to bank liquidity are Bank Size, Capital Adequacy, Financial Crisis and Interbank Rate but turned out insignificant.

CHAPTER 1: RESEARCH OVERVIEW

1.0   Introduction

Banks indulge in treasury services providing a conduit for monetary policy implication. Banks do as well assist in foreign exchange dealings, earning a commission (spread of bid and offer rate). Banks do also provide trust services like unit trust in which the bank withholds assets for the next of kin charging a nominal fee. Apart from these, one of the central roles of banks is being a financial intermediary that facilitates credit to deficit users by channeling fund from surplus economic units. By this, banks are actually collecting short term deposit and issuing loans for long terms. This will create a liquidity problem to the bank. When a bank does not have enough liquidity to fulfill its obligation, the bank is said to face liquidity risk. According to the Bank for International Settlements/BIS (2008), liquidity is defined as bank's ability to acquire funds required to meet obligations when due without incurring any substantial losses. It's an agreed fact that all businesses including banks face liquidity risk. The banks liquidity risk is evident from its operations of providing mismatched maturities of deposits and loans (short-term deposits for long-term loan). As a consequence, banks fundamentally need to hold not only an optimal level of capital but also liquidity to maintain efficiency and operative excellence.

Based on BIS (2013), due to the recent financial mayhem and decline, the Basel Committee has proposed a tighter capital requirement (7.25% of business and most consumer loans in 1989. However, this requirement increased to 8% even before 1993) to facilitate the insolvency of banks. Prior to "liquidity phase" of financial crisis happen at 2007, a lot of banks still experienced financial distress despite having adequate capital as a consequence of poor liquidity management. The crisis highlights the importance of proper liquidity management on both financial market and banking sectors. Before the crisis, asset markets were active

and funding was made easy even at low cost. A rapid market downturn quickly dried up liquidity and that illiquidity will last for a pro-longed period. The severe distress in banking system forces the central bank to take action in supporting both the function of the money market and banks.

Besides that, the Basel Committee has also emphasized the importance of banks' liquidity creation. Liquidity Coverage Ratio (LCR) was the key to the reformation of a resilient banking sector. The aim is to encourage the short term tolerance on liquidity risk profile of banks. This was made by making sure banks have an adequate stock of unencumbered high-quality assets (HQLA) that liquidate easily in private markets in the case of emergency needs for a 30 calendar day liquidity stress scenario. LCR will provide a cushion for absorbing shock and economic stress (Bank for International Settlements, 2013)

Past research (Diamond and Dybvig, 1983) and a much more recent research (Rauch, Steffen, Hackethal and Tyrell, 2009) agreed that the main reason for bank fragility is due to the transformation of maturity and to provide insurance with regards to depositors liquidity needs. Besides that, a lot of financial institutions failed even though they were profitable as the case of Lehman Brothers in 2008 due to liquidity mismanagement.

Due to the unexpected shock and grievous loss in financial markets, determining liquidity is vital for a better understanding on the concept of liquidity risk in relation with other financial risks. Then, without hesitation financial organizations liquidity is utterly crucial to the economic excellence of a country. This research project is divided to several sections; consisting of 8 segments including brief overview of banking history in Malaysia, statement of the problem, the overall purpose of the study, research questions and hypotheses, research methodology, scope and limitations of the study, significance of the study and organization of the study. There forth, the researchers strive towards determining the factors that may manipulate the liquidity of financial intermediaries.

1.1 Research Background

Malaysia financial system consists of both conventional and Islamic financial system with its wide range of institutions to serve the increasingly complicated needs of the public. The root of Malaysia's banking can be traced back to the 19th century with Hong Kong and Shanghai bank (HSBC) and Charted Bank (Standard Chartered Bank) setting up their branches in Penang. Only in mid of the 19th century, Bank Negara Malaysia (BNM) was established with the purpose to issue currency, act as a supreme banker and adviser to the government along with regulating the country's credit situation and banks. The primary goals of banks are to provide price, maintain monetary and financial stability to promote sustainable growth of the Malaysian economy. In 2002, the Malaysian government had implemented the banking sector reformation in respond with 1997 financial crisis. Under the reformation plan, Malaysian government officially encouraged and guided merging activities of banks under the supervision of the central bank. Prior to the period, Malaysia's banking sector encompassed 54 domestic deposit taking institutions which later became eight large-capitalized banks (anchor banks) after merging activities by the end of 2002 (Institution Bank-Bank Malaysia, n.d.).

Bank plays a vital role to develop a progressive and inclusive financial sector to preserve the core foundation of financial stability, to provide effective and efficient financial intermediation. The banks' activities include channeling surplus savings to deficit users. In this process, banks give lower interest to risk adverse savers and earn a higher interest from borrowers to realize profits. The financial sector was intended to anchor stable economic growth in real sector. To date, financial system had grown at the rate of 8-11% per annum contributing 8.6% of nominal GDP in 2010 and expected to grow between 10-12% by 2020 (Central Bank of Malaysia, n.d.)

During 2007-2008, a global financial outbreak was considered the worst since the Great Depression in 1930. The whole financial system faced threats of total collapse for large financial institutions, national government bailout banks and

global stock downturn. This was indeed caused by the global bank massive spending spree while funding their investments with low short term rates. The result, investment banks leverage ratio shoot up to 30 times or even higher. Even the top investment banks such as Morgan Stanley, Lehman Brothers, and Merill Lynch were funded by mostly short term borrowing. For the commercial banks, they issued hundreds of billions home mortgages and issued collateralize debt obligation (CDO) and mortgage back securities (MBS) to poor individuals with low adjustable rates. When the interest rate rose, default rates of these poor mortgage loans suddenly outstood. Bottom layer of CDOs and MBSs were wiped out and investors started to lose hope and confidence in top AAA tranches and banks that held large amount of these securities. When this happens, liquidity in the financial market starts to dry up and financial institutions liquidity position started to fall while their borrowing maturity was nearing. This caused top investment banks like Bear Stearns and Lehman Brother to become insolvent due to subprime exposure. Besides that, all other banks also suffered the similar problem in liquidity obligation at this point but the worst affected was Lehman Brother Bank(Wall Street Oasis, n.d.).

Wall Street Oasis, (n.d.) noted that *bank failures and bank run are a rare sight in Malaysia but it is quite common outside Malaysia, for instances in the U.S. A bank failure means the closing of a bank by the federal government or state banking regulatory agency when it is unable to meet its obligation to depositors and others. In other words, when a bank is illiquid for a pro-longed period, it will face the risk of being closed by the federal authorities. Malaysia was lucky to survive the 1997-1999 major economic crises back then where Indonesia, Thailand, Philippines and Korea were facing serious economic mishaps. But still, some of the banks in Malaysia failed.*

The bank would either be:
1. Recapitalized by either the central bank or an agency specifically created to address the crisis, and/or it required a liquidity injection from the monetary authority.
2. Temporarily suspended ("frozen") by the government.

3. The financial institution was absorbed or acquired by another financial institution.

Or else it would be shut down by the government.

Based on Malaysia Loan (2008), below is some list of famous banks in Malaysia that failed in 1997-1999

1. June 1997 Chung Khiaw Bank (Malaysia) Bhd
1. October 1998 AmBank Group
2. November 1998 BSN Commercial Bank (Malaysia) Berhad
3. November 1998 RHB Bank Berhad
4. December 1999 BSN Merchant Bank BHD
5. January 1998 RHB Finance Berhad
6. November 1998 Southern Investment Bank Berhad
7. 1999 TA Enterprise Berhad

In the case of bank failure, Perbadanan Insurans Deposit Malaysia (PIDM) will reimburse the depositors its deposit up to RM60, 000 in the 90's and now up to RM250, 000 per account (Malaysia Loan, 2008). Due to this feature, Malaysian regulators such as Bank Negara Malaysia (BNM) had introduced the Liquidity Framework in 1998 to replace the liquid asset ratio requirement back centuries. The main objective is to raise awareness among banking institutions on their funding structure and their capability in handling short and medium-term liquidity problems. This includes adopting a more effective and frequently updated liquidity measurement. The framework is also capable to provide the banks with much better means of assessing on their present and future liquidity position. This also includes ability of banking institutions to access funding from the market particularly under stress scenarios(Prudential Financial Policy Department, n.d.).

For this, the new requirement does not focus on rigid compliance with particular ratio but rather a flexible one such as adjusted loan/deposit ratio, net offshore borrowing/total domestic deposit liabilities, Net domestic interbank borrowing/Total domestic deposit liabilities and Short term gross domestic

interbank borrowing/Short term domestic total funding,to provide a more systematic project of analysis between Bank Negara Malaysia and the related banking institution. The methods would aid a bank to identify at an early stage, any negative trend that is potentially hazardous to its future liquidity position (Prudential Financial Policy Department, n.d.).

Besides that, BNM now would perceive the bank's Asset Liability Committee (ALCO) as the main department for the liquidity management. Banks are now needed to maintain a minimum requirement of surplus in the cumulative net maturity mismatch of the "1 week" ("3 days" for investment banks) and "1 month" liquidity buckets. On top of that, the banks are required to submit Financial Institutions Statistical System (FISS) under the Report on Liquidity Framework (RLFM) to BNM.

Apart from the new regulation, financial crisis that happened had awakened the banking institutions that identify the factors that would potentially affect the liquidity position of a bank more importantly than before. Factors from either external environment such as macroeconomic factors or bank-specific factors should be accurately identified to facilitate better decision making (Prudential Financial Policy Department, n.d.).

1.2 Problem Statement

According to Mishkin and Eakins (2012), the role of the financial sectors in Malaysia is an agreed fact – it is to channel funds from surplus users (mostly household to business, government, and to the least, foreigner) to deficit users (mostly business to government, household, and to the least, foreigner). The financial sector also provides a channel for higher authorities to conduct monetary policies, indeed avoiding undesired inflations. Generally, the role of commercial banks is subdivided to;

- Retail banking services such as the acceptance of deposit, granting of loans and advances, and financial guarantees.
- Trade financing facilities such as letter of credit, discounting of trade bills, shipping guarantees, trust receipts and banker's acceptance.
- Treasury services.
- Cross border payment services.
- Custody services such as safe deposits and share custody.

It is known, that banks provide a medium to store surplus funds and lend out excess reserves (loan). Loans are regarded as the most profitable service yet the most risky service provided by banks. It is most risky due to the likeliness of credit risk which may eventually end up in liquidity shortage. According to Ericsson & Renault (2006), as default risk increases, liquidity risk also increases. This has caused banks to take measures like evaluating the type of borrowers and their creditworthiness. Banks also provide services of banker's acceptance where the bank guarantees payment of a stated cost of imports to the exporter on a specific date. Banker's Acceptance is known for its high liquidity.

Banks in Malaysia foster the growth of the economy breathing as a source of liquidity. Opportunities in Malaysia's financial services lie in commercial banking, investment banking, Islamic banking, insurance and Takaful, asset management and wealth management, and myriad. As mentioned above, over the years, the financial sector had contributed to Malaysia's GDP with increasing trend from 9.2% in 2000 to 11% in 2008 (Karunairajah, 2009).

Apart from that, The Edge Malaysia (2013) reported that the total deposit in Malaysia has been reported to rise over the years (1997: RM4,572,807.40million to 2012: RM16,349,704.40million; grew 244%),with this rapid growth, banks are essentially required to maintain timely cash flows in order to up keep with unusual large withdrawals. Regulators have also implemented heavy regulations, setting out a Liquidity Framework. This has forced banks to monitor their funding structure and its ability to handle short term liquidity problems and provide banks

with a better means of assessing the present and future liquidity risk associated
with its future liquidity position.

Liquidity risk is defined as the inability to obtain necessary cash at justifiable cost
when required. It is undeniable, since banks face liquidity risk from time to time.
So, banks are officially encouraged to maintain sufficient liquidity for each
clientele. As stated above, in the year of 2008 major banks encountered extreme
liquidity risk caused by the United State of America (U.S.A) subprime mortgage
crisis. Several episodes of bank failure have gained the attention of financial buffs.
However, the most prominent financial organization to fail is the Lehman
Brothers, in reference; the Lehman case can be briefly regarded for too much
concentration in lending out loans to the mortgage sector causing the engulfment
of the entire available funds – filing the largest USA bankruptcy dating back.
Some banks resolved liquidity issue by with acquisition and merging. Malaysia
did as well undergo this situation dating back to the mid of 90's where large bank
in Malaysia like RHB and BSN faced liquidity shortage, failed and was nearly
closed by government.

In reality, commercial banks liquidity is of utmost importance. With higher
liquidity, banks will have remarkable performance encouraging public confidence
and soundness among banks. Hence, the question tugged at mind - What are the
factors that allow a bank to maintain its liquidity level? No doubt, there are
internal and externals sources of liquidity. According to past research, factors
found to significantly affect liquidity position of a bank include bank specific
factors and macroeconomic factors. Bank specific factors consist of bank size,
capital adequacy, non-performing loan (NPL), and profitability while
macroeconomic factors include GDP, interbank rate, and financial crisis.

1.3 Research Objectives

Given the importance of commercial banks in Malaysia, this paper is to examine the factors that contribute to the bank safety and soundness in term of liquidity.

1.3.1 General Objective

The objective of this paper is to determine the factors affect the liquidity of commercial bank in Malaysia.

1.3.2 Specific Objective

The comprehensive intention of this study is to closely examine how internal factors such as capital ratio, bank size, NPL, and profitability affect the commercial banks' liquidity. Besides, the objective of this paper is also to examine how external factors such like GDP, interbank rate, and financial crisis affect the liquidity of commercial banks. It is critical to determine which factors essentially determine the liquidity of the commercial banks.

1.4 Research Questions

What are the significant factors of liquidity influencing commercial banks in Malaysia?

1.5 Hypotheses of the Study

The major hypothesis of this study is to evaluate whether external factors as well as internal factors are important in explaining Malaysia Commercial Bank's liquidity. The internal factors include capital ratio, bank size, NPL, and profitability, while external factors include GDP, interbank rate, and financial crisis. This study follows an extensive literature that focuses on internal as well as external factors as main determinants of banks' profitability.

1.6 Significance of Study

In this study, researchers examine a series of variables by introducing internal and external factors that may significantly affect the commercial banks' liquidity. Researchers' study can be used as a reference for commercial banks to focus and control over the variables that bring negative effects to its liquidity.

1.7 Chapter Layout

The researchers' report consists of five chapters. Chapter one provides the general introduction about the whole project including background, purpose and objective of this study and others. Chapter two provides insight of literatures review on the liquidity determinants that is explained by internal variables and external variables. Data description and methodology are provided to estimate researcher's research finding in chapter three. Chapter four consists of the description, analysis and finding of research. Lastly in chapter five, researchers elaborate on the finding and make the conclusion and provide some relevant policy recommendations.

1.8 Conclusion

This paper is to examine the determinants of the liquidity among commercial banks in Malaysia. The external and internal determinants of commercial bank's liquidity have been focused in this paper and the result may differ from previous researches as the factors used may not be the same and other factors may also affect the final result.

CHAPTER 2: LITERATURE REVIEW

2.0   Introduction

This research is purposed to discuss the variables that influence the safety and
soundness of commercial banks in terms of liquidity in Malaysia. The researchers
discuss the findings of past research on internal and external factors affecting
liquidity of commercial banks in Malaysia. The researchers examine the factors
influencing liquidity of banks using the theoretical framework in order to propose
a conceptual framework. A hypothesis is concluded based on the theoretical
framework developed based on analysis.

2.1 Review of the Literature

Financial institutions most important decisions are divided into profitability and
liquidity. The recurring crisis has strained banks to prioritize liquidity instead of
profitability. Financial buffs have speculated that the worst is yet to come. It is
evident with Syria facing political collides and gold prices falling rapidly, have
indeed trigged banks to lookout for financial distress.A financial institution may
employ several sources to meet its liquidity needs. The sources include the sale of
financial instruments, receipts of demand deposits, return on investments,
interbank borrowings and funds from the central bank. This is agreed by Aspachs,
Nier and Tiesset (2005), adding that banks may acquire liquidity by holding
sufficient cash asset, reserves in central bank, interbank borrowing, investing in
government securities and involvement in repurchase agreements (REPO). Banks
can also interlink their assets and liabilities maturity period through interbank
borrowings.

Studying on the uses of liquid funds, Rochet (2008) in his study has stated some uses of funds (liquidity needs):

Asset Side	Liability Side
New application of loans	Large volume of deposit withdrawals
Expiry of financial instrument sold	Large number of depositor withdrawals
Off-balance sheet activities	Repayment of bonds sold

Table 2.1: Uses of liquid funds

Based on knowledge, when uses of funds exceed sources of funds, liquidity risk or illiquidity is present. As defined, illiquidity is the risk that the organization does not have the financial capacity to meet its short-term obligations.

There are several conceptual papers dealing with bank liquidity creation (Bryant 1980; Diamond & Dybvig 1983; Holmstrom & Tirole 1998 and Kashyap et al. 2002). However, most researches focus on measuring the amount of liquidity created in the banking sector (Deep & Schaefer, 2004 and Berger & Bouwman, 2007); yet few studies have shed light on the determinants of bank liquidity creation. Therefore, this research focuses on examining the relevant determinants on bank liquidity creation. This chapter will discuss in depth the determinants pertaining to the topic under study, including reviewing and analyzing of literatures and the core aspects of liquidity creation.

This review of literature said in establishing the framework for this study and clearly identifies the gap in past literature. This has helped in formulating the research hypotheses for this study.

This chapter is divided into four sections.
- Section 2.1 discusses about the theoretical aspects of banks liquidity and the determinants of liquidity investigated by the study.
- Section 2.2 explains the review of relevant theoretical models.

- Section 2.3 gives details on proposing a theoretical framework for the study.
- Section 2.4 summaries the chapter and briefly discusses the knowledge gap from past literatures.

2.1.1 Bank liquidity

Author	Year	Definition
Yeager and Seitz	1989	The ability of a financial institution to meet all legitimate demand for funds.
Garber and Weisbrod	1992	The ability to convert an asset to cash quickly. Also known as "marketability''.
Hempel et al.	1994	
Bank for International Settlement	2008	The ability of a bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses.
Moore	2009	The ability of an organization or financial institution to convert assets to cash without any obstructions.
Kleopatra Nikolaou	2009	Liquidity refers to the unhindered flow of funds between an agent of a financial system, with a particular focus on the flows among the central bank, commercial banks and markets.
Kimberly Amadeo	2013	Liquidity is the amount of capital that is available for meeting short-term obligations.

Table 2.1.1: Definition of Bank Liquidity

Based on the above definitions, it is understood that a bank must possess adequate funds to meet the requirements of its customers. It is also understood that financial institutions may opt to other sources to meet the liquid demands of customers.

Some primary sources include interbank or central bank borrowings to satisfy customer needs at times of distress. Financial institutions may also opt to REPO transactions for short-term (1-7days) liquidity needs. It is important for us to appropriately measure bank liquidity because financial institutions that fail to meet customers' demands face illiquidity that may result to worsened financial system stability. Consequently, the researchers appropriately examine past studies on the measurement of bank liquidity creation.

The two most widely used approaches to measure liquidity risk of banks are by liquidity gap/flow approach and liquidity ratio/stock approach. The liquidity gap approach adapts the variation between assets and liabilities both currently and future periods. A positive liquidity gap means for deficit, requiring for liabilities to be increased (Bessis, 2009). The liquidity gap treats liquid reserves as a reservoir: the bank computes the required liquidity by comparing inflows and outflows during a specified period.

On the other hand, liquidity ratio uses various ratios to identify liquidity tendency. The various ratios label for immediate viable source of funding. This indeed entitles portfolio of assets that can be sold off without any fuss and also adequate amounts of stable liabilities. Most importantly, ready credit line with other financial institutions. Various authors like Moore (2010), Rychtárik (2009), or Praet and Herzberg (2008) have also provided similar understandings with liquidity ratios such as liquid assets to total assets, liquid assets to deposits and short term financing, loans to total assets and loans to deposits and short term borrowings (as cited in Vodová, 2011).In short, the liquidity ratio carries varies balance sheet ratios to identify liquidity needs.

Even tough, both approaches are intuitively appealing. Researches find the liquidity gap approach is more confusing as it is data intensive yet no standard method to forecast inflows and outflows. So, academic literatures prefer liquidity ratio due to a more standardized method (Crosse and Hempel 1980; Yeager and Seitz 1989; Hempel et al. 1994; Vodova 2011). Referring to Crosse and Hempel (1980), the most extensively used ratio is the loan-to-deposit ratio and liquid

asset-to-total assets ratio. When these ratios are low, they indicate for high liquidity. However, the setback of loan-to-deposit ratio is it does not consider other assets available for conversion into cash, while the liquid asset-to-total asset ratio ignores the flow of funds from repayments, increases in liabilities and the demand for bank funds. Providentially, these ratios are likely to move in parallel ways (Crosse and Hempel 1980).

Hence, to meet the objective of this research the liquidity ratio/stock approach was chosen over the latter. Researchers choose to utilize the loan-to-deposit ratio over liquid asset-to-total asset ratio because the liquidity framework from BNM is favorable towards loan-to-deposit ratio. The liquidity framework provided by BNM proves that loan-to-deposit ratio consist of gross loans (all loans outstanding).

2.1.2 Capital adequacy and bank liquidity

Author	Year	Definition
Richard Cantor	2001	Capital adequacy is the sufficient funds to absorb losses to protect depositors, creditors, and official institutions in the interest of maintaining banking system stability.
BNM - Capital adequacy framework	2008	The regulatory requirement for the banking institution to meet its obligations if they fall due, while also maintaining the confidence of customers, depositors, creditors and other stakeholders in their dealings with the institution.

Prasit Udomsirikul, Seksak Jumreornvong, and Pornsit Jiraporn	2011	The capacity of a financial institution's net worth to absorb potential adverse changes in the value of its assets without becoming insolvent.
Samson Ogege, Harley Tega Williams, and Apollos Emerah	2012	The amount of capital funds a bank or other financial institutions have to hold as required by the financial regulator.
Ritab al-Khouri	2012	Indicates a bank's financial ability to pay depositors whenever they demand their money and still have enough funds to increase the bank's assets through additional lending.

Table 2.1.2: Definition of Capital Adequacy

Based on the definition above, it is understood that the BNM's definition fits best since this research is concerning Malaysia. BNM provides the measure of capital adequacy as:

Total capital ratio = Total Capital / Total Risk Weighted Asset

A high ratio expresses low risk. It shows how much the market value of a bank's asset can drop before endangering its depositors and creditors. Basically, capital adequacy seeks to ensure that risk exposures of a banking institution are backed by an adequate amount of capital to absorb losses on a continuous process.

To best knowledge, authorities have put forth capital requirements to preserve liquidity among financial institutions and also promote public confidence towards financial providers. This fact is enticed by Robert Anderson (n.d.), stating minimum capital requirement is necessary to take up unexpected losses simultaneously reducing the risk of insolvency, while ensuring banking institutions have adequate capacity to operate the intermediation function, which is compulsory for the progress of the economy. In 1989, the BIS employed a rule of 7.25% capital, of business and consumer loans. However, in 1993, BIS increased capital requirements to 8% to accommodate the wider range of financial products. This rule was also applied to financial institution licensed under the

Banking and Financial Institution Act 1989 (BAFIA) especially commercial banks, finance companies and even investment banks. In another aspect generated by Bunda and Desquilbet (2008), where higher equity ratio means for lesser liquid assets required for sound banking practices. Yet this hypothesis received much criticism from other researchers. From analysis, it is found that past studies stated below have gathered two varying relationships between bank capital and liquidity creation.

Firstly, in disagreement to the fact that higher capital requirement provides higher liquidity to financial institutions. Evidence found include from (Diamond & Rajan, 2000, 2001) where research on "Financial Fragility Structure" stating that depositors will be charged a nominal fee for the intermediary service of loaning out their respective deposits. However, this fee differs according to the borrowers' capability of repayment. For those with higher risk borrowing but are reluctant to incur higher cost, will provoke depositors to withdraw their funds. In extreme scenarios, the possibility of bank runs. Bank runs will definitely cause liquidity problems to banks. It is also found in Gorton and Winston (2000) proposing the "Crowding Out Effect" indeed meaning for preference of banks to shift investors' funds to capital accounts in purpose to meet higher capital requirements. Yet investments in capital accounts are prone to financial volatility and cyclical ups and downs. Also in facts, capital investments are not insured and cannot be withdrawn as desired. This indeed lowers liquidity creation. Similarly, Heuvel (2007) argued that higher capital requirements hinder the amount of asset a bank can hold issuing deposits. Hence, higher capital requirement regulations can be exorbitantly costly to banks.

Secondly, in agreement to higher capital requirements provide higher liquidity to financial institutions. Where risk absorption theory is realized for "Higher capital improves the ability of banks to create liquidity". This evidence is provided by Diamond and Dybvig (1983) and Allen and Gale (2004) stating that liquidity creation exposes banks to risk. This activity being directly related to one of the roles played by financial intermediaries (risk transformation) (Al-Khouri, 2012). The greater liquidity needs of banks, most likely for banks to incur higher losses

due to the disposal of illiquid assets at available market prices rather than the desired prices to meet the customers' obligations. This however, can be absorbed via higher capital levels. Also in fact, Bhattacharya and Thakor (1993) and Coval and Thakor (2005) emphasized the point by quoting that "bank capital absorbs risks and expands banks risk-bearing capacity". Briefly, higher capital ratios allow banks to create more liquidity. Repullo (2004) has as well stated that higher bank capital allows for more efficient absorption of risk.

Consecutively, Al-Khouri (2012) has also consistent findings to above which states that bank capital increases bank liquidity through its ability to absorb risk. This concludes that recent studies also agree that a positive and significant relationship exist between bank capital and liquidity.

2.1.3 Bank size and bank liquidity

Author	Year	Definition
Boyd and Runkle	1993	The magnitude a bank, which is also associated with the concept of economies of scale.
David B. Audretscha, Julie Ann Elstonb	2002	What a bank owns, including loans, reserves, investment securities, and physical assets.
Rauch, Steffen, Hackethal and Tyrell	2009	Total asset a bank owns.
Allen N. Berger and Christa H.S. Bouwman	2007	Net-asset figures are useful in gauging bank size. Bank size is what the bank possesses. Bank size is useful to measure bank agility and popularity too. • Large banks (GTA exceeding $3 billion) • Medium banks (GTA $1 billion - $3 billion)

		• Small banks (GTA up to $1 billion)
Cornett, McNutt, Strahan, and Tehranian	2011	Total assets or total net assets are also used to describe a fund's size.

Table 2.1.3: Definition of Bank Size

Based on the above definitions, it is understood that bank size is defined broadly as the banks net total asset. Review results presented below discuss the relationship between bank size and liquidity.

To best knowledge the term 'too big to fail' is applicable here, where regulators are most likely to reimburse for any insolvency encountered by large institutions. Large banks take advantage of this to indulge in high risk activities. This has caused liquidity creation to differ among banks according to their sizes. This indeed branches to both positive and negative relationship between bank size and bank liquidity. This is agreed by Deléchat, Henao, Muthoora, and Vtyurina (2011) who found that liquidity ratios grant higher liquidity with bank size but also begins to decrease slightly after a certain level in bank size.

In agreement for positive effect of bank size and liquidity, Rauch, Steffen, Hackethal and Tyrell (2009) and Berger and Bouwman (2009), state that smaller bank tend to emphasis on intermediation processes and transformation activities they do have smaller amount of liquidity. It is known that liquidity creation varies according to banks organizational structures too. Merger and Acquisition structured banks are seen to hold the highest amount of liquidity creation back in the years. Back in 2012, Tesfaye proposed that moral hazard problem arises due to the protection provided by regulators. Iannotta, Nocera and Sironi (2007) also stated this to be true encouraging larger banks to venture into riskier assets. This caused much dependence on the central bank for liquidity needs.

In contrary, Audretsch & Elston (2002) state that smaller firms have relatively lesser liquidity constrains, meaning having relatively more liquid assets. Kashyap and Stein (1997) and Kashyap, Rajan and Stein (2002) also find a strong effect of bank size on holdings of liquid assets, with smaller banks being more liquid as they face constraints in accessing capital markets. Hence, there are negative relationship between bank size and liquidity.

2.1.4 Profitability and bank liquidity

Author	Year	Definition
Owolabi, S. A., Obiakor, R. T., and Okwu, A. T.	2011	Profitability is a measure of the amount by which a company's revenues exceeds its relevant expenses.
Michael Webber	2013	Profitability is a business term that is used to mean the likelihood of a business venture earning the desired level of income and incentives, within a specific period of time, under certain prevailing business conditions.
Pavla Vodová	2013	Profitability is a measure of the amount by which a company's revenues exceeds its relevant expenses.
Victor Curtis Lartey, Samuel Antwi, and Eric Kofi Boadi	2013	Bank profitability is the ability of a bank to generate revenue in excess of cost, in relation to the bank's capital base.
Myrna R. Berrío	2013	Profitability is the measure of the difference between the purchase price and the costs of bringing to market

Table 2.1.4: Definition of Bank Profitability

Recent crisis has highlighted the vitality of sound liquidity management of a bank. In response, regulators are developing new liquidity frameworks to make stable and resilient financial system. However, there is often that, these two variables pose a conflicting relationship (dilemma of maintaining liquidity or profitability exist). A financial manager has to ensure, on one hand, that the firm has adequate cash reserves as a contingency plan for any emergency while ensuring that the funds of the bank are available for investment with good value.

Liquidity needs constrain a bank from investing all its cash though profitability comes from either investing it or bank lending activities. Since banks need to be both profitable (shareholders demands) and liquid (legal regulations), there is inherently conflicts between the two and the need to balance both. In this regard, the liquidity (legal regulations) is different for non-bank businesses. Therefore, banks should always strike a balance between liquidity and profitability to satisfy shareholders' wealth aspirations as well as regulatory requirements.

As all this fact is agreed by Owolabi, Obiakor and Okwu (2011) whose research result provide evidence that, there is a trade-off between profitability and liquidity in that increase in either one would decrease the other, which mean more liquidity implies less profitability. Subsequently, Bordeleau and Graham (2010), their research analyses the consequences of holding liquid assets on bank profitability for a sample of large Canadian and U.S. banks and results suggest that profitability will be improved for banks that hold some liquid assets, however, there is a limit to it where holding further liquid assets reduce a banks' profitability, holding all else constant. Moreover, empirical studies reveal that this relationship varies depending on the condition of the economy and bank's business model. According to the author, banks must also consider the tradeoff between liquidity shocks to resilience and the cost of holding lower return liquid assets as the latter may affect a banks' ability to generate income, increase capital and extend credit.

Various methods are available to measure bank profitability. According to Vodova (2013), he employed return on equity (ROE) ratio as the proxy for banks'

profitability. The results suggest a negative influence on bank profitability (measured by return on equity) and bank liquidity creation. This is consistent with standard finance theory which emphasizes the negative correlation of liquidity and profitability. Other than ROE, alternative bank profitability indicator such as ROA and NIM are also suggested on a research done by Parameswar, Murthy and Wague (2012). Their result evidence that a strong capital, liquidity, and profitability ratios in the pre-crisis phase are seen to point to high liquidity creation in the crisis phase. Al-Khouri (2012), who examines the empirical effect of bank capital and other micro and macro-characteristics on liquidity creation, used ROA as proxy of profitability on one of his independent variable.

2.1.5 Non-performing loan and bank liquidity

Author	Year	Definition
Abdul Ghafoor Awan	2009	A Non-performing loan is a loan that is in default or close to being in default. Many loans become non-performing after being in default for 90 days, but this can depend on the contract terms.
Joseph, Edson, Manuere, Clifford & Michael	2012	Non-performing loans are also known as "bad loans", impaired loans or problem loans which are ninety days or more past due or no longer accruing interest and are not generating income.
Muhammad Nawaz	2012	Non-performing loans are loans that the customers fail to meet their obligations problems
Berríos	2013	Impaired loans are those loans with a high likelihood of default.
Adriaan M. Bloem and Cornelis N. Gorter	-	A loan is nonperforming when payments of interest and principal are past due by 90 days or more, or at least 90 days of interest payments have been capitalized, refinanced or delayed by agreement, or payments are less than 90 days

		overdue, but there are other good reasons to doubt that payments will be made in full

Table 2.1.5: Definition of Non-performing loans

Based on the above definitions, it is understood that NPLs are loans that a bank customer fails to meet his contractual obligations on either principal or interest payments exceeding 90days. NPLs are loans that give negative impact to banks in developing the economy. Rise of non-performing loan portfolios significantly contributed to financial distress in the banking sector.

A definite fact, financial systems are responsible for managing complex and advance financial transactions. The banking systems play the central role of mobilizing and allocating resources in the market, conduit for savings and surplus funds channeled to deficit units. Financial institutions oversee that operations are being run effectively and efficiently. The financial term for this activity is known as "Risk Transformation" (riskless deposit to risky loans). Granting loans generate most profits for banks. However, it involves high risk and eventually the main contributor to non-performing loans (NPLs). A core substance for sustained and rapid economic progress is financial stability. Financial stability measures are immensely used, among various indicators of financial stability include banks' non-performing loan reflecting on its asset quality, credit risk and also its efficiency in the allocation of resources to productive sectors. NPLs are the main contributor to liquidity risk, which exposes banks to insufficient funds for operations. Liquidity risk is the outcome of credit risk, which is the inability of borrowers to meet their repayment obligation. According to Dolan and Collender (2001), credit risk is measured by the percentage of non-performing loans to total loans.

On analysis, NPLs are found to affect liquidity. Firstly, Toby (2008), in his study quoted that the use of minimum liquidity ratio (MLR) as amonetary policy tool has an inverse association with industry asset quality measured with NPLs. As MLR rises further coupled with an outcome where bank liquidity ratio (BLR) rises, industry NPLs are expected to fall, and vice-versa. Hence, he concluded that the reason behind scheming excess liquidity may bring about adverse outcomes

increasing NPLs. Equally, Joseph, Edson, Manuere, Clifford and Michael (2012), further findings indicate that NPLs have a negative relationship towards banks performance be it liquidity or profitability. Clearly, NPLs reduce profits and liquidity of banks. Similarly, Gupta (1997) added that NPLs does affect profits of banks and eventually to liquidity crunch and hinders growth in Gross Domestic Product (GDP) (as cited in Sharma, 2005).

Besides the above, further research has led us to the same negative relationship between NPLs and profitability, exposing banks to greater risk of liquidity and distress. This fact is without doubt proven by past researches Nawaz, Shahid Munir, Shahid Ali Siddiqui, Tahseen-Ul-Ahad, Faisal Afzal, Asif and Ateeq (2012). Other researchers have also verified that NPLs not only affects financial institutions but also non-financial institutions. However, the most affected by NPLs are financial institutions such as commercial banks and mortgage financing institutions (Bloem and Gorter, 2001). Prominent economist have that failing banks tend to deviate from efficient frontier banks. The reasoning is that inefficient institutions fail to optimize their portfolio decision by lending less than demanded (Barr et al., 1994).

2.1.6 GDP growth and bank liquidity

Author	Year	Definition
Andrew Ang, Monica Piazesizz, and Min Wei	2006	GDP is an indicator of the economic health of a country, as well the gauge a country's standard of living.
Karl E. Case, Ray C. Fair, and Sharon M. Oster	2009	GDP is the total market value of a countries output with production factors located within a country.
Chung-HuaShen, Yi-Kai Chen, Lan-Feng Kao, and Chuan-Yi Yeh	2009	GDP is the measurement of level of economic activity of a country.

Juan Pablo Painceira	2010	The market expenditure on final goods and services produced equal to consumption, investment, government expenditure and net exports.
Koray Alper, Timur, Hulagu, GursuKeles	2012	Monetary value of all final goods and services produced in a country within a time.

Table 2.1.6: Definition of Gross Domestic Product

Based on the above definitions, it is understood, GDP is a countries financial health indicator. It is hypothesized from previous studies, that macroeconomic factors affect bank liquidity. For example, Gavin and Hausmann (1998) justified that bank failures are to a degree caused by macroeconomic shock. This fact is also supported by (Shen, Chen, Kao, & Yeh, 2009). Indisputably, GDP is a macroeconomic factor that affects bank liquidity. For which, a major recession or crises in business operations reduces borrowers' capability to service obligations which increases banks' NPLs and eventually banks insolvency (Gavin & Hausmann, 1998).

In reference to Painceira (2010), research on liquidity preference during different business cycle states that banks liquidity fondness is low in the course of economic boom. Where, banks confidently expect to profit by expanding loanable funds to sustain economic boom, while restrict loanable funds during economic downturn to prioritize liquidity. To sum up, banks prefer high liquidity due to lower confidence in reaping profits during economic downturn. Aspachs, Nier and Tiesset (2005) has also inferred that banks prioritize liquidity when the economy plummets, during risk lending opportunities, while neglecting liquidity during economic boom when lending opportunities may be favorable. Thus, to best knowledge, banks forgo liquidity inducing lending during economic growth. Even Valla, Saes-Escorbiac and Tiesset (2006) reported a negative relationship between liquidity and GDP real growth.

Consequently, Bordo, Eichengreen, Klingebiel, Martinez-Peria and Rose (2001) opinions and suggests on a different view. He says during recession it is likely for

an increase in the number of loan default. This causes depositors to perceive high solvency risk and immediately tend to withdraw deposits held at financial institutions. Subsequently, financial institutions face bank run causing liquidity risk, resulting in bank insolvency. Other researchers have also agreed to the findings of Bordo et al. (2001). Alper, Hulagu and Keles (2012) exemplified that during economic expansion banks would issue more loans and run down their liquidity buffer. Moreover, it's harder for banks to attract deposits during economic expansion, consequently increasing their financing gap.

2.1.7 Interbank rate and bank liquidity

Author	Year	Definition
Charles T. Carlstroma, Timothy S. Fuerst	2005	It is the interest rate on loans or other obligations with maturity less than 1 year.
Tom Bernhardsen	2007	The interest rate that banks apply for other loans on the interbank market.
Marcella Lucchetta	2007	The rate banks charge each other for loans usually made overnight.
Rauch, Steffen, Hackethal, and Tyrell, M.	2009	Interbank rate refers to the interest rate that banks charge to each other for overnight or short term financing.
Freixas, Martin and Skeie	2010	The rate of interest charged on short-term loans made between banks. Banks borrow from interbank markets to manage liquidity.

Table 2.1.7: Definition of Interbank Rate

Based on the above definitions, it is understood that short-term interest rates are commonly associated with real interest rates. It is associated with monetary policy purposes aiming at stimulating economic activity. However, if the central bank aims to dampen activity, interest rates must be set so that the real interest rate is higher than the neutral rate.

It is a known fact, that interest rates affect bank liquidity. This cannot be denied, following the research by Bindseil, Nyborg and Strebulaev (2009) stating that banks tend to pay different charges to secure liquidity needs according to their current market positions. It is understood that bank-relevant factors especially financial health, size and structure influence their market position.

Four research findings have been obtained:

Author	Year	Findings
Allen, Peristani, and Saunders	1989	Empirical evidence has shown differences in purchasing behavior among differently sized banks in the federal funds market.
Nyborg, Bindseil, and Strebulaev	2002	It is verified that larger banks pay less in securing liquidity needs.
Kashyap, Rajan and Stein	2002	Larger banks could be less exposed to liquidity shocks. Thus, better access to inter-bank market instruments and transactions.
Bindseil, Nyborg and Strebulaev	2009	Financially unhealthy banks are likely to face tighter conditions in the interbank market, which is expected to translate into higher prices of financing needs.

Table 2.1.7(i): Research findings

When banks face liquidity risk, they turn to interbank market. From the findings in Table 2.1.7 (i), it is clear that large and sound banks are able to secure liquidity with lower cost. However, small and unsound banks face much higher cost.

The research by Aspachs, Nier and Tiesset (2005), proxied monetary policy with short-term interest rate and found it significant in liquidity measures. The outcome obtained were of negative relationship, signifying when interest rates are high, banks tend to hold less liquid assets and vice versa. The central bank utilizes this

policy by altering interest rates to influence the monetary base accordingly. Vodova (2013) also declares the same findings.

In another research, by Rauch, Steffen, Hackethal and Tyrell (2009), which liquidity creation depends strongly and negatively on monetary policy tightness for instance a tighter monetary policy will lead to a decrease in liquidity creation. Furthermore, Lucchetta (2007) research on a panel of European banks, proxied short term interest rate with interbank interest rate and confirms that higher liquid assets held by banks will induce a bank to lend more in the interbank market. The research also reveals that interbank interest rate will be a reward for holding liquid assets.

2.1.8 Financial crisis and bank liquidity

Author	Year	Definition
Bhagwan Chowdhry, and Amit Goyal	2000	A loss of confidence in a country's currency or other financial assets causing international investors to withdraw their funds from the country.
Gheorghe Savoiu	2009	Financial crisis means a situation in which the supply of money is outpaced by the demand for money.
Allen, Babus and Carletti	2009	A situation in which the value of financial institutions or assets drops rapidly.
Gary Gorton, Yale and Nber	2012	Financial crises that have been associated with banking panics, stock market crashes, bursting of asset price bubbles or currency crises throughout the centuries.
Muhammad bin Ibrahim	n.d.	The term financial crisis is applied broadly to a variety of situations in which some financial assets suddenly lose a large part of their nominal value

Table 2.1.8: Definition of Financial Crisis

Previous global crisis has shown the vitality of proper management on liquidity to a whole new level. Improper management priority, negligence on systematic risks combine with unrestricted financial innovations led to a world crisis that still has ongoing effects. The impact of financial crisis can dry up liquidity in the financial market which leads to the domino effect of banks failure eventually to the instability and soundness of the entire financial system.

A lot financial institutions experienced liquidity distress even when they are profitable such as Lehman Brothers' incident in 2008 due to poor liquidity management that worsened during the financial crisis. Nadir & İlhan (2011) says that in order to mitigate the negative relationship, it is only through good liquidity management. According to Fadare (2011) research, the financial crisis can seriously affect a bank's liquidity. He shows that a bank holding excess liquidity in a non-financial crisis period can become critically insolvent during financial crisis, hence increasing their vulnerability to the distress. As an example, Nigerian deposit money banks during the non-financial crisis period were significantly well capitalized due to the mandatory recapitalization of Nigerian deposit money banks that in December 2005. Unfortunately, during the financial crisis, the position starts to reverse which starts in late 2007 and became worst in 2008. The forecasted loan/deposit ratio becomes dangerously lower than actual loan/deposit ratio. This leads to the excess liquidity held in Nigerian Banking Sector to dry up as deposit money banks wrote off unpaid loan and they still have to deal with large depositors' withdrawals.

Besides that, Vodová (2013) finds a negative correlation between financial crisis and bank liquidity. Although financial crisis could cause by poor bank liquidity, the effect may be of opposite outcome. Firstly, the volatility of vital macroeconomic variables could lead to unfavorable business environment for banks. Then, economic instability will start to worsen the business environment of borrowers and affect their ability to make loan repayments, finally leading to a decline in bank liquidity.

2.2 Review of Theoretical Model

The research paper done by Munteanu (2012), on optimizing the liquidity-profitability relationship found that many banks experienced financial distress even when they are profitable such as Lehman Brothers in the year 2008 because of poor liquidity management. This made identifying factors that influence liquidity a vital issue. He used two ratios as the dependent variable of liquidity and they are net loans to total assets ratio (L1) liquid assets to deposits and short term funding ratio (L2) then hypothesized the relationship between these variables to provide more accurate insights for different banks. For the independent variables, they categorize the factor into internal and external factors namely.

Internal Factor (bank-specific)	Measure	Hypothesized Relationship
1. Capital Adequacy	a) Tier 1 Capital Ratio b) Z-score = (Equity/Total Assets + ROA) /$6ROA$	Positive Positive
2. Assets Quality	a) Impaired Loans/Gross Loans b) Loan Loss Provisions/Net Interest Revenue	Negative Negative
3. Interbank Funding	Interbank Assets/ Interbank Liabilities	Positive
4. Funding	Cost Total Interest Expense/Total Liabilities	Negative
5. Cost to income ratio	Total expenses/Total generated revenues	Positive

Table 2.2(i): Internal Factors and their hypothesized relationship

External factors (macroeconomic)	Measure	Hypothesized Relationship
1. Interest rate ROBOR	ROBOR 3 months	Positive
2. Credit risk	Rate Total exposures/Total Loans and	Negative

	Interests	
3. Inflation rate	Consumer Price Index (CPI)	Positive
4. GDP real growth rate	GDP Relative Growth GDP Deflator	Positive
5.Unemployment	Unemployment Rate	Negative

Table 2.2(ii): External Factors and their hypothesized relationship

The data for internal factors are taken from Fitch's Bankscope database on
financial information on an annual basis for banks in 180 countries around the
world. For external factors the authors adopted the Eurostat which is the
statistical office of the European Union and National Bank of Romania Statistics.
This totaled up to 27 banks active in Romania over the period 2002-2010 panel
data, focusing differences between the pre-crisis years (2002-2007) and the crisis
years (2008-2010). The author uses a linear multivariate regression model to
estimate the relationship.

After running the model the author found:

Liquidity determinant	2002-2010	2002-2007 (pre-crisis)	2008-2010 (crisis year)
Bank specific factors-L1	Tier 1 Capital (negative relation)	Tier 1 Capital (negative relation)	Insignificant
	Z-score (positive relation)	Insignificant	Z-score (positive relation)
	Impaired Loans (negative relation)	Impaired Loans (negative relation)	Impaired Loans (negative relation)
	Interbank Funding (negative relation)	Interbank Funding (negative relation)	Insignificant

	Cost to income ratio (positive relation)	Loan Loss Provisions (positive relation)	Insignificant
Macroeconomic factors-L1	Credit Risk Rate (positive relation)	Insignificant	Insignificant

Table 2.2(iii): Result Obtain after regressed on L (1) Net Loan/Total Asset

Liquidity determinant	**2002-2010**	**2002-2007 (pre-crisis)**	**2008-2010 (crisis year)**
Bank specific factors-L2	Insignificant	Tier 1 Capital (positive relation)	Insignificant
	Loan Loss Provisions (positive relation)	Insignificant	Loan Loss Provisions (positive relation)
	Funding cost (positive relation)	Insignificant	Insignificant
Macroeconomic factors -L2	ROBOR 3M (negative relation)	Credit Risk Rate (negative relation)	ROBOR 3M (positive relation)
	Unemployment (positive relation)	Inflation Rate (positive relation)	Inflation Rate (positive relation)

Table 2.2(iv): Result Obtain after regressed on L (2) Liquid Assets/Deposits and Short-Term
Funding

Another research done by Vodova (2013) had the objective to find out what
determinants affect liquid asset ratio of Czech and Slovak commercial banks. The
author incorporates data from the period 2001 to 2010. The author considers four
bank specific factors and nine macroeconomic factors. The author, Vodova (2013)
first focuses on development of liquid asset ratio of Czech and Slovak banks.
Author employed unconsolidated balance sheet data from 2001 to 2010. The panel
is unbalanced because some of the banks didn't summit their annual report.

The data is as table below:

Year / Country	01	02	03	04	05	06	07	08	09	10
Czech Republic										
Total number of banks	21	22	20	20	18	18	17	16	16	17
No. of observed banks	15	16	16	16	16	13	13	12	12	13
Share of observed banks on total assets (in %)	68	74	74	74	72	74	75	66	67	68
Slovakia										
Total number of banks	16	15	15	15	15	14	13	14	13	12
No. of observed banks	12	12	12	13	14	12	12	12	10	10
Share of observed banks on total assets (in %)	56	52	56	59	65	62	65	70	66	65

Table 2.2(v): Total number of banks and observed banks

For these banks, the author calculated liquid asset ratio which include cash, short-term claims on other banks, and government bonds and securities from trading portfolio in liquid assets. Table 2.2(v) shows the growth of liquid asset ratio of Czech and Slovak banks. It shows that Czech banks have declined liquidity ratio during last ten years. For the period 2001–2008, the ratio for Slovak banks moved with low magnitudes. About one-third of assets of Slovak banks were liquid assets.

Authors find that there is a negative impact of financial crisis on the liquidity ratio for both countries. However, the magnitude of impact differs among countries. Amount of bank's liquid assets decreased because of reduction of interbank transaction in the respective years. This means the interbank market was frozen because of the lack of trust between banks.

The authors finding are as below:

Variable	Source	Finding
CAP: the share of equity on total assets of the bank	Annual reports	Positive
NPL: the share of non-performing loans on	Annual reports	Negative

total volume of loans		
ROE: the share of net profit on banks´ equity	Annual reports	Negative
TOA: logarithm of total assets of the bank	Annual reports	Positive/Negative
FIC: dummy variable for financial crisis (1 in 2009, 0 in rest of the period)	own	Negative
GDP: growth rate of gross domestic product (GDP volume % change)	IMF	Positive/Negative
INF: inflation rate (CPI % change)	IMF	Positive
IRB: interest rate on interbank transactions	IMF	Positive
IRL: interest rate on loans	IMF	Negative
IRM: difference between interest rate on loans and interest rate on deposits	IMF	Negative
MIR: monetary policy interest rate	IMF	Negative
UNE: unemployment rate	IMF	Negative
EUR: exchange rate CZK(SKK)/EUR (yearly average)	Oanda	Positive/Negative

Table 2.2(vi): Findings from Vodova (2013) research

Another research conducted by Vodova (2013) states that the objective of the study was to estimate the factor that affect the Poland commercial bank liquidity. Data included from year 2001 to 2010. The author used four different formulas to calculate the dependent variable which is the liquidity ratio. The first liquidity ratio, L1 is liquidity assets divide by total assets, the second liquidity ratio, L2 is liquid assets divide by deposits, the third liquidity ratio, L3 is loans divide by total assets and the last liquidity ratio, L4 is loans divide by deposits.

The data is as table below:

Year Country	01	02	03	04	05	06	07	08	09	10
Cezch Republic										
Total number of banks	69	59	58	5	54	51	50	52	49	49

No. of observed banks	26	29	33	35	36	33	32	32	30	27
Share of observed banks on total assets (in %)	71	74	89	85	85	83	81	80	78	75

Table 2.2(vii): Total number of banks and observed banks

This study uses the bank specific factors and others macroeconomic factors to determine bank liquidity. The table below shows the definitions, sources and findings of all the variables:

Variable	**Source**	**Finding**
CAP: the share of equity on total assets of the bank	Annual reports	Positive
NPL: the share of non-performing loans on total volume of loans	Annual reports	Negative
ROE: the share of net profit on banks´ equity	Annual reports	Negative
TOA: logarithm of total assets of the bank	Annual reports	Positive/Negative
FIC: dummy variable for financial crisis (1 in 2008 and 2009, 0 in rest of the period)	own	Negative
GDP: growth rate of gross domestic product (GDP volume % change)	IMF	Positive/Negative
INF: inflation rate (CPI % change)	IMF	Positive
IRB: interest rate on interbank transactions	IMF	Positive
IRL: interest rate on loans	IMF	Negative
IRM: difference between interest rate on loans and interest rate on deposits	IMF	Negative
MIR: monetary policy interest rate	IMF	Negative
UNE: unemployment rate	IMF	Negative

Table 2.2(x): Definitions, Sources & Findings

According to the research paper of Al-Khouri (2012), it examines the impact of bank's capital and other macro and micro characteristics on liquidity creation. The yearly data is obtained from 43 commercial banks' annual reports which are

operating in the Gulf Cooperation Council (GCC) countries over the period 1998
– 2008. The difference between liquid liabilities and liquid assets as a percentage
of total assets is used as the measurement of liquidity, also known as liquidity
transformation gap (LT gap). The measurement in the form of equation is *LTG =
(LA-LL)/GTA*, where LTG= liquidity transformation gap, LA= liquid assets, LL=
Liquid liabilities, and GTA= Gross total assets. The higher the gap, the greater is
the liquidity transformation performed by the bank. The independent variables in
this paper are bank capital, credit risk (σROA), profitability [ROA], bank size
[In(TA)], government ownership (GO), growth in real GDP (GGDP), inflation
(Inf), stock market capitalization to GDP (SCAP), and degree of market
concentration (Con). The regression model is as follow:

*LTG it = a0t + a1itEQUITY +a2it-1 σROA+ a2it LnTA + a3it GGDP + a4it
SCAP + a5it INF + a6it CON +a7it GO + a8it ROA+a9it-1lag(LTG)*

The author regressed the liquidity creation measures for each bank-year
observation on the bank's equity capital ratio and a number of control variables to
examine whether the financial fragility effect versus the risk absorption effect
dominates empirically by using panel data sets on banks residing on the GCC
market over the period 1998-2008.

Control variables	Correlation
σROA	positive
GGDP	positive
EQUITY	positive
ln TA	negative
INF	positive
ROA	negative
CON	positive
lag(LTG)	positive
GO	negative

Table 2.2(xi): Findings from the Article

Model 2.2.1

$$L_{it} = \alpha + \beta^{'} X_{it} + \delta_i + \varepsilon_{it}$$

The model presented above used by Vodova (2011) is a panel data that determines liquidity factors of commercial banks in Czech Republic. This study was conducted from 2001 to 2010, having δ to represent fixed effect on banks, X representing the vector of explanatory variables for the bank to compute L_{it} measured by liquidity ratio (Liquid assets to total assets).

The research used four independent variables, precisely capital adequacy, non-performing loans over total loans, return on equity, and logarithm of total assets. On the other hand, it also conducted the study using macroeconomic factors like GDP, inflation rate, interbank rates, market rates on commercial lending, unemployment rate and dummy variable for financial crisis.

Model 2.2.2

$$
\begin{aligned}
(y)_{n,t} = \propto_n &+ \sum_{l=1}^{L} \beta_1 (y)_{n,t-1} \\
&+ \sum_{l=1}^{L} \beta_2 (Macro)_{n,t-1} \\
&+ \sum_{l=1}^{L} \beta_3 (Performance)_{n,t-1} \\
&+ \sum_{l=1}^{L} \beta_4 (Characteristics)_{n,t-1} \\
&+ \sum_{l=1}^{L} \beta_5 (Size)_{n,t-1} + d_t + \varepsilon_{n,t-1}
\end{aligned}
$$

A similar study performed by Hackethal, Rauch, Steffen and Tyrell (2010) using multivariate dynamic panel model on all 457 German savings institution from the period 1997 until 2006 had three different dependent variables to represent the

bank liquidity, out of which, one being liquid assets to total assets. The study classifies their factors into four that are macroeconomic factors, bank performance, bank characteristics and bank size. The macroeconomic factors consist of unemployment rate, savings quota, interest rate and yield curve spread. The bank performance was measured using earnings before interest and tax and return on equity. The bank characteristic was measured using loans outstanding, provision incomes and interest income too. Lastly, bank size was measured based on the number of customer deposits and loans issued.

Model 2.2.3

$$Y_1 = \propto + \beta_1 SIZE + \beta_2 NPL + \beta_3 ROE + \beta_4 CAR + \beta_5 ROA + \varepsilon$$

Iqbal (2012), equally researched liquidity risk of both commercial and Islamic banks in Pakistan from 2007 to 2010, then the dependent variable was liquid assets over total assets. The research included bank size, NPLs ratio, ROE, capital adequacy ratio and ROA as its independent variables.

Model 2.2.4

$$Liq_{it} = c + c * NUK + \beta_{11} SR_{it} + \beta_{12(}NUK * SR) + \beta_{21} r_{it} + \beta_{22}(NUK * r_{it}) \\ + \beta_{31} Y_{it} + \beta_{32}(NUK * Y) + \eta_i + \varepsilon_{it}$$

In the meantime, Aspaches, Nier and Tiesset (2005) investigated banks liquidity in the United Kingdom regressing macroeconomic factors and the role of lender of last resort (LOLR) of the central bank from 1985 to 2003. In their study Liq_{it}, represents liquidity ratio either being liquid assets to total assets or liquid assets to total deposits. The independent variable consisting of SR as the support from the central bank, r which is short-term interest rate and Y is real GDP growth. Finally, NUK is used as the dummy variable to highlight foreign owned banks. They adapted the fixed effect model (FEM) to regress panel data.

Model 2.2.5

$$
\begin{aligned}
Liquidity ratio = {} & \alpha_0 + \alpha_1 total asstes + \alpha_2 equity to asset ratio \\
& + \alpha_3 presences of prudential regulation(dummy) \\
& + \alpha_4 lending interest rate + \alpha_5 public expenditures/GDP \\
& + \alpha_6 rate of inflation + \alpha_7 rate of growth \\
& + \alpha_8 realisation of a financial crisis(dummy) \\
& + \sum_k \beta_k \, type of the exchanges rate regime(dummy)
\end{aligned}
$$

Examining the determinants of bank liquidity in 36 countries from the year 1995 to 2000, Bunda and Desquilbet (2008) ran two random effect models on their data, using bank specific factors, market factors and also macroeconomic factors. They quote bank specific factors to be capital adequacy, market factors to be prudent regulations, lending rates and exchange rates. Last of all, macroeconomic factors include GDP, economic growth, inflation rate and financial crisis.

Model 2.2.6

$$
LA_{it} = \propto_i + \beta_1 DEPO_{it} + \beta_2 TDEPO_{it} + \beta_3 K_{it} + \beta_4 SIZE_{it} + \beta_5 FC + \varepsilon_{it}
$$

Guillermo & Ingela (1999), examining the effect of demand deposits, refinancing cost, capital and size as determinants of liquid assets, used panel variable with time range of January to February 1998. The examination held 442 observations with DEPO being demand deposits, TDEPO being time deposits, K representing capital, SIZE representing bank size and at last FC being refinancing cost.

2.3 Proposed Theoretical Model/Conceptual Framework

Bank Specific Factors

Macroeconomic Factors

Capital Adequacy (CAP)

Gross Domestic Product (GDP)

Bank Size (SIZE)

Dependent Variable

Bank Liquidity (Liq)

Interbank Interest Rate (INTER)

Non-performing loan (NPL)

Profitability (ROE)

Financial Crisis

$$Liqit = \beta_0 i + \beta_1 CAP_{it} + \beta_2 SIZE_{it} + \beta_3 ROE_{it} + \beta_4 NPL_{it} + \beta_5 GDP_{it} + \beta_6 InterB_{it} + \alpha_1 D_{FC} + \varepsilon_{it}$$
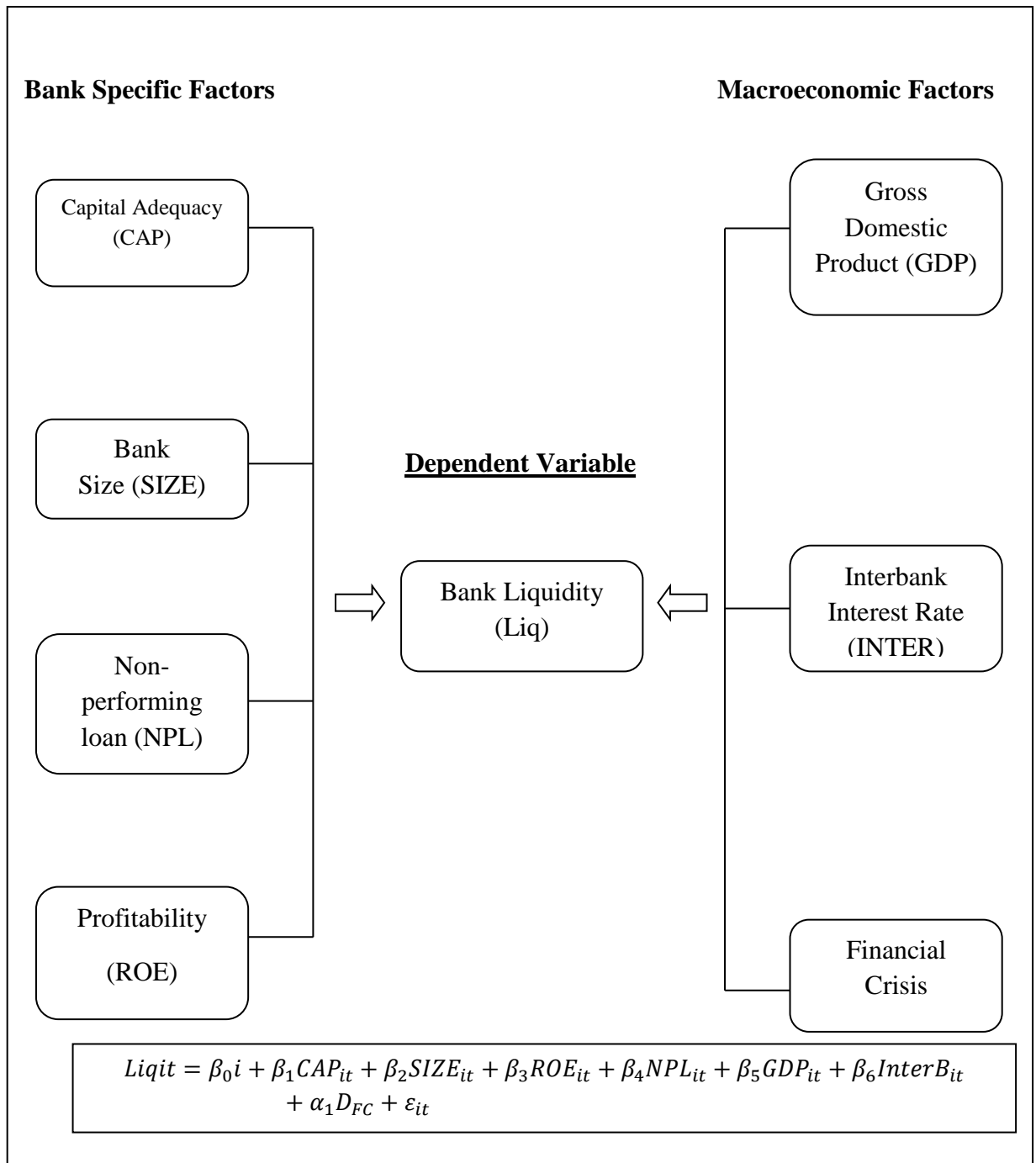
Figure 2.3 Proposed of theoretical model

2.3.1 Dependent Variable:

2.3.1.1 Bank Liquidity

Although from analysis, the researchers identify there are two approaches to measure bank liquidity such as liquidity gap/flow approach and liquidity ratio/stock approach (Bessis, 2009). The researchers propose liquidity ratio/stock approach due to be in accordance to the BNM definition of bank liquidity in liquidity framework, as loan to deposit ratio.

2.3.2 Independent Variable:

2.3.2.1 Capital Adequacy

Basing on BNM, the researchers employ the capital adequacy as:

Total capital ratio = Total Capital / Total Risk Weighted Asset

Consistent to findings, bank capital is referred to mitigate liquidity shock. This concludes that recent studies also agree that a positive and significant relationship exist between bank capital and liquidity.

2.3.2.2 Bank Size

As generally accepted, the researchers employ bank size as the banks net total asset. Reviewing journals, present a positive relationship between bank size and liquidity. However, there were also results stating crowding out effect. This is when bank size increases after a certain level, liquidity begins to decrease.The proxy for bank size is the natural logarithm of total assets.

2.3.2.3 Profitability

To knowledge, there is a trade-off between liquidity and profitability. The researchers employ the definition of profitability as generating revenue in excess of cost, in relation to the bank's capital base. Banks can't prioritize liquidity entirely, for loss awaits in the long-run or prioritize profitability entirely and suffer during economic mishaps. This result indicates the banks' liquid assets holding behavior in different stages of economic cycle hence, banks necessarily must balance both for better resilience to avoid liquidity shocks.The proxy used to measure profitability is ROE.

2.3.2.4 Non-Performing Loans (NPL)

Based on facts above, NPLs are loans that a customer fails his contractual obligations on either principal or interest payments exceeding 90days. Banks play "Risk Transformation" (riskless deposit to risky loans) in order to survive and find a negative relationship between NPLs and profitability. The proxy for NPL is the percentage of NPLs to total loans.

2.3.2.5 Gross Domestic Product (GDP)

The researchers accept GDP as a countries financial health indicator. GDP is a macroeconomic factor affecting business operations (collection of receivables). It is concluded that GDP has negative relationship with liquidity. Banks generally expect to profit during bullish market and expect to sustain liquidity during bearish market. The proxy of GDP is

Economic Growth: Real GDP / Nominal GDP.

2.3.2.5 Interbank Rate

As defined, interbank interest rate is commonly associated with real interest rates. Interest rates must be set so that the real interest rate is higher than the neutral rate. Interest rates are aimed at enticing economic activity. Analyzing in a banks perspective, banks turn to interbank market when faced with liquidity risk. It is found that short-term interest rates have negative relationship, with bank liquidity. The annual short-term interbank rates were used here.

2.3.2.6 Financial Crisis

Apparently, financial crisis can seriously affect a bank's liquidity. It is defined as the time when institutions or assets are part of their nominal value causing losses. As presented, Nigerian money deposit banks had sufficient liquidity in December 2005, unfortunately suffered liquidity shock in 2007 and severely in 2008. Studies present a negative impact of financial crisis on bank liquidity. Financial crisis is used as a dummy variable in this model where one will be allocated in financial crisis period and zero for the other time period.

2.4 Hypotheses Development

The main hypothesis of researchers study aims to examine the importance of bank specific factors and macroeconomic factors in explaining commercial banks' liquidity in Malaysia. Loan to deposit ratio was used as banks liquidity measurement and the dependent variable; while bank specific and macroeconomic factors as independent variables. Bank specific factors include capital ratio, bank size, profitability, and asset quality (NPL) while macroeconomic factors include GDP, interbank rate, and financial crisis. In this research, the test of hypothesis is

tested to find any significant relationship between the explanatory variables and the dependent variable.

2.4.1 Capital Adequacy

H0: Capital adequacy has no significant effect on bank liquidity.

H1: Capital adequacy has a significant effect on bank liquidity.

2.4.2 Bank Size

H0: Bank Size has no significant effect on bank liquidity.

H1: Bank size has a significant effect on bank liquidity.

2.4.3 Profitability

H0: Profitability has no significant effect on bank liquidity.

H1: Profitability has a significant effect on bank liquidity.

2.4.4 Non-Performing Loan (NPLs)

H0: NPLs has no significant effect on bank liquidity.

H1: NPLs has a significant effect on bank liquidity.

2.4.5 Gross Domestic Product (GDP)

H0: GDP has no significant effect on bank liquidity.

H1: GDP has a significant effect on bank liquidity.

2.4.6 Interbank Rate

H0: Interbank rate has no significant effect on bank liquidity.

H1: Interbank rate has a significant effect on bank liquidity.

2.4.7 Financial Crisis

H0: Financial crisis has no significant effect on bank liquidity.

H1: Financial crisis has a significant effect on bank liquidity.

2.5 Conclusion

The aim of study in this chapter is to identify the factors that will affect the
liquidity of commercial banks in Malaysia. Previous researches matching our
study have proven useful by providing us with right guidance and also with much
information to this study. This information will be conferred in detail in the next
chapters of this study.

CHAPTER 3: METHODOLOGY

3.0 Introduction

In this chapter, researchers will brief about the research methodology. The researchers adapt secondary data from different resources. The data are collected from annual reports for bank specific factors. For macroeconomic factors, the data are acquired from International Monetary Fund (IMF). Method employed to carry out this research project is E-view 6.

3.1 Research Design

Before the researchers examine the types of research designs, it is very important to understand the role and purpose of research design. In order to finalize the data presentation, the researchers frame a question by developing an econometric equation to determine the entire research process. The researchers intend to use panel data model in this study. In this research paper, the researchers are using the quantitative model which is numerical. The aim of this research paper is to determine the relationship between the explanatory variables and the liquidity of commercial banks in Malaysia. This study provides a reliable and practical evidence to verify a significant result of bank liquidity determinants.

According to Eldabi et al., (2002), a quantitative research was carried out to examine a social setting by identifying individual components and explaining the phenomenon in term of constructs and relationship between constructs. Hence, quantitative research plays a role in emphasis on methodology, procedure and statistical measures of validity. It also relies on the measurement and analysis of statistical data to produce quantifiable conclusion.

For the determinants of liquidity among commercial banks in Malaysia, the researchers include nine years of data from 2003 until 2012. The data used are acquired from annual reports of 15 commercial banks in Malaysia and industry data from BNM to calculate the ratio such as liquidity ratio, capital ratio, log of total asset and non-performing loan ratio. In the mean time, the researchers also collected macroeconomic data for GDP, and inter-bank interest rate data from World Economic Outlook Database from IMF. All these data represent dependent and independent variables.

3.2 Data Collection Methods

In this study, the researchers reviewed journal articles and annual reports pertaining to the commercial banks in Malaysia. Data collected are from secondary resources. The secondary data that used in this paper includes 10 years annual reports of 15 commercial banks from year 2003 to year 2012, periodic from Bank Negara Malaysia (BNM) and World Economic Outlook Database from International Monetary Fund (IMF).

3.2.1 Secondary Data

Secondary data was collected by the researchers to analyze and meet the requirements of the various research objectives. In this study, a literature review was provided to present the relationship between the dependent variable and the independent variables. While the dependent variable is liquidity ratio and the independent variables consist of capital adequacy, bank size, profitability, non-performing loan, gross domestic product, interbank rate, and financial crisis. The main sources of secondary data for this research is taken from articles, online information, journals and books which are relevant to explain the factors affecting bank's liquidity.

Type of data	Source
Macroeconomic factors	
Gross domestic product	IMF
Interbank Rate	BNM
Financial crisis	IMF
Bank's specific factors	
Capital Adequacy	Bank's annual reports
Non-performing loans	Bank's annual reports
Bank's profitability	Bank's annual reports
Bank's size	Bank's annual reports

Table 3.2.1: Sources of Data

3.3 Sampling Design

3.3.1 Target Population

In this research, the target population is the banking sector in Malaysia. According to BNM, Malaysia consists of 27 commercial banks and 15 were selected for this research. The reasoning behind choosing these 15 banks was due to their availability of data for the specific duration of 2003 to 2012. The 15 commercial banks chosen to examine liquidity factors in Malaysia are presented as below:

Local commercial bank:	Foreign commercial bank in Malaysia:
1. Affin Bank Berhad	8. HSBC Bank Berhad
2. Ambank Berhad	9. Standard Chartered Berhad
3. RHB Bank Berhad	10. OCBC Bank Berhad
4. Maybank Berhad	11. Citibank Berhad
5. Public Bank Berhad	12. United Oversea Bank Berhad
6. CIMB Bank Berhad	13. Bank of China (Malaysia) Berhad

7. Hong Leong Bank Berhad	14.Deutsche Bank (Malaysia) Berhad
	15. The Royal Bank of Scotland Berhad

Table 3.3.1: Commercial Banks in Malaysia

3.3.2 Analytical Tools

In this study, the analytical tools used are E-view 6 and Stata 11. Two tools were used because, after running the result in E-Views 6, the researchers had an intuition of econometric problem, leading to the use of Stata 11. Stata 11 is used because E-views 6 have a limitation to detect econometric problems in panel data. Since econometric problem were detected in Stata 11, the researchers then solved them using E-views 6.

3.3.3 Sampling Size

Sampling size can be defined as the number of units in a population to be studied. Researchers need to have a large sample size in order to get more accurate results and have a high likelihood of detecting a true result. Researchers have used 15 commercial banks in Malaysia from year 2003 until year 2012. This means the sample size is 150.

3.4 Data analysis

3.4.1 Fixed Effect Model

In this study, fixed effect model is used to analyze the data collected. The purpose of using fixed effect model is to examine the macroeconomic factors and banks' specific factors on 15 commercial bank's liquidity regardless of time effect. In this model, there are two conditions being applied. Firstly, data

must exhibit different characteristic and has time effect or different
characteristic and has no time effect. Secondly, the error terms and the
independent variables are correlated which means autocorrelation problem
does exist in the fixed effect model. The equation is shown as below:

$$Y_{it} = \beta_{1i} + \beta_2 X_{it} + u_{it} \text{----------------------------------- Model (I)}$$

- Y_{it} is the dependent variable, where i = entity and t = time.
- β_{1i} (i=1….n) is the unknown intercept for each entity (n entity-specific intercepts)
- X_{it} represents one independent variable
- β_2 is the coefficient for that particular independent variable
- u_{it} is the error term

3.4.2 Data processing

A description of data preparation processes such as checking, editing, coding,
and transcribing as well as specifying any special or unusual treatments of data
before they are analyzed. To get a robust result, the model (I) has to be free
from any econometric problems such as multicollinearity, heteroscedasticity,
autocorrelation, and must make sure the error term for each variable is
stationary. This part of study is dedicated to describe the said econometric
problem. Before conducting the diagnostic test on model (I), the researchers
have to perform redundant fixed effect test and Hausman test. The reason is to
examine whether pooled OLS model or fixed effect model or random effect
model is better for this study.

3.4.2.1 Redundant fixed effect

H_0: Pooled OLS is better than fixed effect model
H_1: Fixed effect model is better than pooled OLS model

Decision Rule: Reject Ho if p-value is less than significance level. Otherwise, do not reject Ho.

Decision: Reject H_0 since the p-value is less than the significance level 0.01 (1%).

Conclusion: There is sufficient evidence to conclude that fixed effect model is better than pooled OLS model.

3.4.2.2 Hausman test

H_0: Random effect model is better than fixed effect model
H_1: Fixed effect model is better than random effect model

Decision Rule: Reject Ho if p-value is less than significance level. Otherwise, do not reject Ho.

Decision: Reject H_0 since the p-value is less than the significance level of 0.01 (1%).

Conclusion: There is sufficient evidence to conclude that fixed effect model is better than random effect model.

3.4.2.3 Multicollinearity

There are various methods to detect multicollinearity. Firstly, by comparing the expected sign of independent variables obtained from the model with prior expectation. It is possible that multicollinearity problem exists in the model if the expected sign for independent variable is inconsistent with theory or prior expectation. Secondly, by examining the correlation matrix provided by Eviews 6. If the researchers found that there is any correlation between two variables to be more than 80%,

automatically the suspicions for the existence of muliticolinearity problem is derived. Besides, multicollinearity problem can be detected by viewing the estimated model has high R-square but with only few or no independent variables found to have significant effect on the dependent variable besides there is high-pair wise correlation between two independent variables.

If multicolinearity is detected, we will conduct the Variance Inflating Factors (VIF) and tolerance (TOL) to detect the seriousness of multicollinearity. VIF is undefined if R^2 is equal to 1, it indicates that there is perfect multicollinearity between the two independent variables. There is serious multicollinearity if VIF is equal or more than 10, whereas, there is no serious multicollinearity if VIF is less than 10 or equal to 1. There is no multicollinearity if R^2 is equal to 0. However, there is negative relationship between seriousness of multicollinearity and level of TOL. The higher the TOL, the less serious the multicollinearity, whereas, lower the TOL, the more serious is the multicollinearity.

3.4.2.4 Heteroscedasticity

Heteroscedasticity occurs when the variance of error term is not constant across the number of observations. The researchers have to make sure that the model is free from heteroscedasticity to obtain a precise and interpretable result. A hypothesis test is carried out using Stata 11 and p-value is obtained to detect the heteroscedasticity problem. If the obtained p-value more than 10% significance level, it implies that the model does not have heteroscedasticity problem.

H_0 : There is no heteroscedasticity problem
H_1 : There is heteroscedasticity problem

Decision Rule: Reject Ho if p-value is less than significance level. Otherwise, do not reject Ho.

Decision: Do not reject Ho since the p-value is more than the significance level 0.01 (1%).

Conclusion: There is sufficient evidence to conclude that the model (I) does not consist of hetetoscedasticity problem.

3.4.2.5 Autocorrelation

Autocorrelation problem will occur when error term at the period t is correlated with the error term at period before t. Autocorrelation is most likely to happen in the time series data due to the importance of the sequence of the time period. Autocorrelation test is carried out by using Stata 11. The p-value obtained examines the presence of autocorrelation problem in the model. If the obtained p-value is more than 10% significance level, it implies that there is no autocorrelation problem in the model.

H_0 : There is no autocorrelation problem
H_1 : There is autocorrelation problem

Decision Rule: Reject Ho if p-value is less than significance level. Otherwise, do not reject Ho.

Decision: Do not reject Ho since the p-value is more than the significance level of 0.01 (1%).

Conclusion: There is insufficient evidence to conclude that the model (I) consist of autocorrelation problem.

3.4.2.6 Normality of the error term

The Classical Linear Regression Model (CLRM) assumes that the error term is normally distributed with the mean of error being zero as positive error will offset the negative error. The normality of error term can be examined through informal way which is using the graph to detect the pattern of the residual or the formal way is the Jarque-Bera test statistics. The Jarque-Bera test statistics requires the value of skewness and kurtosis in the model in order to calculate the Jarque-Bera test statistics value. Other than that, the researchers also can use Jarque-Bera p-value to determine the result.

H_0: The error term is normally distributed
H_1: The error term is not normally distributed

Decision Rule: Reject H_0 if the p-value for Jarqua-Bera statistic < significance level (1%), otherwise do not reject H_0.

Decision: Since the p-value for Jarqua-Bera statistic < significance level (0.01), reject H_0 and conclude that the error term is not normally distributed.

3.4.2.7 Unit Root Test

According to Granger and Newbold (1974), the estimated regression result will be spurious if dependent variable and independent variables have nonstationary (or inconsistent) movement in the level form. Stationarity movement is defined as the mean, variance and covariance of series are constant across different periods. Since researchers' model includes time series data, researchers have to ensure that the underlying time series is stationary. Generally there are two ways to know whether the series is

stationary or not which is using graphical method or hypothesis testing. For this research purpose, the researchers will conduct the hypotheses testing which is also known as Augmented Dickey Fuller (ADF) unit root test, the test is presented as below.

H_0: The series is non-stationary or it has a stochastic trend

H_1: The series is stationary or has a non-stochastic trend

Decision Rule: Reject H_0 if the p-value of unit root test less than significance level.Otherwise, do not reject H_0

Decision: Reject the H_0 since the p-value for unit root test is less than the significance level.

Conclusion: There is sufficient evidence to conclude that series is stationary.

3.5 Conclusion

In chapter 3, researchers have already presented the sources of secondary data collected. Besides that, the financial ratio technique and the macroeconomic factors data will be adopted to estimate the determinants factors. Researchers have involved 15 commercial banks in Malaysia in this study. Researchers have also discussed the method that is used to analyze the study and determine the measurement testing to provide empirical result of the researchers' study. The next chapter, chapter 4 will discuss about data analysis such as propose the result of regression model and discussion on major findings.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

In this chapter, the researchers used 15 commercial banks in Malaysia over a 10 years bracket, which is from 2003 to 2012. The data extracted by the researchers were obtained from annual reports from BNM for bank specific independent variables. As for macroeconomic factors, the data is extracted from IMF. The researchers used E-views software to analyze this research findings and data. Further, the researchers carried out relevant diagnostic testing to identify for any presence of econometric problems using E-views and Stata11. No doubt, E-views is reliable to provide an accurate output in analyzing descriptive statistics, correlations and regressions.

4.1 Scale Measurement

4.1.1 Redundant Fixed Effect Test

Test statistic value
Prob.Chi-Square = 0.0000

Table 4.1.1:Redundant Fixed Effect Test P-valueobtained from E-view output.

In order to select the correct estimated model, researchers had conducted Redundant Fixed Effect Test. The null hypothesis states that Pool OLS Model is better than Fixed Effect Model (FEM). The researchers can decide whether to reject null hypothesis by comparing p-value with the significance level. From table 4.1.1, the p-value is 0.0000 which is less than significance level of 0.10. This made the researchers to reject the null hypothesis and conclude that FEM is the best.

4.1.2 Hausman Test

Test statistic value
Prob.Chi-Square = 0.0000

Table 4.1.2:Hausman Test P-value obtained from E-view output.

To choose between FEM and Random Effect Model (REM), the researchers had conducted Hausman test. The null hypothesis states that REM is better than FEM. From table 4.1.2, the p-value of 0.0000 reckons the researchers to reject null hypothesis at significance level of 0.10. This concludes that FEM is the best.

4.1.3 Multicollinearity

Researchers examine the existence of multicollinearity by using correlation matrix. For multicollinearity, researchers then obtain the correlation value between variables and stated as below:

	LIQ	SIZE	CAP	NPL	ROE	INTER	GDP	D_{FC}
LIQ	1.000000	-	-	-	-	-	-	-
SIZE	0.617470	1.000000	-	-	-	-	-	-
CAP	-0.296196	-0.650759	1.000000	-	-	-	-	-
NPL	0.335135	0.171658	-0.165399	1.000000	-	-	-	-
ROE	0.338568	0.415615	-0.474232	-0.166493	1.000000	-	-	-
INTER	-0.014926	0.012226	-0.042786	0.009920	0.149095	1.000000	-	-
GDP	0.045118	0.165938	-0.050888	-0.421050	-0.069046	0.047069	1.000000	-
DUMMY	-0.042047	0.054229	-0.043264	-0.198033	0.040413	0.206940	0.107703	1.000000

Table 4.1.3: Correlation between dependent variable and each independent variable of the estimated model.

Based on the result of correlation analysis for each pair of variables in table 4.1.3, the researchers found that the correlation for each pair of variables are not high enough (lower than 0.80 as researchers' benchmarks), so the researchers conclude that there is no serious multicollinearity problem.

4.1.4 Heteroscedasticity

Test statistic value
Prob.Chi-Square = 0.0000

Table 4.1.4: P-value obtained from Stata output.

Researchers run diagnostic checking for heteroscedasticity by using Stata11. The null hypothesis states there is no heteroscedasticity problem in the model. Researchers can decide whether to reject null hypothesis by comparing p-value with significance level. From table 4.1.4, the p-value is 0.0000 which is less than significance level of 0.10. This made the researchers to reject the null hypothesis and conclude that there is a heteroscedasticity problem at significance level of 0.10. Heteroscedasticity means the variance of error is not constant. Since there is heteroscedasticity problem, the estimated parameter is no longer BLUE because of the inefficient parameter. The t and f statistic value and p-value will be biased and wrong. It will lead the researchers to wrong inferences on the significance of each independent variables, thus the result of hypothesis testing will be misleading. Next, the researchers proceed to solve heteroscedasticity using White cross-sectional test by E-views.

4.1.5 Autocorrelation

Test statistic value
Prob.Chi-Square = 0.0002

Table 4.1.5: P-value obtained from Stata output.

The researchers proceed to run diagnostic checking for autocorrelation using Stata11. As mentioned in section 4.1.2, the researchers reject the null hypothesis meaning that there is autocorrelation since the p-value is less than the significance level of 0.10 (table 4.1.5). This indicates that error term is correlated with the independent variables. Thus, the estimated parameters will

be inefficient and the model is no longer BLUE. Therefore, the researchers adjust for autocorrelation by using Durbin-Watson test available on E-views.

Test statistic value
Durbin-Watson statistic = 1.880167

Table 4.1.6: Durbin-Watson value obtained from E-view output.
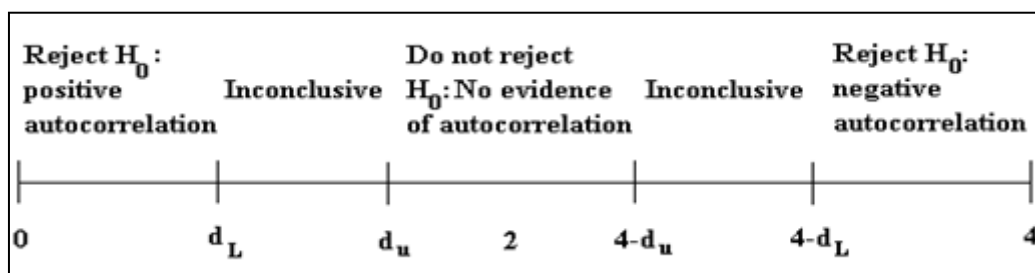
Figure 4.1.1 Durbin-Watson Decision Rule.

Durbin-Watson statistic of 1.880167 (around to 2) in table4.1.6 suggests that there is no (first-order) autocorrelation in such model.

4.1.6 Normality of the Error Term
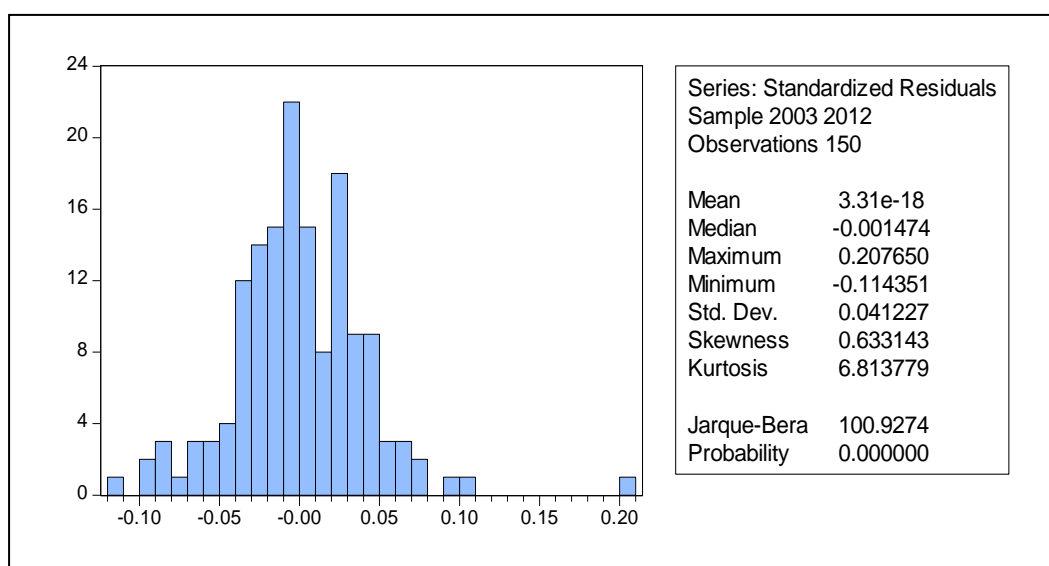
Figure 4.1.2 Normality Test result from E-view output

First, the researchers conduct normality test. The null hypothesis states that the error term is normally distributed. From graph 4.1.2 above, the p-value is 0.0000 which is less than significance level of 0.10. Therefore, the researchers reject the null hypothesis and conclude that the error term is not normally distributed at significance level of 0.10. This is due to the characteristics of Fixed Effect Model (FEM). Under the assumption of FEM, the error term are assumed to be normally distributed. Besides that, central limit theorem suggests that when the sample size is large (more than 100) the error term is assumed to be normally distributed (Gujarati, D.N. & Porter, D.C. (2009)).

4.1.7 Unit Root Test

Test statistic value
Im, Pesaran and Shin W-stat = 0.0000
ADF - Fisher Chi-square = 0.0000
PP - Fisher Chi-square = 0.0000

Table 4.1.7: Unit Root Test result obtained from E-view output.

The researchers conducted unit root test to examine the stationarity of variables. The null hypothesis states that there is non-stationarity for variables in the model. From table 4.1.7, the p-value of all three statistics is consistent, 0.0000 which is less than significance level of 0.10. This made the researchers to reject the null hypothesis and conclude that all the variables are stationary at significance level of 0.10. The result proves the entire parameter and estimation model are not spurious.

4.2 Inferential Analyses

Variables	Coefficient	P-value
Bank Size	-0.054723	0.0370**
Capital Adequacy	-0.544000	0.0000***
Non-performing Loan	0.238594	0.0090***
Profitability	0.169559	0.0051***
Gross Domestic Product	0.000136	0.0257**
Interbank Rate	-0.009041	0.2259
Financial Crisis	-0.021379	0.0058***
R-square	0.950889	
Adjusted R-square	0.942831	
Prob.(F-statistics)	0.000000	

Table 4.2.1 Estimation model output from E-view.

***significant at 1 %(strong effect)

**significant at 5 %(medium effect)

*significant at 10 %(weak effect)

4.2.1 R-square

First, researchers need to analyze the R-square in Table 4.2.1. R-square is to measure the proportion of the total variation in the dependent variable (Y) that is explained by the variation in the independent variable (X). The range of R-square is from 1 to 100%. If the R-square value is close to 1%, it means that less variation of Y can be explained by the variation of X. If R-square is close to 100%, it means that high variation of Y can be explained by the variation of X. However, if R-square equals to 0, it is mean that there is no variation of Y that can be explained by variation of X. Since R-square of the researchers study output is 0.9509 which is equivalent to 95.1%, the researchers can conclude that 95.1% variation of bank liquidity can be explained by the variation of bank size, capital adequacy, non-performing loan, profitability,

gross domestic product, interbank rate and financial crisis. However, there is a remaining of 4.9% that cannot be explained in this model.

4.2.2 Bank specific factors

4.2.2.1 Bank Liquidity Ratio

From much effort, bank liquidity ratio is realized as a type of statistical measure to assess bank liquidity by dividing loan with deposit. This measure indicates the safety and performance of the bank to cover unforeseen funds demand. For example, a high liquidity ratio would indicate a less favorable result (illiquid). Likewise, a low liquidity ratio would state a much favored result (liquid). As Crosse and Hempet (1980) stated that a lower ratio proves for the banks inability to meet loan demand. Similarly, a higher ratio proves for the banks to be able to meet loan demand.

4.2.2.2 Capital Adequacy

Results show capital adequacy is significant at 0.10 intervals. This is consistent with the researchers' expectation that there is a negative relationship between capital adequacy and Malaysia commercial bank liquidity ratio. The rsearchers' have hence drawn a conclusion that when capital adequacy increases by 1 percentage point, Malaysia commercial bank liquidity ratio deceases by 0.544000units, by holding other variables constant. In short, the more the bank capital, the higher suggestion for bank liquidity.

4.2.2.3 Bank Size

It is found that bank size is significant at 10% interval with p-value 0.0647. From running the data, it is detected that bank size has a coefficient value of 0.054723. This is consistent with the researchers' prior expectation. From this research, when bank size increases by 1 percentage point, Malaysia commercial bank liquidity ratio decreases by 0.054723units, by holding other variables constant. As indicated earlier, a lower ratio means higher liquidity, so we can conclude that larger banks tend to be more liquid.

4.2.2.4 Return on Equity (ROE)

Again, the researchers found a significant positive relationship at 10% significance level between ROE and Malaysia commercial bank liquidity ratio. This is parallel with the researchers' prior expectation. The coefficient after running the data states that an increase in ROE by 1% point bring an effect of 0.169559unit to Malaysia commercial bank liquidity ratio, by holding other variables constant.

4.2.2.5 Non-Performing Loan

Results show non-performing loan (NPL) is significant in explaining Malaysia commercial bank liquidity ratio at 10% significance level. The prior expectation of the researchers on NPL on Malaysia commercial bank liquidity ratio is a positive correlation which is same with the E-views output. The coefficient from this study states that an increase in NPL by 1 percentage point causes Malaysia commercial bank liquidity ratio to increase by 0.238594 units, by holding other variables constant. This indicates that higher NPL, the lower the bank liquidity.

4.2.3 Macroeconomic factors

4.2.3.1 Gross Domestic Products (GDP)

As predicted the GDP is significant in explaining changes to Malaysia
commercial bank liquidity ratio at significance level of 0.10. This is found
to be in line with prior expectation to influence Malaysia commercial bank
liquidity ratio positively. The coefficient after running the data states that
an increase in GDP by RM1 brings an effect of 0.000136units to Malaysia
commercial bank liquidity ratio, by holding other variables constant. This
proposes that a higher GDP or during economic boom, bank liquidity tends
to be weaker.

4.2.3.2 Interbank Rate

Moving on, the interbank rate estimated on Malaysia commercial bank
liquidity is of negative relationship, however it is not significant at 10%
significance level. From hypothesis testing, researchers do not reject null
hypothesis and conclude that interbank rate doesn't affect Malaysia
commercial bank liquidity. Researchers agree with Munteanu (2012) study
that suggests interbank rate is not significant with commercial bank
liquidity. This is because the interbank rate per annum is so small where
practically there is no effects on bank liquidity management hence no
influence on Malaysia commercial bank liquidity ratio.

4.2.3.3 Financial crisis

Empirical result shows that there is a significant negative effect of
financial crisis on Malaysia commercial bank liquidity ratio at 10%
significant level. This is same as the researchers' prior expectation. This

means that when financial crisis is present, Malaysia commercial bank liquidity's ratio decreases by 0.021379units, by holding other variables constant, when financial crisis occurs, banks tend to prioritize liquidity.

4.3 Conclusion

In chapter 4, the researchers have done on the discussion of empirical results and major findings. Before the researchers interpret the result, diagnostic checking of econometric problems and adjustment of econometric problems are provided. Next, the discussions of empirical results also include F-statistics, coefficient of determination and testing of each independent variable. The next chapter will discuss about the implications and conclusion of the study.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATION

5.0 Introduction

This chapter consists of the overall conclusion of the entire research. The summary of statistical analysis that is showed and discussed in chapter 4 will be provided in this chapter. Besides that, it also provides the discussion of the major findings and implication of the study. Lastly, researchers also suggest some recommendations for future researchers, based on the findings, limitation and conclusion.

5.1 Summary of Statistical Analyses

Diagnostic Checking	Decision	Solution
1. Multicollinearity	Every variables' correlation is not more than 80%	-
2. Heteroscedasticity	Reject Ho	Solved by using white test
3. Autocorrelation	Reject Ho	Solved by using Durbin Watson
4. Normality	Reject Ho	Assume to be normal because: 1) Represent one of FEM characteristic 2) Central limit theorem
5. Unit root test	Reject Ho	-

Table 5.1 Result of diagnostic checking

As mentioned in previous chapters, the researchers had used Stata11 to detect autocorrelation and heteroscedasticity problems and Eviews6 to detect

multicollinearity and stationary problems. Based on table 5.1, all the econometric problems had been solved by using a proper way. This means that the researchers' result is trustable and can be interpreted accordingly.

5.2 Discussions of Major Findings

Variables	Coefficient	P-value	Result
Bank Specific Factors			
Bank Size	-0.054723	0.0370**	Significant
Capital Adequacy	-0.544000	0.0000***	Significant
Non-performing Loan	0.238594	0.0090***	Significant
Profitability	0.169559	0.0051***	Significant
Macroeconomic Factors			
Financial Crisis	-0.021379	0.0058***	Significant
Gross Domestic Product	0.000136	0.0257**	Significant
Interbank Rate	-0.009041	0.2259	Insignificant
R-square	0.950889		
Adjusted R-square	0.942831		
Prob.(F-statistics)	0.000000		

Table 5.2 Major Findings

***significant at 1 %(strong effect)
**significant at 5 %(medium effect)
*significant at 10 %(weak effect)

Refers to table 5.2 in chapter 5, R-square is equal to 0.950889 which is very close to 1. Therefore, it shows a strong correlation between Y (dependent variable) and X (independent variable). R-square value in table 5.2 (0.950889) which means 95.1% variation of commercial bank liquidity can be explained by variation of bank size, capital adequacy, non-performing loan, profitability, gross domestic product, interbank rate and financial crisis.

The researchers had used regression analysis from E-view to analyze the relationship of bank size, capital adequacy, non-performing loan, profitability, gross domestic product, interbank rate and financial crisis of 15 commercial banks in Malaysia towards banks' liquidity. Result shows that there is only one insignificant variable towards the relationship which is interbank rate. Other than that, there are 6 variables significant which are bank size, capital adequacy, non-performing loan, profitability, gross domestic product and financial crisis.

5.2.3 Bank Specific Factors

5.2.3.1 Capital Adequacy

As for capital adequacy, researchers found out that it is negatively correlated with the bank liquidity ratio. This means that a positive relationship between capital adequacy and bank liquidity exist which in line with the risk absorption theory proposed by Diamond and Dybvig (1983) and Allen and Gale (2004) research. The reason behind the positive relationship between capital adequacy and bank liquidity is because higher capital improves the ability of banks to create liquidity. When a bank needs greater liquidity, it usually results in higher loss due to the disposal of illiquid asset. However, this can be prevented if the bank had a high capital to provide the needed liquidity.

5.2.3.2 Bank Size

The researchers found that bank size shows a negative relationship on Malaysia commercial bank liquidity ratio, which means the higher the bank size, the lower the liquidity ratio which means higher liquidity. This is consistent to prior research, as in Deléchat, Henao, Muthoora, and Vtyurina (2011) studies. Positive relationship with Malaysia commercial

bank liquidity and bank size also support by Rauch et al. (2008) and
Berger and Bouwman (2009), state that smaller banks prioritize on
intermediation processes and transformation activities hence have a
smaller amount of liquidity. A larger liquidity hold by bank means that
bank will have a smaller liquidity ratio.

5.2.3.3 Return on Equity (ROE)

The researchers find a negative relationship between banks profitability
and bank liquidity. This is parallel to the researchers' prior expectation and
supported by Vodova (2013) where her study reveals that when a bank
needs to sacrifice liquidity to achieve a higher profitability which in turn
increases the liquidity risk and liquidity ratio. Liquidity need is actually a
constraint for a bank from investing all its cash as profit comes from either
bank lending activities or by investing it.

5.2.3.4 Non-Performing Loan

The researchers find that the bank non-performing loan is positively
correlated with bank liquidity ratio. This result is supported by Joseph,
Edson, Manuere, Clifford and Michael (2012), indicating that NPLs have a
negative relationship towards bank performance be it liquidity or
profitability where it would result in an increase in Malaysia commercial
bank liquidity ratio. The explanation is that when a bank involves in
excessive lending, the possibility of defaulting loans increases. This
default deteriorates the Malaysia commercial bank liquidity. Further
findings which stated by Iqbal (2012) implies that NPL is negatively
correlated with banks liquidity. The explanation is that when banks
involve in excessive lending, the possibility of defaulting loans increases.
This default deteriorates the Malaysia commercial bank liquidity. Further

findings stated, by Iqbal (2012) implies that NPL is negatively correlated with banks liquidity.

5.2.4 Macroeconomic Factors

5.2.4.1 Gross Domestic Products (GDP)

As for macroeconomic economic factors, an increase in GDP would result in an increase in bank liquidity ratio. This is found to be in line with prior expectation to influence Malaysia commercial bank liquidity ratio positively. Koray Alper, Timur, Hulagu, and Gursu Keles (2012) suggest a negative relationship between GDP and liquidity. During economic boom it is likely for an increase in the number of loan and hence reducing the liquidity buffer for a bank meaning a positive relationship with bank liquidity ratio.

5.2.4.2 Interbank Rate

As for interbank rate estimated on Malaysia commercial bank liquidity, it is not significant at 10% significant level. The research by Aspachs, Nier and Tiesset (2005), proxy monetary policy with short-term interest rate and found it significant in liquidity measures. However, Munteanu (2012) study suggests otherwise where it is not significant. The logic behind is that the interbank rate per annum is of minute amount where practically there is no effect on bank liquidity management hence no influence on Malaysia commercial bank liquidity ratio.

5.2.4.3 Financial Crisis (Dummy)

For financial crisis, it is found to be negatively correlated with bank's liquidity ratio. When a financial crisis outbreak, bank would horde liquidity because they do not believe in the borrower's ability to repay the loan.This is same as researchers' prior expectation. Vodová (2013) and Fadare (2011) studies show the same thing as when financial crisis outbreak happens, banks tend to issue less loan as the default rate and risk is too high. This eventually increases a bank's liquidity and hence decreases the Malaysia commercial bank liquidity ratio.

5.3 Implications of the Study

The major implication is that when financial crisis is expected to happen in future, bank can use our model to estimate the amount of liquidity in order to survive. Thus, it enables banks to make decision making regarding the issue on liquidity and communicate it to the government to solve it together to increase the chance of surviving.

5.3.1 Bank specific factors

5.3.1.1 Bank's capital

The shareholders can play a role in supervising banks involvement in risky activities and their risk management policies. On the other hand, the government can set a policy that requires all domestic commercial banks to hold a minimum level of capital. Consequently, banks will be hindered from being deeply involved in risky investments as they have to hold larger amount of capital. Alternately, banks can issue more shares to attract more shareholders. These shareholders' stakes will contribute to the bank's capital and thus reducing the liquidity risks. All these are to ensure

that the banks can achieve the minimum liquid assets holding target and at
the same time improve domestic commercial banks liquidity. In conclusion,
the domestic commercial banks will be subjected to less liquidity risks.

5.3.1.2 Bank's size

Based on empirical findings, as banks increase in size, they can gather
deposits more easily. Banks are hence encouraged to venture into more
liquid assets such as government security and short term as these securities
are readily to be converted into cash thus increase the liquidity of banks.
Banks are encouraged to fund these investments by attracting more core
deposits which are less sensitive to interest rates thereby reducing the
probability of banks run.

Loans are the main assets to a bank. However, banks should also avoid
concentrating on long term loans as they are riskier and illiquid. Banks
should plan their loan portfolio to an optimal level to reduce their risk and
increase their liquidity.

Other than that, currently government advice on merger and acquisition of
smaller banks should be continued because larger banks are relatively
more stable in the sense of liquidity.

Moreover, government can control the competition so that smaller banks
would have more competitive edge to expand thus making them more
liquid and stable. Current regulations that restrict the number of branches
each bank can open should be tightened to facilitate a fair competition.

5.3.1.3 Bank's Profitability

The results show that higher profitability leads to lower bank liquid assets holding. A bank should not be profit oriented in the sense that an uncontrolled profit by issuing more loans and investing in riskier assets as in long term, the bank's performance would deteriorate over time due to low quality assets. However, not giving loans can also be a loss in opportunity to sustain over long terms. Hence, the bank management should balance or maintain optimal levels or loans given out and deposits retained.

Policy makers should also impose a clear guideline on the activity that a bank could take and a higher capital requirement on risky loan to improve bank's liquidity.

5.3.1.4 Non-performing loans

Through the hypothesis testing, non-performing loans can reduce banks liquidity. In order to reduce non-performing loans, fraud management should be taken seriously. On top of that, banks should in all time follow the risk assessment guidelines and give loans to prime borrowers only.

Furthermore, the government should use monetary policies to increase the interest rate so it would indirectly tighten the requirement for loan applications.

5.3.2 Macroeconomic Factors

Based on this study, it is found that from the three macroeconomic factors chosen, only one is not significant which is the interbank rate while gross

domestic product and financial crisis are statistically significant and have significant effect on bank liquid asset holding.

In order to deal with these effects, bank can develop a system that could forecast inflation rate and gross domestic product (GDP) based on past data. This system will assist banks in decision making when adjusting interest rate on loans.

During financial crisis, the interbank market tends to be less stable, thus Bank Negara Malaysia (BNM) should monitor the interbank market closely and be all set to adjust liquidity among the banks if the banks require fulfilling any sudden liquidity needs. Although banks remain conservative in liquid asset holding during recession, banks should keep in mind that the liquid assets should only be kept at optimal levels. This is to reduce the opportunity cost that has to be forgone while holding these liquid assets.

In addition, banks at all times should remain prudent in all their activities to buffer shocks in the event of a financial crisis occurring. The risk management department should be on toes to detect any noncompliance activities by the banks and report to BNM.

5.4 Limitation of the Study

This study suffers from several limitations. There are handful researchers who did studies on banking field. Nonetheless, only a handful of these studies are on the liquidity of bank and fewer use loans to deposit ratio as the dependent variable. Moreover, studies related to the determinant of bank liquidity in Malaysia are limited. Our literature is only supported by other countries finding hence, it could be one of the obstacles as we cannot get any benchmark for our analysis. Thus, this confined the researchers from performing an inclusive literature review.

Secondly, the duration allocated to carry out this study is only for the period of a year. Thus, due to the allotted time frame, it is most appropriate to adapt the secondary data to pursue this study. Dissimilar to secondary data, primary data allows for a more complete control of sampling design such as on the intended target market, type of respondents, selective banks and etcetera. Also in fact, a thorough examination is required before using secondary data as the origin of the data might be dubious. Furthermore, secondary research requires critical judgment on the reliability and validity of the information, hence it is more cumbersome.

Thirdly, data collection is one of the limitations. Researchers intended to collect data on bank specific factors in Malaysia for 13 years. However, the data available in BNM is not complete. There are plenty of banks that do not disclose complete annual reports from year 2000 to 2012. Therefore, we faced difficulties in obtaining more sample size for this study. In the end, the researchers could only successfully collect 10 years beginning 2003 to 2012 annual reports. Besides the above, some valuable secondary data such as articles and journals only provided an abstract of the study and charges exorbitant fees for the full version. Thus, due to the lack of resources, the researchers are only able to retrieve bank's data from bank's annual reports and complimentary journals to explain the hypothesis testing.

Moreover, every country has distinct characteristics and its own political background, regulations and culture. Since this research is based on commercial banks in Malaysia, the findings and discussion are only meaningful for Malaysia domestic banks and government regulation. Researchers from other countries can use this research only as referral but might not be able to apply this study into their political background.

Lastly, the bank specific data collected is calculated manually by referring to the annual report that is generated from BNM. The researchers have been using the formulas to calculate the independent variables from the data collected. Therefore, there is the tendency for biased outcome despite several times of checking.

5.5 Recommendations for Future Research

Due to limited studies done in Malaysia, more researchers are encouraged to conduct research on liquidity issues faced by banks in Malaysia. This would actually benefit the policy makers to setup a better new policy.

Researchers have examined the relationship between dependent variable (bank liquidity) and independent variables (bank size, capital adequacy, non-performing loan, profitability, gross domestic product, interbank rate and financial crisis). Therefore, future research is recommended to use more challenging independent variables (for example, short-term monetary interest rate, political influence, government implications and others) to explain the dependent variable of bank liquidity ratio.

Besides, future researchers are also recommended to use a more complicated econometric model or dynamic panel model where it could capture the possible effect of independent variable on dependent variable that lags behind. As for the dependent variable, future researchers are recommended to use a few liquidity ratios such as liquid assets to deposit and short term financing ratio, loan to total asset ratio to provide different insight about the implication.

Lastly, future researchers are encouraged to include more banks and years to increase the sample size improving representativeness. This can be done by adding banks from Asian country into their research to provide a more accurate and inclusive and suitable finding to be used by others.

5.6 Conclusion

Banks should remain liquid at all times to prevent falling into liquidity crisis and cause distress in the overall economy. Thus, this study attempts to identify the determinants of liquidity of commercial banks in Malaysia. This research also provides summary of previous studies on similar topics. Panel data set is used; spanning 15 Malaysia commercial banks over 10 years and estimate using Fixed Effect Model (FEM). After carrying out the hypothesis testing, the following conclusion has been formed.

It is found that bank capital, bank size, non-performing loan ratio, gross domestic product, financial crisis and return on equity have significant effects on bank's liquid assets holdings. However interbank rate is proven to be insignificant in this research.

Summary of the hypothesis findings, discussions of the study, and its implications are included in this last chapter. Despite the best efforts, this research still suffers from a few limitations. However, these limitations do not have a large effect on the results and most of which can be solved.

In brief, this research has reached its objective in finding the determinants of liquidity of commercial banks in Malaysia and can be used as a referral for future researchers who are interested to study on this topic.

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APPENDICES

Appendix 1: Result of Redundant Fixed Effects Tests (E-view)

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

Effects Test	Statistic	d.f.	Prob.
Cross-section F	78.471863	(14,128)	0.0000
Cross-section Chi-square	338.996413	14	0.0000

Cross-section fixed effects test equation:
Dependent Variable: LIQUIDITYRATIO
Method: Panel Least Squares
Date: 06/25/13   Time: 21:27
Sample: 2003 2012
Periods included: 10
Cross-sections included: 15
Total panel (balanced) observations: 150
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BANKSIZE	0.184557	0.035503	5.198264	0.0000
CAPITALADEQUACY	1.061865	0.282631	3.757074	0.0003
NONPERFORMINGLOAN	2.303870	0.477293	4.826955	0.0000
PROFITABILITY	0.859449	0.156725	5.483803	0.0000
INTERBANKRATE	-0.030625	0.007923	-3.865274	0.0002
GROSSDOMESTICPRODUCT	0.000379	0.000100	3.792145	0.0002
FINANCIALCRISIS	0.002203	0.006811	0.323487	0.7468
C	-1.878878	0.361590	-5.196155	0.0000

R-squared	0.529372	Mean dependent var	0.501702
Adjusted R-squared	0.506172	S.D. dependent var	0.186031
S.E. of regression	0.130730	Akaike info criterion	-1.179514
Sum squared resid	2.426810	Schwarz criterion	-1.018947
Log likelihood	96.46354	Hannan-Quinn criter.	-1.114281
F-statistic	22.81781	Durbin-Watson stat	0.372555
Prob(F-statistic)	0.000000		

Appendix 2: Result of Hausman test (E-view)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	7	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.
** WARNING: robust standard errors may not be consistent with
    assumptions of Hausman test variance calculation.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
BANKSIZE	-0.054723	0.016919	0.000246	0.0000
CAPITALADEQUACY	-0.544000	-0.484000	-0.001128	NA
NONPERFORMINGLOAN	0.238594	-0.079755	-0.028139	NA
PROFITABILITY	0.169559	0.200329	-0.008264	NA
INTERBANKRATE	-0.009041	-0.010016	-0.000025	NA
GROSSDOMESTICPRODUCT	0.000136	0.000082	0.000000	0.0009
FINANCIALCRISIS	-0.021379	-0.022760	0.000007	0.5904

Cross-section random effects test equation:
Dependent Variable: LIQUIDITYRATIO
Method: Panel Least Squares
Date: 06/25/13   Time: 21:29
Sample: 2003 2012
Periods included: 10
Cross-sections included: 15
Total panel (balanced) observations: 150
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.061830	0.257627	4.121575	0.0001
BANKSIZE	-0.054723	0.025955	-2.108334	0.0370
CAPITALADEQUACY	-0.544000	0.120605	-4.510585	0.0000
NONPERFORMINGLOAN	0.238594	0.089924	-2.653279	0.0090
PROFITABILITY	0.169559	0.059431	2.853039	0.0051
INTERBANKRATE	-0.009041	0.007430	-1.216782	0.2259
GROSSDOMESTICPRODUCT	0.000136	6.03E-05	2.256449	0.0257
FINANCIALCRISIS	-0.021379	0.007626	-2.803322	0.0058

Effects Specification				

Cross-section fixed (dummy variables)

R-squared	0.950889	Mean dependent var	0.501702
Adjusted R-squared	0.942831	S.D. dependent var	0.186031
S.E. of regression	0.044480	Akaike info criterion	-3.252823
Sum squared resid	0.253245	Schwarz criterion	-2.811263

Log likelihood	265.9618	Hannan-Quinn criter.	-3.073432
F-statistic	118.0152	Durbin-Watson stat	1.098402
Prob(F-statistic)	0.000000		

Appendix 3: Correlation between dependent variable and each independent variable of the estimated model (E-view)

	LIQ	SIZE	CAP	NPL	ROE	INTER	GDP	D_{FC}
LIQ	1.000000	-	-	-	-	-	-	-
SIZE	0.617470	1.000000	-	-	-	-	-	-
CAP	-0.296196	-0.650759	1.000000	-	-	-	-	-
NPL	0.335135	0.171658	-0.165399	1.000000	-	-	-	-
ROE	0.338568	0.415615	-0.474232	-0.166493	1.000000	-	-	-
INTER	-0.014926	0.012226	-0.042786	0.009920	0.149095	1.000000	-	-
GDP	0.045118	0.165938	-0.050888	-0.421050	-0.069046	0.047069	1.000000	-
DUMMY	-0.042047	0.054229	-0.043264	-0.198033	0.040413	0.206940	0.107703	1.000000

Appendix 4: Result of Fixed Effect Model (E-view)

Dependent Variable: LIQUIDITYRATIO
Method: Panel Least Squares
Date: 06/25/13   Time: 20:39
Sample: 2003 2012
Periods included: 10
Cross-sections included: 15
Total panel (balanced) observations: 150

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BANKSIZE	-0.054723	0.029368	-1.863354	0.0647
CAPITALADEQUACY	-0.544000	0.134265	-4.051676	0.0001
NONPERFORMINGLOAN	0.238594	0.195308	1.221630	0.2241
PROFITABILITY	0.169559	0.088722	1.911128	0.0582
FINANCIALCRISIS	-0.021379	0.008602	-2.485189	0.0142
GROSSDOMESTICPRODUCT	0.000136	6.72E-05	2.025252	0.0449
INTERBANKRATE	-0.009041	0.008939	-1.011406	0.3137
C	1.061830	0.296091	3.586165	0.0005

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.950889	Mean dependent var	0.501702
Adjusted R-squared	0.942831	S.D. dependent var	0.186031
S.E. of regression	0.044480	Akaike info criterion	-3.252823
Sum squared resid	0.253245	Schwarz criterion	-2.811263
Log likelihood	265.9618	Hannan-Quinn criter.	-3.073432
F-statistic	118.0152	Durbin-Watson stat	1.098402
Prob(F-statistic)	0.000000		

Appendix 5: Result of Fixed Effect Model after Heteroscedasticity solved (E-view)

Dependent Variable: LIQUIDITYRATIO
Method: Panel Least Squares
Date: 06/25/13   Time: 20:42
Sample: 2003 2012
Periods included: 10
Cross-sections included: 15
Total panel (balanced) observations: 150
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BANKSIZE	-0.054723	0.025955	-2.108334	0.0370
CAPITALADEQUACY	-0.544000	0.120605	-4.510585	0.0000
NONPERFORMINGLOAN	0.238594	0.089924	-2.653279	0.0090
PROFITABILITY	0.169559	0.059431	2.853039	0.0051
FINANCIALCRISIS	-0.021379	0.007626	-2.803322	0.0058
GROSSDOMESTICPRODUCT	0.000136	6.03E-05	2.256449	0.0257
INTERBANKRATE	-0.009041	0.007430	-1.216782	0.2259
C	1.061830	0.257627	4.121575	0.0001

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.950889	Mean dependent var	0.501702
Adjusted R-squared	0.942831	S.D. dependent var	0.186031
S.E. of regression	0.044480	Akaike info criterion	-3.252823
Sum squared resid	0.253245	Schwarz criterion	-2.811263
Log likelihood	265.9618	Hannan-Quinn criter.	-3.073432
F-statistic	118.0152	Durbin-Watson stat	1.098402
Prob(F-statistic)	0.000000		

Appendix 6: Adjustments for Autocorrelation (E-view)

Dependent Variable: ERROR
Method: Panel Least Squares
Date: 06/25/13   Time: 21:21
Sample (adjusted): 2004 2012
Periods included: 9
Cross-sections included: 15
Total panel (balanced) observations: 135
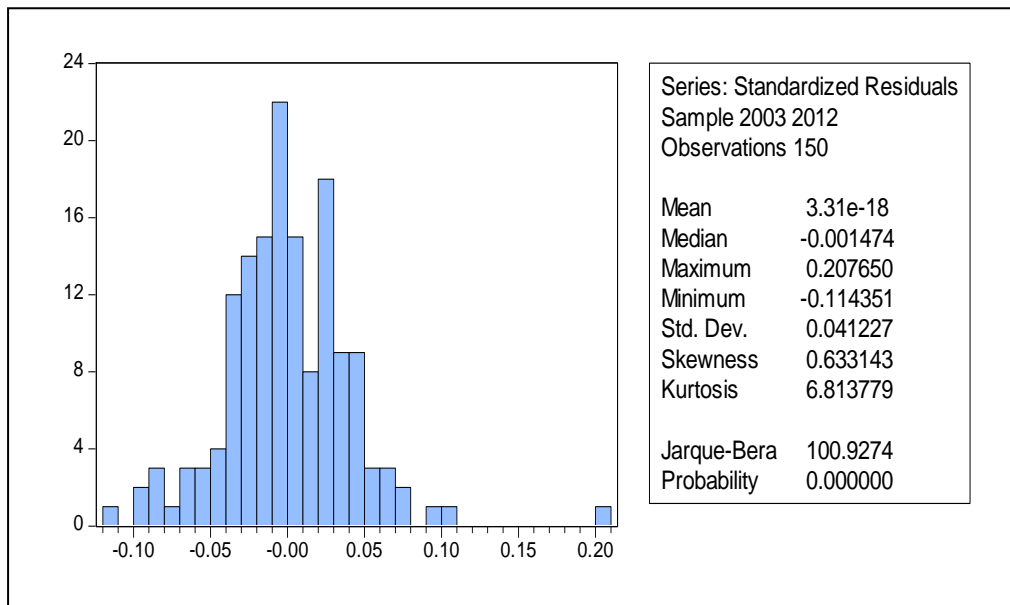White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERROR(-1)	0.431800	0.094569	4.565990	0.0000
C	-0.000817	0.003764	-0.217063	0.8285

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.213720	Mean dependent var	-0.001398
Adjusted R-squared	0.114609	S.D. dependent var	0.040212
S.E. of regression	0.037837	Akaike info criterion	-3.600165
Sum squared resid	0.170366	Schwarz criterion	-3.255836
Log likelihood	259.0111	Hannan-Quinn criter.	-3.460239
F-statistic	2.156373	Durbin-Watson stat	1.880167
Prob(F-statistic)	0.011473		

Appendix 7: Result of Jarque-Bera Test (E-view)

Series: Standardized Residuals	
Sample 2003 2012	
Observations 150	
Mean	3.31e-18
Median	-0.001474
Maximum	0.207650
Minimum	-0.114351
Std. Dev.	0.041227
Skewness	0.633143
Kurtosis	6.813779
Jarque-Bera	100.9274
Probability	0.000000

Appendix 8: Result of Unit root test (E-view)

Group unit root test: Summary
Series: LIQUIDITYRATIO, BANKSIZE, CAPITALADEQUACY,
    NONPERFORMINGLOAN, PROFITABILITY, FINANCIALCRISIS,
    GROSSDOMESTICPRODUCT, INTERBANKRATE
Date: 06/25/13 Time: 21:03
Sample: 1 150
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic selection of lags based on SIC: 0 to 1
Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.48977	0.0064	5	743
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.35731	0.0000	5	743
ADF - Fisher Chi-square	43.8113	0.0000	5	743
PP - Fisher Chi-square	52.3208	0.0000	5	745

** Probabilities for Fisher tests are computed using an asymptotic Chi
   -square distribution. All other tests assume asymptotic normality.

Appendix 9: Detection of Heteroscedasticity problem (Stata)

H0: sigma(i)^2 = sigma^2 for all i
chi2 (15) =   1373.95
Prob>chi2 =   0.0000

Appendix 10: Detection of Autocorrelation problem (Stata)

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
   F (1,   14) =   25.155
      Prob > F =   0.0002