

BANK LIQUIDITY RISK MANAGEMENT FROM
MICRO PERSPECTIVE: A STUDY IN OIL
EXPORTING COUNTRIES

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requirement for the degree of

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DECLARATION

We hereby declare that:

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- (2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.
- (3) Equal contribution has been made by each group member in completing the FYP.
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DEDICATION

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LIST OF ABBREVIATIONS

BCBS	Basel Committee on Bank Supervision
LR	Liquidity Risk
DCP	Debtor Collection Period
CPP	Creditor Payment Period
LB	Liquidity Buffer
AD	Augmented Dickey–Fuller test
PP	Phillips–Perron test
KPSS	Kwiatkowski–Phillips–Schmidt–Shin
AIC	Akaike Information Criteria
BIC	Bayesian Information Criteria
HQIC	Hannan–Quinn Information Criteria

PREFACE

Undergraduate Research Project (UBFZ3026) is a compulsory subject for all final undergraduate students in order to complete their studies for Bachelor of Finance (Hons). During the process of doing the project, we will investigate one research topic and search for all information relating to background, literature review, research design and others. As a student, this is beneficial for us since we can contribute our interest and knowledge, generate our ideas and more understand our courses learning.

Our research topic is “Bank Liquidity Risk Management from Micro Perspective: A Study in Oil Exporting Countries. We have made the research among 59 banks in 13 countries with the bank data from year 2014 until 2018. The reason of focusing on liquidity risk management is because we believe that liquidity risk should be more concerned by the banking sector.

Liquidity refers to the ability of banks in converting their assets into cash. Obviously, it is an effective way to predict the healthy status of a financial institution. Every financial institution should have good liquidity in order to meet their financial obligations. Besides, the level of liquidity risk also can link to the rating and profitability of a bank. Hence, analysis and estimation of liquidity risk in bank risk management become more important in order to avoid bank failure or losses.

In our research project, we have concluded the formulation of our study, in which we will use creditor payment period, debtor collection period and liquidity buffer

to determine bank liquidity risk. These three methods can help us to calculate the liquidity status of a bank and examine the liquidity of a bank.

ABSTRACT

Liquidity risk management is important for banks to avoid bank run and maintain its survival in long run. In this study, the data set is panel data and consists of 59 banks in 13 oil exporting countries for the periods of 2014-2018. The data was collected from secondary sources; Bloomberg. Besides, Linear Regression Model has been applied in this study to analyse the relationship between the bank specific factors and liquidity risk. In addition, the panel data with 295 observations has been run by Panel Vector Autoregression (PVAR). In fact, this study is mainly discussed the methods can be used by the banks to manage the liquidity risk from micro perspective. Thus, this study will determine whether there is a significant relationship between the debtor collection period, creditor payment period and liquidity buffer with the liquidity risk in both long term and short term period. The major findings in this study showed that there is a positive relationship between the debtor collection period and liquidity risk in long-term. Meanwhile, there is a negative relationship between the creditor payment period and liquidity buffer with liquidity risk in both short-term and long-term.

CHAPTER 1: RESEARCH OVERVIEW

1.1 Research Background

Bank risk management plays an important role in evaluating institution's profit or loss to protect their assets in banking sector. One of the main importance of the bank risk management is the banks able to figure and analyse what kind of event will create potential losses to them, so they are able to implement a right and efficient method to reduce or prevent the risk. By having a sound risk management, the banking institutions are able to survive and remain their competitive advantage in the long run; thus, a robust financial system is able to be built. For example, Goldman Sachs Group, Inc, is an American investment banking and financial services firm and it is well known internationally. According to the report of Wall street, this company has efficient working in risk management since it has built a department to do the price trading and manage the risk. Hence, during the crisis of 2008, Goldman was able to survive since they already prevented the risk and were able to take advantage from the weak competitors. As with Goldman, JP Morgan is also a famous investment banking industry in America. This firm not only did well in risk management, but also spread the knowledge to the shareholders. As a result, they are able to prevent the risk and use their financial ability to survive in the financial crisis.

Besides, the financial crises can be avoided in the existence of sound risk management among the financial institutions. Financial crisis is the event that is unfavourable to all banks, so they need to investigate and research their operation to prevent a crisis. Financial crisis may affect the economic activities negatively and increase the risk of economic recession. For example, the recent financial crisis is caused by fluctuation of the financial instruments, property, assets and so on. Those situations had affected the asset and liabilities of the bank as well as the ratio

of the bank such as liquidity ratio, financial leverage and profitability. By having a sound risk management, the banks may be able to survive from the pandemic. As shown in the past studies, most of the banks collapsed due to their failure in the implementation of risk management process.

In fact, liquidity risk is the most important risk of banks that need to be well managed to ensure the banks able to convert their assets to the money and meet the financial obligations. The liquidity management is very crucial for the banking institutions to cope with any unexpected events that may happen in future by enabling the banks to have enough funds to fulfill the depositors' need if there are any sudden deposits withdrawing.

Furthermore, bank runs happen because the depositors expect the bank to fail so they will withdraw their deposits from the banks. The rumours cause the banks to liquidate their assets and sell at a lower price; even only certain amounts of deposits withdrawal, the bank will also fail. This panic will cause the trouble in the monetary system because all the banks are facing liquidity risk at the same time. Furthermore, unpaid loans will also contribute to the problem of bank runs. This is because the banks expect a continuous future growth, so the credit will be extended to the real sectors in the upturn. At the end, the high leverage might cause the banks unable to cover the losses in the recession if the creditors run from the loans.

1.1.1 How Liquidity Risk Led to Bank Failure

The first bank run happened is in Nashville, Tennessee, in 1930. Caldwell and Company, which had incurred debts suffered from financial difficulties in developing the acquisition program and had insufficient cash reserves. This is due to the firm did not comply with normal financial and business practices and procedures. For instance, Caldwell recorded his lavish lifestyle and personal expenses as the company expenses. Caldwell actively involved in finance and

politics with Luke Lea, who was the owner of the Nashville Tennessean and they bought controlling interests in Holston National Bank in Knoxville and the Memphis Commercial Appeal and the Knoxville Journal to solve the financial difficulties. Next, Caldwell and Company's position became worse after the stock market fell in 1929 but it remained operating because they obtained government's preferential treatment. According to Corporate Finance Institute (2020), the examiners of state audited the Bank of Tennessean and declared it suffered from solvency issues and cash shortage as the banks hold a small portion of their total deposits and the remaining deposits were lent out to other clients. The bank must liquidate loans and sell assets to support the withdrawals due to insufficient of cash. The banking crisis occurred with the collapse of Caldwell subsided in 1931 and this generated the wave of bank runs on other banks of Caldwell-control in Tennessee. Therefore, the proper risk management system is crucial for all the firms by complying with the policies and procedures of the firm in order to minimize the chance of bank run.

Furthermore, the liquidity risk management should not be neglected by banks since a failure of banks can be caused by insufficient liquidity raised to meet the obligations. For instance, during the 1990s, Southeast Bank of Miami which is a second largest bank was closed due to liquidity problems. The Southeast Bank has started slipping after the collapse of the regional commercial real estate market in the late 1980s. Meanwhile, the subsequent effect of the huge losses amounted to \$203 million announced by the bank in 1990 is the customers began to withdraw their funds from the bank. Hence, in order to meet the withdrawal of depositors, Southeast bank started to borrow the funds from Federal Reserve. However, the liquidity problem of the bank became worse as it did not have enough liquid assets or funds to repay the loans from the Federal Reserve and was forced to close in September 1991. This case clearly shows that a bank in large size can be collapsed because of liquidity risk and sound risk management is important for them to sustain in the banking industry.

In addition, the serious problems caused by the failure in bank liquidity risk management clearly shown in the financial crisis happened in 2008. The reason for the occurrence of this financial crisis is that the derivative markets collapsed and brought a subsequent effect of liquidity problem to the banks in many countries such as Japan, European Union and Asian country. For instance, the first bank that was involved in the bank run in 2007 is Northern Rock because the panic causes the bank facing illiquidity. On the other hand, DSB bank failed to perform in the crisis which caused an amount of 600 million withdrawal in just around 2 weeks. The amount is almost half of the asset in the bank, so the bank went into bankruptcy. In addition, the investment bank in New York, Bear Stearns and Lehman Brothers fail in short term creditors runs as they are involved in liquidity risk. The bank runs happened in Corporate Commercial Bank and first investment Bank in Bulgaria after customers started to receive messages from text, email and Facebook which asking them to withdraw funds from the nation's biggest banks in year 2014. After that, the Bulgarian central bank had taken control of Corpbank after over 20% of its deposits in the bank were withdrawn; the depositors also withdrew \$547 million from First Investment Bank. It is found that the BNB's deputy governor and banking supervision head had to take absence leave because they are found under criminal investigation and the people began to withdraw their saving out. The Corpbank suffered from insufficient cash and it had been put under special supervision due to the media speculation and encouraged by the Bulgarian prosecution service. Hence, it was closed and stopped by the Bulgaria National Bank and Bulgarian banker Tzvetan Vassilev.

Moreover, a lot of banks with well capitalization in the US are forced to liquidate their business because they are unable to provide liquidity to their customers or fulfill the obligations. A clear example is Lehman Brothers Holdings Inc that has been a fourth-largest investment bank in the US forced to declare bankruptcy in 2008 indicates the importance of liquidity risk management to a bank. One of the reasons that causes the failure of the bank is its poor liquidity risk management. Based on Mawutor (2014), the main factors contributed to the Lehman Brothers Holdings Inc failure is it is unable to fulfill its short term obligations although it has a greater asset base. Consequently, greater withdrawals from depositors occurred

due to market confidence loss and led to the liquidity problem. Next, the reason for liquidity problems occurring in Lehman Brothers Holdings Inc is starting from the collapse of subprime mortgages. The Lehman Brothers Holdings Inc that was overdependent on the securitization mortgages has been largely affected. Besides, Lehman Brothers Holdings Inc that heavily relied on the repo market as a source of income is another cause of the problem. In short, the main reason for the Lehman Brothers Holdings Inc failure is liquidity challenge instead of insolvency problem. There was an early signal of the financial problem in Lehman Brothers Holdings Inc as it failed to obtain funds from operating activities did not consider its potential liquidity challenge if any unfavourable conditions happened. From here, it can be concluded that the liquidity risk management should not be ignored by the banks since the liquidity problem is a big challenge for the banks to sustain in the industry.

One of the banks in United States, Washington Mutual for saving and loan association also failed during the year 2008. The Office of Thrift Supervision had shut down Washington Mutual. The primary cause of the bank failure is huge amounts of subprime mortgage provided to the unqualified buyers. The borrowers that do not qualify for conventional mortgages due to their poor credit score were given the mortgage because the bank wants to earn a higher interest rate. As a result, the bank will suffer a greater default risk. In 2008, greater amounts of depositors withdrawing their savings and checking accounts when Lehman Brothers bankruptcy and caused the bank had insufficient funds because Washington Mutual bank fail to sell the securities to generate cash in the market. There is an amount of \$16.7 billion in deposits taken out and this led to the bank's collapse (Kimberly, 2021).

1.1.2 Basel Committee on Bank Supervision

The Basel Accords plays an important role in ensuring the financial institutions hold adequate capital on account for the purpose of absorbing unexpected losses and

meeting obligations; hence, the financial institutions able to survive when any financial distress happened. The accords are very important for the financial institutions since it will provide recommendations on banking regulation to manage the market risk, credit risk, operational risk and so on. It can be broken down into Basel I, Basel II, and Basel III.

Basel I was formed in 1988, with the purpose of enhancing the stability of the financial system by setting minimum reserve requirements for international banks. A limitation of Basel 1 is it only focusing on determining the minimum capital requirements and credit risk while the market risk and operational risk are being ignored.

In 2004, the extension of Basel I, Basel II, was introduced. It created a more comprehensive risk management framework and concentrate on three issues which are minimum capital requirements, supervisory mechanisms and transparency, and market discipline. It developed the standardized measures for credit, operational, and market risk to measure and determine their minimum capital requirement. Furthermore, it enhanced supervisory mechanisms and market transparency by creating disclosure requirements to oversee regulations.

Before the global financial crisis happened, there are only consists of Basel I and II which do not have the liquidity restrictions and cause them has capital structures in excess and liquidity management in poor. After the Global Financial Crisis of 2008, it exposed the shortcoming of the international financial system and led to the improvement of Accords and created Basel III to ensure them able to solve the crisis of liquidity by requiring the banking institutions to maintain a minimum liquidity ratio and a minimum amount of equity capital. Consequently, the bank able to perform better financial position for long run and recover any losses when the crisis happened.

The banking institutions should practice a sound liquidity risk management to manage the risk effectively. First and foremost, one of the methods is maintaining a low debtor collection period. The right management in current asset and liabilities able to maintain a high liquidity position and greater rate of return. A well-managed of receivable accounts can help a company to generate better profit as well as reduce the cost of raising fund when facing liquidity problem. Thus, shorter collection periods can help the company or bank to reduce liquidity risk. One of the crises in the Great Recession which existed between the year 2007 and 2009 is known as the subprime mortgage crisis. It has caused financial problems in the global economy. Many parties such as investors, lenders, companies and banks that involved in subprime mortgage are affected and suffered from liquidity risk. Normally, the banks earn revenue by lending out loans to the customer and collecting an amount of interest. The interest is a source of revenue for the bank to make investment or daily operation. At the same time, some banks focused on earning revenue and neglected the credit score of the customer or borrowers where the loan was lent to. At the end, the subprime mortgage crisis happens. The subprime mortgages will be combined with other similar mortgages sold by the lender to the investment bank or investor. At that time, the bubble of houses burst, the interest rate and people could not afford to pay for the mortgage as well as could not sell the house. Then, it is incapable for banks to sell off the liquid asset to generate cash flow and even hard to receive money from receivable. Hence, this will lead to a longer debtor collection period and liquidity problems arise in the same way as the case for Washington Mutual and Bear Stearns. Therefore, if the firms or bank that could maintain lower debtor collection period bring would be able to free from the crisis.

Furthermore, the other method to manage the bank liquidity risk is maintaining a high creditor payment period. The firm should analyse creditor payment period to ensure balance between liquidity and profitability because it affects the short-term liquidity of the firm. In fact, the longer time a firm taken to pay its suppliers or creditors is generally favourable to the firm, for more cash that will be available to finance its investments and operations. A firm with a shorter creditor payment period may reflect that the firm is not fully utilizing its credit period offered by creditors. The risk management is crucial for the financial institution because bank

run may occur if many customers withdraw all their money from their deposit accounts at the same time due to their afraid of the financial institution might become insolvent. When there are more customers withdraw their money, the probability of a financial institution default in payment will be higher. This will trigger more withdrawals and the bank will have insufficient cash to support their business operation. Thus, an uncontrolled bank run can cause bankruptcy, and when more banks are involved in the bank run, it generates an industry-wide panic that can cause an economic downturn. For example, the case of Overend Gurney which is the largest discount house in London unable to pay their creditor and customer and finally lead to bank run because of their poor credit underwriting standard and risk management. It became insolvent due to average losses made by the late of 1860. The firm is also exposed to riskier customer lending because of the poor credit underwriting standard and risk management standard because there were no serious actions and penalties taken to identify the accuracy of the mentioned valuation or the collateral provided by the borrower. Thus, the poor risk management practices caused the loan losses on riskier customer loans. On the other hand, Overend largely invested in speculative-grade bills in the early 1860. The share price fell dramatically and a long period of high interest rates in London caused the stock market to fall and Overend Gurney suffered from liquidity issues due to financial instability. After that, the firm tried to seek assistance from the Bank of England. Unfortunately, the bank refused to provide a loan to Overend Gurney and the firm suspended payments to pay to their creditors and shareholders and declared insolvent. In short, Overend was unable to pay the creditors and the shareholders because they relied largely on the investment gain to generate the liquidity of the firm. It can be observed that the firm had no risk management to eliminate the liquidity risk and neglect the importance of keeping longer creditor payment periods.

Meanwhile, holding of adequate liquid assets is one of the effective liquidity risk management methods because it enable banks to reduce their exposure to the liquidity risk. Besides, the liquid assets in high-quality should be maintained in a greater amount to act as an insurance against the uncertainty such as the behaviour change of liability holders. By doing this, the banks managed to better deal with the scenario of liquidity pressure and maintain its stability. This is because liquid assets

can be sold out easily to convert into cash and used to meet the cash demands of customers and pay the liabilities when facing any uncertainty events. Otherwise, the banks will face bankruptcy risk even though they have high profitability. However, some of the banks will ignore the significant threat of asset-liabilities imbalance which is one of the causes of liquidity risk. This indicates that the banks mostly used the funds of short-term deposits which are liquid to finance its investments in long-term which are illiquid. As a result, when the economic situation is unfavourable or other uncertainties happen, the depositors tend to withdraw their short-term deposits and the banks will have difficulty liquidating their investments long-term to gain immediate funds. For example, Banco Popular which is a fifth-largest bank in Spain collapsed in 2017 because of the liquidity problem. One of its failure reasons is it was unable to cope with the financial distress when large amounts of deposit withdrawal due to the customers loss of confidence. According to its annual report in 2016, the reason behind the failure is it has a very low liquidity ratio of 2.9% that is lower than the minimum rate of 8-10% and lead to the worsen situation (“What are the world’s safest banks and how to evaluate them”, 2017). To sum it up, sufficient liquid assets holding will be one of the effective liquidity risk management methods that can be implemented by the banks.

1.2 Research Problem

In history, there were many crises happened that challenging the financial institutions such as wall street crash in 1929, oil price shock in year 1973 and financial crisis in 2008. Among these crises, financial crisis happened in 2008 is the most serious crises that bring troublesome to a great deal of banks due to liquidity risk. For example, Washington Mutual, Bear Stearns and Lehman Brothers failed during the crisis because of suffering liquidity risk. The failure of Lehman Brothers is caused by holding too much of short-term liabilities while the failure of Washington Mutual is caused by lack of liquid assets hold on hand as they overdependent in the mortgage loans. As a result, when the financial crisis

happened, bank run may happen since there are large withdrawal from depositors. The banks with greater amounts of long-term assets have to transform these assets into cash in a shorter time to meet the demand of depositors that may cause higher losses. Thus, the banks that did not have enough liquidity fail to meet the obligations and forced to bankrupt eventually.

After the crisis, the banks realized the importance of liquidity risk management to their survival in the banking sector. Besides, the banks also understand there is a greater impact of banks specific factors in the liquidity risk management. Therefore, the banks can implement a better internal control in terms of liquidity to avoid illiquid situation and bank run happened. For example, the banks can manage its working capital and hold more liquid assets on hand to enhance its liquidity. For working capital management, the banks can emphasize on minimizing its debtor collection periods and optimizing its creditor payment periods to increase liquidity. Meanwhile, the banks are encouraged to hold an adequate of liquidity buffer on hand. By doing this, the banks able to reduce their liquidity risk and able to survive if crisis happened.

1.3 General Objective

The general objective for this study is investigate the bank liquidity risk management and micro level variables. Namely, debtor collection period, creditor payment period and liquidity buffer.

1.3.1 Specific Objectives

1. To examine the long run relationship between banks' liquidity risk management and micro level variables. Namely, debtor collection period, creditor payment period and liquidity buffer.
2. To investigate the integration between banks' liquidity risk management and micro level variables. Namely, debtor collection period, creditor payment period and liquidity buffer.
3. To investigate the short run respond between banks' liquidity risk management and micro level variables. Namely, debtor collection period, creditor payment period and liquidity buffer.

1.4 Specific Questions

1. What is the long run relationship between the banks' liquidity risk management and micro level variables including debtor collection period, creditor payment period and liquidity buffer?
2. What is the integration between the banks' liquidity risk management and micro level variables including debtor collection period, creditor payment period and liquidity buffer?
3. What is the short run relationship between the banks' liquidity risk management and micro level variables including debtor collection period, creditor payment period and liquidity buffer?

1.5 Research Significance

The finding of this study will contribute to the important subject of banking liquidity risk management method. Specifically, this study will explain the extent to the risk model used by the bank in measuring liquidity risk of banks. Therefore, this study is crucial for the assessment of the liquidity risk level understanding and liquidity risk management in banks. Meanwhile, this study will provide the main direction of banking risk management improvement for risk assessment. The research perspective will identify the role of liquidity as a useful tool to mitigate the risk. The study will also be important to the commercial bank that will be able to understand the risk management practices that contribute to financial stability and financial performance of commercial banks and ensure that they undertake acceptable banking practices and procedures.

Additionally, this study also develops the understanding on the ways liquidity holdings can contribute to financial stability that are complementary to capital. Through this study, it does provide the view on the importance of the bank to keep sufficient liquidity to withstand all types of unexpected events that might happen in the future. Therefore, the analysis of liquidity risk management framework and the role of liquidity is a crucial supervisory action that will ensure the proper functioning and management of the bank and the financial stability of the bank. Based on Bank Negara Malaysia (n.d.), the stability of the financial system is crucial for economic development as it enables the funds can be efficient and effectively allocated between the supplier and demanders of funds. Moreover, this study that allows the banking institutions to more understand the effective way in managing risks enable them better cope with the uncertainty which will also contribute to society. This is because the survival of banking institutions able to guard against the deposits of depositors and continue to provide financial services to the people.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

In chapter 2 which is literature review, the review of various journal articles on the bank risk management method will be presented. For example, the description, evaluation, summary of the journals from different researchers will be discussed. The literature review can be classified into few parts such as review of the variables and theoretical framework. In the review of variables, the definition and the linkage of the dependent variables and independent variables will be shown. The review of the past studies also will be included in this section to show the perspectives from different researchers towards the relationship between the variables. There are different results and analysis by using the different methods, countries, and period for the samples. Moreover, the existing theory will be conveyed and used to support the viewpoint of the researchers in the theoretical framework. The theory will include the relationship between the explained variable and explanatory variables, which able to be evaluated critically and will become strengthened.

2.1 Review of Variables

The variable can be classified into dependent variable and three independent variables. The dependent variable is liquidity risk while the three independent variables are debtor collection period, creditor payment period and liquidity buffer. The definition of these variable will be shown to enhance a better understanding. From the previous research, the relationship between the dependent variable with the three independent variables can be proven with some explanations or elaborations.

2.1.1 How the banks determine and identify Liquidity Risk?

Liquidity refers to the ability of the organizations whether they can convert the asset or security quickly when meeting financial obligations. A good liquidity ratio means that the firm or the financial institutions able to trade quickly when doing investment or deal with obligations. When there is liquidity risk, it means the liquidity is not performed well, hence the asset or security having the issue that cannot convert quickly or cannot find another marketer to do an exchange transaction when needed. A firm will face liquidity risk when it has some issue in the declining liquidity. The credit rating of the firm might also affect, for the liquidity risk is one of the problems of the firm. Liquidity risk is essential for every financial institution to measure and avoid as it will reflect the ability of the firms including the ability to control all the marketers or parties, and also reach to difficultly in managing their assets.

There are several considerations of banks to meet the liquidity. Firstly, the obligation of the bank should be considered. The common obligations include the deposit or fund that was put in the bank, some granted loan and some specific loans with the central bank. Hence, the liquidity here refers to the ability of the bank to generate funds to meet the loan payment or issue the withdrawal to the public. If the bank's fund or asset is greater than the obligations or liability, showing that the bank escaped from liquidity risk. This is because the bank having the enough asset to cover or pay the fund to public. Liquidity risk occurs when the imbalance or downward of the balance sheet, thus if the bank liabilities more than asset, the liquidity risk are higher. However, in the bank institution, the measurement or the degree of the liquidity is differ with the business firm. They need to allocate some funds which cannot easily trade to cash. Other than that, they also need to allocate some funds for the withdrawal.

Liquidity risk usually can be determined and predicted by the liquidity ratio. There is no specific reason that caused the bank to occur liquidity risk, it can have several impacts or causes related to liquidity risk. Those include the failure in control of the cash flow, failure in the business performance, unexpected changes in the financial market or industries and others.

2.1.2 What is the relationship between Debtor Collection Period and Liquidity Risk?

Current assets are important in looking at firm liquidity and profitability. It includes cash, inventory, receivables and so on. In order to analyse the working capital with liquidity risk debtor collection period is used as one of the variables in this study. It is also a component in the Cash Conversion Cycle. Therefore, Das (2015) stated that Cash Conversion Cycle (CCC) is the length of time between the purchase of raw materials and debtor's collection. It is a useful tool to measure the efficiency of liquidity management because it compares the difference of the length of time between cash payment for purchase and debtors' collection. Thus, when the Cash Conversion Cycle is reduced, the company will be in profit and more liquid. However, there are also studies mentioning that longer the time in Cash Conversion Cycle will also increase in sales and company performance (Akindele & Odusina, 2015).

Debtor collection periods can be defined as the length of time needed to receive cash from the borrowers. This will aid the banks to know whether they manage or not to cover back the lending funds or cash outflow. It is important as insufficient of cash will cause liquidity risk to the bank or any industry. According to the research that studied nine quoted commercial banks in Kenya from year 2002 until 2011, the more the time used to collect back the debt, the less the liquidity of a firm, while the less the time used to collect back the debt, the more liquidity of a firm. It is a positive relationship between debtor collection period and liquidity risk.

Therefore, the lesser time used to collect debt will be better for the bank to mitigate the liquidity risk.

There are many factors affecting the cash flow in the study. One of the factors which is the debtor collection period has a negative relationship between the cash flow in the bank in Ghana. In other words, the lesser time for debtor collection period, the better the cash flow which brings better liquidity to the banks (Yeboah, & Agyei, 2012). In another study which used Pakistani firms on Karachi Stock Exchange in 1999 until 2004 to identify the relationship. Pearson's correlation, and regression analysis (Pooled least square, general least square and cross section weight models) are used in this study to analyse the data. It shows that there is a significant relationship on debtor collection period on liquidity and profitability (Raheman, & Nasr, 2007). Besides that, there is also a study that was conducted on listed companies in the Vietnam financial market in 2006 until 2008. Multiple Regression Analysis and Correlation Analysis are used in this study. The data shows that the collection period and profitability are negative relationships, this indicates that it indirectly affects the liquidity in the firms (Dong, & Su, 2010).

This journal used Multiple regression and correlation analyses to analyse the average collection period with profitability and shows a negative relationship on it. The data study on the manufacturing firms listed on the Nairobi Securities Exchange. The result is same as the study done by Deloof (2003) which shows an inverse relationship between the two variables on the company in Belgian. Furthermore, the research from Chisti (2013) which also studies the effect of average collection period with liquidity and profitability. The data collected from listed Indian companies in 2006 until 2011. The result is similar as the variable has a significant relationship. Therefore, this proves that the time for collecting from the debtor shorter, the company has better cash inflows. Thus, this will provide better profit to the company (Nzioki, Kimeli, Riwo Abudho, & Nthiwa, 2013).

2.1.3 What is the relationship between Credit Payment Period and Liquidity Risk?

The Cash Conversion Cycle is a liquidity measure of the bank and it does give the further estimation into the liquidity of the bank. Based on the study of Stojanovic (2014) that was conducted in selected Croatian companies, the reasons of weakening the Cash Conversion Cycle is declining inventory and receivables management and raising the credit payment period. It also found that the companies had decreasing Cash Conversion Cycle issues with the net working capital management.

Credit payment period is defined as an efficiency measurement that estimate the average number of days a company used to settle with its suppliers or creditors. It can estimate how long the firm retain on its cash. It provides the meaning if the firm is having the greater credit payment period, the firm will delay the credit payment and conserve cash. The average credit payment period has a positive association between working capital management and performance of a firm.

Kimani, James, Nyangáu, Benson, Karungu, and Kirui (2014) stated there is a significant association between the average credit payment period and the liquidity risk of the bank. This can be seen from the analysis of the average credit payment period with the liquidity for nine NSE listed banks from 2002 to 2011 in Kenya. It shows when the creditors average payment period creates an upward trend, it raises the liquidity of the banks. In other words, if increasing in the length of credit payment period of bank to pay for loans, it aids in reducing the trouble with their cash and cash equivalent can be hold. Thus, it provides the better liquidity position for the commercial banks.

Deloof and Jegers(1996) had studied the relationship between the credit payment period and liquidity. It found that as the liquidity of a firm is negative, the inadequate cash will negatively affect the credit payment period. This indicates that

an excess of cash not invested in accounts receivable, but that a shortage of funds is reduced by lowering credit payment period. In contrast, when the liquidity of a firm is positive, the excess of cash can be used to decrease financing, or it can be invested in other current assets that can generate value. Additionally, they also argued that the longer the time lag, the greater the investment in working capital when using different methods to identify the time lag between the cost of sales and collection of finished goods sales.

Next, Wieczorek-Kosmala, Doś, Błach, and Gorczyńska (2016) conducted a study that examines the liquidity reserves on a sample of Polish public companies. The aim is to identify the field of working capital management that were associated with the magnitude of liquidity reserve and its attributes. By using the cash conversion cycle approach, they define liquidity reserve in terms of its time-suitability which shows the number of days a company may use the excessive cash in the case of delay in the operating cycle caused by risk occurrence. The result shows an increment of accounts payable will decline the demand on net working capital. Therefore, the time-suitability of liquidity reserves has a negative relationship with cash conversion factor.

2.1.4 What is the relationship between Liquidity Buffer and liquidity risk?

The liquidity buffer of banking institutions can be defined as a buffer of liquid assets that should be held or managed by the banking institutions to meet the obligations or any outflows of cash; thus, the banks are able to continue its operation as normal. The liquidity buffer of the banks can be computed by using the ratio of liquid assets to deposits. The liquid assets will include the cash and the most liquid assets such as the claims on other banks in short term and government bonds, while the deposits can be the interbank deposits in short-term and customer deposits.

There is a significant association between the liquidity buffer and liquidity risk of the banking institutions that is supported by the inventory theory of capital and liquidity buffer. The holding of an adequate liquidity buffer plays a significant role in helping the banks to reduce the liquidity risk by preventing them running out of cash. The Basel Committee on Bank Supervision (BSBC) that comes out the capital rule and requires the banking institutions to maintain a certain level of the capital reserve to avoid the liquidity problem has also provided support to the relationship between the liquidity buffer and liquidity risk.

According to Singh and Sharma (2016), there is a negative relationship between the adequacy of liquidity buffer and liquidity risk. It is important for the banks to hold a liquidity buffer sufficiently to ensure their financial stability and to prevent the liquidity risk. This statement also has been supported by Basel Committee on Bank Supervision (BSBC) that introduced a new rule in capital to ensure enough capital reserves kept by the banks to avoid the liquidity risk and solvency problem. For example, the banks in India that have maintained sufficient buffers of liquid assets shows that they are less likely to be affected by the raising of funding costs since they are being insured by the liquidity buffer.

According to Bianchi and Bigio (2014), the banks that keep sufficient government bonds and reserve buffers in advance able to mitigate the liquidity risk. This is because the banks will always issue the demand deposits to finance their loans. Thus, it is essential for the banks to have enough liquidity buffer to cope with the uncertainty of large withdrawals as the loans are assets that are illiquid. Otherwise, the banks will incur high liquidity risk and will borrow the money from the central banks or other banks that charged a higher discount rate and interbank rate. This is costly for the banks and incurs the unnecessary losses because they do not have sufficient liquidity buffer. Based on Bindseil and Lamoot (2011), the liquidity buffer is negatively associated with the liquidity risk. The banks able to survive even if they have large cash outflows by having a sufficient liquidity buffer that able to absorb the liquidity shock. This is due to the liquidity buffer preventing the banks from suffering the situation of fire sale.

Moreover, according to Bonner, Van Lelyveld and Zymek (2015), the banks able to manage their liquidity risk by holding the liquidity buffer. In addition, the negative association between the liquidity buffer and liquidity risk also supported by Centralny (2012). The research shows that banks will align the investors' interest with their incentives if they hold the liquidity buffer and their risk-taking's incentives will be reduced. Furthermore, the costs of liquidation will be reduced since they have enough liquid assets to meet the early withdrawals by depositors. As a result, the situation of financial contagion and fire-sale externalities can be avoided. In short, the banks that have adequate buffers of liquid assets able to reduce their liquidity risk in funding. To sum it up, there is a negative relationship between the liquidity buffer and the liquidity risks.

2.2 Theoretical Framework

The theories that related to the topic are cash conversion cycle and inventory theory of capital and liquidity buffer. These theories will explain the relationship between the explained and explanatory variables. Next, the cash conversion cycle will explain the relationship between the liquidity risk and two explanatory variables which are debtor collection period and creditor payment period. Meanwhile, the inventory theory of capital and liquidity buffer will present the relationship between the liquidity risk and liquidity buffer.

2.2.1 Cash Conversion Cycle (Debtor Collection Period)

Profitability and liquidity are linked together or will be affected by each other (Kimani, Nyangáu, Karungu, & Kirui, 2014). From the study of Chisti (2013), the company will face bankruptcy if the liquidity is not concerned by the company. The

company also cannot sustain itself in the long term if there is no concern in profit either. The collection period does help in considering this problem as it affects the liquidity and profitability. According to Filbeck and Krueger (2005), the better the ability of a financial manager that can manage the receivables, inventory and payables well are able to help the business to success. This is because the firm will not be involved in liquidity risk when they have sufficient funds. However, higher sales will earn profit but does not always show liquidity because there are no changes in cash flow as there might be higher credit sales given to the customer which shows the profit.

In addition, a company may need enough working capital to manage the firm effectively. The impact is huge if working capital did not work well because working capital is crucial for the company having enough money to meet their short-term goals. Therefore, the study is conducted to review the profitability and liquidity of Pakistani companies. It also shows that the liquidity and average collection period are negative in relationships. Therefore, it indicates that a firm that takes lesser time to collect back their money will show the better liquidity and profit will raise (Usama, 2012). However, some companies will not consider on the liquidity problem until the issue occurs and almost cause insolvency (Eljelly, 2004).

2.2.2 Cash Conversion Cycle (Credit Payment Period)

Shajahan, Umayya S. and Suganya (2017) stated the account payable period has a significant impact on the firm performance. The study suggested that paying creditors longer and decreasing the collecting payments period from debtors, and keeping inventory in less time, are all related to an increase in the firm's performance. It shows that working capital management is crucial because it focuses on the maintenance of a sufficient balance between current assets and liabilities of a firm. An efficient working capital management system can aid in identifying areas that require concentrate on maintaining liquidity and profitability.

In short, the account payable period negatively affected the liquidity risk of the firm in the study.

Meanwhile, Mathuva (2010) stated that the higher the average payment period will lead to the higher profitability and lower liquidity risk. The study suggests that when the number of days account payable increased by 1 day, it will create the upwards trend for profitability. It indicates that the bank can reserve their payment to creditors to utilize the benefit of cash available for their working capital needs. Besides, it does reflect that if the longer the length of the bank to repay their credit payment, the higher level of the working capital it reserves and uses to raise up the profitability. Furthermore, Wieczorek-Kosmala, Doś, Błach, and Gorczyńska (2016) stated that the working capital management and liquidity risk has the association. They suggest that the more the volume of working capital, lesser liquidity risk; working capital management shows the issue of the demand on net working capital which is crucial while seeking the needs for 'operating cash' in a company. Cash conversion cycle is the important for the company to calculate how long a company require funding for its operating activities other than accounts payable.

Additionally, the theoretical study of working capital management holds that the liquidity and profitability of a firm has a negative relationship. Efficient working capital management occurs an issue of reconciling the conflicting between the demands of liquidity and profitability. Atseye, Ugwu and Takon (2015) stated that to enhance the profitability of a firm, the firm should decrease the credit payment period for paying purchases of raw materials. Therefore, the Cash Conversion Cycle should be increased and the amount of time business takes to pay will be less to balance the relationship between the waiting period to pay your credit and maintaining your supplier or creditor relationships.

2.2.3 Inventory theory of capital and liquidity buffer (Liquidity Buffer)

According to Sheefeni (2016), the inventory theory of capital and liquidity buffer indicates that the opportunity cost of keeping the short-term asset that is liquid has to be reflected in the liquidity buffer's size instead of the loans and fundraising cost during a short period of time. Besides, the liquidity buffer sizes should consider the allocation of liquidity shock that may be suffered by the banking institutions. In fact, the fundraising costs and the volatility level in the funding process should positively affect the liquidity buffer's size. This is because the adequate liquidity buffer plays a significant role in helping the banking institutions to better manage its liquidity risk and prevent the liquidity shock. The adequate liquidity buffer will assist the banks to have enough cash on hand when the large sudden withdrawals by depositors happen and reduce the risk of bank run.

The inventory theory of capital and liquidity buffer also has been supported by Kochubey and Kowalczyk (2014). The commercial bank that holds enough buffer of liquid assets obviously will make huge contributions to the sustainability of the banks by reducing the costs. This is due to the banks will face the liquidity shortage issue when the reserves of the bank are less than the withdrawal amounts by depositors. Consequently, the banks may incur premium costs because of the excess withdrawal of depositors as the commercial banks may need to engage in the trade that is not beneficial for them. For example, they may need to sell off their investment or asset in capital loss and increase its current liabilities to solve the liquidity problem. Thus, the inventory theory of capital and liquidity buffer specified that there is a strong association between liquidity buffer and the liquidity risk.

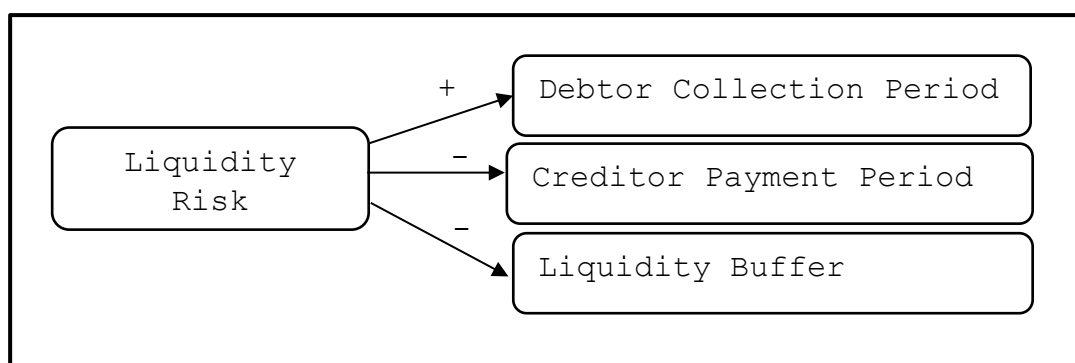
Based on Mugenyah (2015), the relationship between the liquidity buffer and bank liquidity risk has been proven by the inventory theory of capital and liquidity buffer. Although holding the liquidity buffer seems costly from the banks and will reduce their profitability, it is helpful for them to avoid the risk of running out of cash.

When the banks hold adequate buffers of liquid, they can achieve the two significant objectives which are to maximize the profits and to minimize the liquidity risks. It is crucial for the banks to well-manage the balance sheet structure and hold a liquidity buffer to mitigate the liquidity risk by reducing the assets and liabilities' maturity gap. This is because the banks will always transform the liquid assets into illiquid liabilities such as investing in the illiquid loans with the deposits in a short-term period. Nevertheless, this is a challenge for the banks to sell off the loans in a short period if any large sudden deposit withdrawals happen. If the banks do not have an adequate liquidity buffer to insure against the liquidity risk, they may suffer and incur a greater loss.

2.3 Conceptual Framework

As shown in Figure 2.4.1, the relationship between the research variables able to be identified. It can be observed that debtor collection period will positively affect the liquidity risk while the creditor payment period and liquidity buffer will inversely affect the liquidity risk.

Figure 2.3 Conceptual Framework of Research Variables



Note. + represent positive relationship while - represent negative relationship.

CHAPTER 3: RESEARCH METHOD

3.0 Introduction

During this chapter, the research method regarding the bank risk management method will be introduced. Firstly, the research framework, which is the Panel Vector Autoregression (PVAR) methodology to measure the dependent variables of liquidity risk. Next, the scope of studies revealed the area that was conducted in the studies. Those have included the types of data, year period and countries involved in the research. Besides that, the research explains the measurement of variables and data collection method for each variable which in the scope of studies.

This study is crucial for the assessment of the liquidity risk level understanding and liquidity risk management in banks and it does provide the main direction for the banking risk management and its improvement. The study will concentrate on investigating the relationship between the working capital management and liquidity buffer and the liquidity risk of the banks. To conduct the study, panel data will be collected since it is joining both of the cross-sectional and time series data. Panel data can detect the dynamic changes of the variables over time and have more informative data. Besides, the variables will be less collinear among each other and more efficient than the other data such as cross-sectional data and time series data able to minimize the bias.

All the variables under PVAR will be treated as endogenous variables since it associates with the traditional VAR approach and can be used to determine dynamic interactions. Moreover, by using panel data approach, the model allows the unobserved individual heterogeneity. The function of the impulse-response functions is explaining the effect of innovation between one variable to another variable in the system, holding there is no shock. Besides, the long run relationship

between the variables can be presented by the generalized method of moments (GMM).

3.1 Scope of Study

This study including the samples of 59 banks in 13 countries that exporting oil such as Algeria, Gabon, Qatar, Norway, Russia, Iraq, Saudi Arabia, UAE, Malaysia, Nigeria, Canada, Kuwait, and United States as cross-sectional data. Meanwhile, the time series data is within the period 2014 and 2018. This study has 3 explanatory variables which are debtor collection period, creditor payment period and liquidity buffer as well as an explained variable which is liquidity risk of banks.

Table 3.1. *Data sources*

Variables	Proxy	Unit Measurement	Sources
Liquidity Risk	Ratio of the liquid asset to total asset	Ratio	Bloomberg
Debtors Collection Period	Ratio of the loan of the banks to net income	Years	Bloomberg
Creditors Payment Period	Ratio of total deposits to cost of Sales	Years	Bloomberg
Liquidity Buffer	Ratio of liquid asset to total deposits and short-term funding	Ratio	Bloomberg

Note. The 13 countries act as the sample is including Algeria, Gabon, Qatar, Norway, Russia, Iraq, Saudi Arabia, UAE, Malaysia, Nigeria, Canada, Kuwait, and United States.

3.2 Research Framework

Research framework adopted by Kimani, Nyangáu, Karungu and Kirui (2014).

The linear regression model is specified as below:

$$LR = f(DCP, CPP, LB)$$

$$LR = \beta_0\alpha + \beta_1DCP_{it} + \beta_2CPP_{it} + \beta_3LB_{it} + \varepsilon_{it}$$

(Equation 1)

Where:

LR = Liquidity Risk

DCP= Debtors Collection Period

CPP= Creditors Payment Period

LB= Liquidity Buffer

β_0 = Intercept constant

β_1, β_2 & β_3 = Partial regression coefficients of the slope of the regression line of the independent variables 1 to 3. They show the correspondence between the independent and dependent variables

ε = error term

The PVAR model will be used to include the data. It has included 295 of observations and 5 years of data. Generalized Method of Moments (GMM) can be used in our model.

$$\begin{pmatrix} y_{it} \\ DCP_{it} \\ CPP_{it} \\ LB_{it} \end{pmatrix} = \begin{pmatrix} DCP_{it} & CPP_{it} & LB_{it} \\ y_{it} & CPP_{it} & LB_{it} \\ DCP_{it} & y_{it} & LB_{it} \\ DCP_{it} & CPP_{it} & y_{it} \end{pmatrix} \begin{pmatrix} \beta_{11} \\ \beta_{12} \\ \beta_{13} \end{pmatrix} + \dots +$$

$$\begin{pmatrix} DCP_{it-n} & CPP_{it-n} & LB_{it-n} \\ y_{it-n} & CPP_{it-n} & LB_{it-n} \\ DCP_{it-n} & y_{it-n} & LB_{it-n} \\ DCP_{it-n} & CPP_{it-n} & y_{it-n} \end{pmatrix} \begin{pmatrix} \beta_{14} \\ \beta_{15} \\ \beta_{16} \end{pmatrix} + \begin{pmatrix} \alpha_{it} \\ \alpha_{it} \\ \alpha_{it} \\ \alpha_{it} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1it} \\ \varepsilon_{2it} \\ \varepsilon_{3it} \\ \varepsilon_{4it} \end{pmatrix}$$

(Equation 2)

α and β = unknown coefficient

In the case to solve the issue of endogeneity issue in PVAR, GMM model can use the equation shown as above. Since it is difficult to interpret the coefficient of the PVAR, thus the variance decomposition and impulse-response functions will be created in order to determine the response and the effect of the variables. Furthermore, the individual effects can be removed by Helmert Transformation or called as Forward Orthogonal Deviation (FOD).

Helmert Transformation:

$$LR_{it}^* = \alpha_1 LR_{it-1}^* + \alpha_2 DCP_{it-1}^* + \alpha_3 CPP_{it-1}^* + \alpha_4 LB_{it-1}^*$$

$$m_{it}^* = (m_{it} - \bar{m}_{it}) \sqrt{T_{it} / (T_{it} + 1)}$$

(Equation 3)

\bar{m} = average of all variable observation, T_{it} = total of number variable observations

Table 3.2. *Expected relationship between variables*

Explanatory variables	Relationship with Liquidity Risk
Debtors Collection Period	Positive

Creditors Payment Period	Negative
Liquidity Buffer	Negative

The dependent variables of liquidity risk can use the liquidity ratio as the measurement. Liquid Asset to Total Asset Ratio is the effective and quickly way to know the liquidity status of the bank. This ratio also provides the measurement regarding on their ability in liquidity status when demand for cash (Sathyamoorthi, Mapharing & Dzimiri,2020). The liquidity higher means that the liquidity risk will lower, since the bank having enough liquidity asset and ability when demand for cash, hence lower their liquidity risk.

3.2.1 Unit Root Test

The unit root test will apply Fisher Augmented Dickey Fuller Test (Fisher ADF), Fisher Phillips, Perron (Fisher PP) Test and Im, Pesaran, Shin (IPS) Test. The reason for using Fisher ADF test as it will involve those delayed values of dependent variables, as well as considering the autocorrelation issues. Fisher PP test can be called a revised version of the ADF test since it takes more consideration. Fisher ADF and Fisher PP is considered as a singular unit root test since they calculated separately for each country meanwhile IPS test is suitable for panel unit root test. Different with ADF, IPS consider all panel unit root tests and the average score of panel members (Firat,2016).

3.2.2 Lag Order Selection

By reviewing the past studies of panel data models, the panel data can be estimated by using the Generalized Method of Moments (GMM). GMM can help to choose the correct model and specification, as well as maintain the consistency. According to Andrew and Lu (1999), they suggested Model and Moment Selection Criteria (MMSC) to complete the GMM estimation. Bayesian Information Criteria (BIC), Akaike Information Criteria (AIC), and Hannan Quinn Information Criteria (HQIC) is the preferable selection method in MMSC. MMSC is based on J test statistics and can help to reduce the over-identifying problem. For the lag order selection, the minimum of MAIC, MBIC and MHQIC will be chosen as the optimal lag order selection.

3.2.3 PVAR Estimation

First and foremost, identify the lag order of endogenous variables and lag value of endogenous variables as variables to estimate to construct the PVAR model. The optimal lag order of PVAR model is determined. The PVAR lag order minimizes the above c is recognized as the optimal lag order. The results show that first-order values are the smallest among all the statistical values of the criteria. Therefore, the first-order value is chosen as the suitable lag order to construct the PVAR model.

After that, to estimate this, the over-identifying restriction test was run to ensure that the H_0 is not rejected in order to prove that the variables in the PVAR model is not overidentify when using Hansen's $J\ chi^2$ to test it. Thus, the estimation is valid in the model if it is overidentified.

3.2.4 Granger Causality

The function of causality test is to analyze the causal relationship between the variables, also to check that if one time series variables is meaningful to predict the variables. (Wang, 2016) Granger causality is a recommended method in the research of econometric models. The characteristics of this test can take consideration of all interaction between variables during the period unit observation, and it also can show clear view regarding the causal chain of the variables (Oluwapelumi & Olaride, 2017). Granger Causality Wald test can help to find the causality between the variables. For the hypothesis test, when probability value is lower than any α level, thus the null hypothesis will be rejected (Wang, 2016).

The hypothesis shown as below:

H₀: Excluded variable does not granger-cause equation variable

H₁: Excluded variable granger-causes equation variable

3.2.5 PVAR Impulse Response-Functions

In the research study, it will concentrate on impulse response-functions for estimated panel VAR model, which indicates the effect of one variable in the system to the innovations in another variable in the system, holding there is no shock. It is constructed from the estimated VAR coefficients and the standard errors. Additionally, the impulse variables must be listed and specified to introduce and evaluate the response for all exogenous variables. In the equation (4), the exogenous variables are in the autoregressive structure of the panel VAR to preserve generality. Based on Hamilton (1994), he stated that if every moduli of their companion matrices \bar{A} present value less than one, it can produce the stable VAR models. Each companion matrix is computed by:

$$\bar{A} = \begin{bmatrix} A_1 & A_2 & \cdots & A_p & A_{p-1} \\ I_k & 0_k & \cdots & 0_k & 0_k \\ 0_k & 0_k & \cdots & 0_k & 0_k \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ 0_k & 0_k & \cdots & I_k & 0_k \end{bmatrix}$$

(Equation 4)

The panel VAR able to have vector moving-average (VMA) representation and reversible if the VAR model is stable. Besides, Panel VAR can present the estimated impulse-response functions (IRF) and the forecast-error variance decompositions. The model could be revised as an infinite vector moving-average (VMA), to evaluate a simple impulse-response function ϕ_i , ϕ_i refer to parameters of VMA.

$$\phi_i = \begin{cases} I_k, i = 0 \\ \sum_{j=1}^i \phi_{t-j} A_j, i = 1, 2, \dots \end{cases}$$

(Equation 5)

Simple IRFs will not come out with the causal interpretation. Another shock on variable will be induced by a variable shock because of the correlation of e_{it} that happen in identical moment. By giving that matrix P, the orthogonalized impulse responses $P\phi_i$ will be transformed from $P'P=\Sigma$, VMA parameters by inducing P to orthogonalize the innovations as $e_{it}P - 1$. The system of dynamic equations can apply the identification of restrictions effectively by using matrix P (Abrigo & Love, 2015).

The Cholesky decomposition of Σ is adhere to the variables' order in Σ is not particular, but the function can be employed in applying about repetitive structure on a VAR (Sims, 1980).

3.2.6 Panel Variance Decomposition

In this research study, the variance decomposition is presented to explain the degree of the overall effect of a shock, providing the movement proportion of one variable can be explained the shock to another variable over time. Additionally, the stimulation of the standard deviation and confidence interval and the variance decomposition of the prediction error of the impulse response equation is to generate the variance analysis result and the impulse response function diagram.

Here shows the equation:

$$Y_{it+h} - E[Y_{it+h}] = \sum_{i=0}^{h-1} e_{i(t+h-i)} \Phi_i$$

(Equation 6)

Where, Y_{it+h} is the observed vector at time $t+h$ while $E[Y_{it+h}]$ indicates the h -step before estimated vector constructed during time t . The matrix P can be used to orthogonalize the shocks, thus I_k can be covariance matrix of the orthogonalized shocks $e_{it}P^{-1}$. The estimated-error variance will have the disintegration in the direct way of the because of the process of orthogonalization. At the same time, matrix P enables the contribution separation for every factor to the variance of estimated-error. The impact of a certain factor on the estimated-error variance of factor contribution can be gained through the formula below:

$$\sum_{i=0}^{h-1} \theta^2 mn = \sum_{i=1}^{h-1} (i'_n P \Phi_i i_m)^2$$

(Equation 7)

Where, I_s is s-th column of I_k . However, the impacts are generally normalized depends on the estimated-error variance in the reality (Abrigo & Love, 2015).

$$\sum_{i=0}^{h-1} \theta_{.n}^2 = \sum_{i=1}^{h-1} i'_{.n} \Phi_i' \Sigma \Phi_i i_n$$

(Equation 8)

3.3 Diagnostic Checking

3.3.1 Over- Identifying Restriction

The over-identifying restriction is very crucial in the statistical test as it can help to check the validity of the moment conditions. The test of validity of moments is not required to apply if the model is already recognized completely. The researcher has to conduct an over-identifying test in order to test the validness status of moment conditions, in case if the model is over identified. (Parente, Silva,2012) In the GMM model, Hansen J-test can be employed to test the over identification restriction and to ensure the model validly exogenous. The test will consist of x^2 along with the degree of freedom L-K (L represents number of instruments, meanwhile K represent number of endogenous regressors. If the value lower than significance level, the null hypothesis needs to be rejected since it means the moment conditions is invalid (Baum, Schaffer, & Stillman,2003).

The hypothesis will be shown as below:

H_0 = All instruments are validly exogeneous

H_1 = All instruments are invalidly exogeneous

3.3.2 PVAR Stability

PVAR stability test is crucial when conducting on PVAR model because it indicates that the model is reversible and has an infinite-order VMA indicator for the stimulation of impulse-response function and the variance decomposition, which indicating the direction of the overall effect of a liquidity risk, providing the proportion of the movement in one variable explained by the liquidity risk to another variable over time. Besides, it could show the model is stable if all the characteristic roots of the model fall within the unit circle and all the moduli are strictly less than one.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

This chapter is primarily presenting the Panel VAR result and the analysis for the results to support the research question about the relationship between the research variables. First and foremost, this chapter will include the result of panel unit root test to prove the research variables are stationary variables. Moreover, the PVAR tests such as lag order selection, granger causality test, impulse-response functions as well as panel variance decomposition will be shown. At the end, the diagnostic tests of the variable such as Hansen's J test and PVAR stability test will be conducted and presented. All the PVAR result are using the same sample size which is 295 observation including 59 banks of oil exporting countries and 5 years from year 2014 to 2018.

4.1 Panel Unit Root Test

Table 4.1. *Result of Panel Unit Root Test*

	Fisher-ADF		Fisher- PP		Im-Pesaran-Shin	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend	Intercept	Intercept and Trend
Level						
LR	152.787**	147.777**	154.131**	164.751***	-0.5135	-0.6582
DCP	319.678***	259.288***	348.592***	322.473***	-	-
CPP	215.851***	177.273***	228.086***	261.198***	41.5817***	19.5299***
LB	179.778***	149.274**	168.148***	151.082**	-	-
					4.91014***	1.70178***
					-2.06209**	-0.7604
First difference						

LR	363.213***	287.853***	427.721***	502.559***	-	-
DCP	459.397***	330.399***	613.377***	555.612***	10.9843***	4.26604***
CPP	344.658***	275.912***	470.794**	451.827***	36.9209***	15.7788***
LB	365.603***	273.185***	416.457***	494.869***	-11.534***	4.54527***
					11.0764***	3.91243***

Note. *, ** and *** presents the rejection of null hypothesis of unit root at significance level of 10%, 5% and 1% respectively. The maximum lag length of ADF and KPSS were chosen according to Akaike Information Crite (AIC) while PP was chosen according to Newey-West automatic bandwidth selection and Bartlett kernel.

As shown in Table 4.1, the panel unit root test has been run by three individual root test types which are Fisher- Augmented Dickey–Fuller test (Fisher-ADF), Fisher-Phillips–Perron test (Fisher-PP) and Im-Pesaran-Shin. The unit root has been tested in level form and first difference form with trend and without trend. The overall result indicates that the null hypothesis of unit root for all variables will be rejected at significance level of 1%, 5% and 10%. This means that all research variables including liquidity risk (LR), debtor collection period (DCP), creditor payment period (CPP) and liquidity buffer (LB) are stationary variables.

4.2 Lag Order Selection

Table 4.2. *Result of PVAR Lag Order*

lag	MBIC	MAIC	MQIC
1	-216.2721	-39.29733	-110.1625
2	-146.9497	-28.96647	-76.20989
3	-84.0814	-25.0898	-48.71151
4	-	-	-

In order to determine the optimal lag order, a PVAR Lag Order has been run. Refer to Table 4.2, the result shows that all selection criteria which are AIC, BIC and HQIC are at minimum at lag 1. This indicates that the lag 1 is the optimal lag order that can be employed to run the panel VAR model. Due to the large sample size, AIC will be followed to reduce the biasness in the results. Hence, lag 1 is the lag order will be used in this research.

4.3 Panel VAR results

Table 4.3. *Result of PVAR Coefficient*

	lr	dcp	cpp	lb
lr	0.7613***	-0.0123***	0.0068***	0.0414***
dcp	3836.4400***	-0.3341***	-0.0141	-1259.581***
ccp	535.9823***	-0.0297***	0.0633***	686.8333***
lb	0.7877***	-0.0291***	0.001	0.2810***

Hansen's J $\chi^2(48) = 56.702674$ ($p = 0.182$)

Note. *, ** and *** presents the variables have a significant relationship at significance level of 10%, 5% and 1% respectively.

As shown in the Table 4.3, the debtor collection period (DCP), creditor payment period (CPP) and liquidity buffer (LB) are significantly affected the dependent variable which is liquidity risk (LR) in long run. This is because the null hypothesis of insignificant relationship between the variables was rejected as the p-values are less than the α at 1%, 5% and 10%. The debtor collection period has a positive impact in liquidity risk while creditor payment period and liquidity buffer have a negative impact in liquidity risk. Meanwhile, the result indicate that the liquidity risk has a negative impact in debtor collection period in long run. Moreover, the PVAR result shows that debtor collection period significantly affect the liquidity buffer in a negative direction.

In order to determine whether the instruments have been overidentified, a Hansen's J test has been conducted. According to the Table 4.3, the null hypothesis of instruments validity was not rejected at significance level of 1%, 5% and 10%. This indicates that all instruments used in this study are validly exogenous and instruments overidentification did not occurred.

4.4 Granger Causality Test

Table 4.4: *Result of Granger Causality Test*

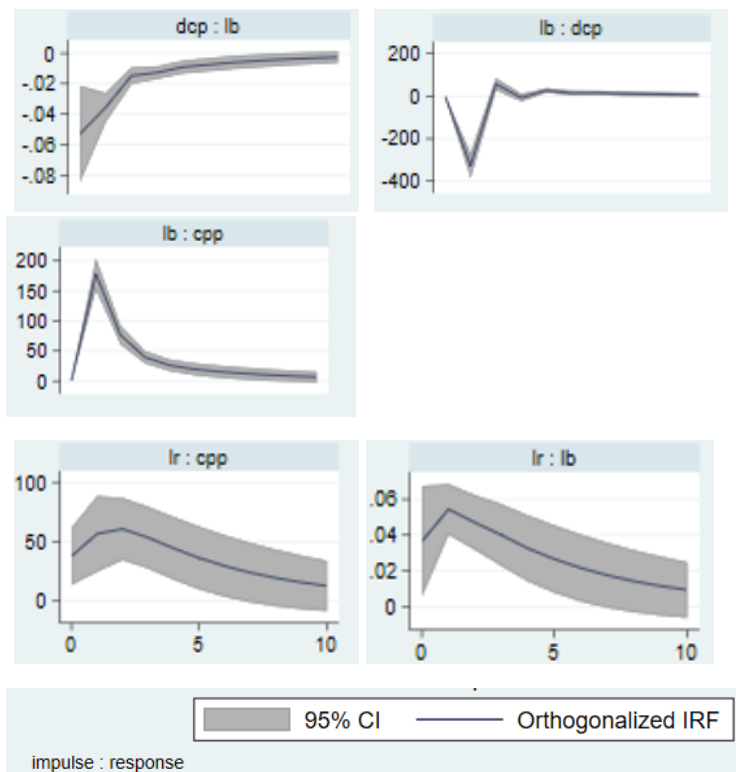
	lr	dcp	cpp	lb
lr	-	188.794***	7.558***	205.539***
dcp	307.417***	-	0.647	140.237***
cpp	7.831***	98.947***	-	241.242***
lb	85.076***	526.456***	1.292	-

Note: ***, **, and * denote statistical significance at confidence level of 1%, 5% and 10%.

Refer to the Table 4.4, granger causality test is performed to see the Granger cause between variables. The null hypothesis shows that the variables does not Granger cause the dependent variable. Therefore, the null hypothesis had to be rejected when p-value is less than 0.1. Based on the table above, there is granger cause between the variables. The results show that there are suggest bi-directional causality between liquidity risk and debtor collection period; liquidity risk and creditor payment period; liquidity risk and liquidity buffer; liquidity buffer and debtor collection period. However, creditor payment period does not granger cause debtor collection period but debtor collection period granger cause creditor payment period. Moreover, liquidity buffer granger cause creditor payment period but creditor payment period does not granger cause liquidity buffer.

4.5 Impulse-Response Functions

Figure 4.5: *Response of debtor collection period, creditor payment period, liquidity buffer and liquidity risk.*



Based on the Figure 4.5, liquidity buffer negatively affects debtor collection period because when the banks decided to hold more liquid asset as buffer, they will reluctant to approve more loans to the customers and thus the debtor collection period will decrease. Furthermore, debtor collection period negatively affects liquidity buffer. Debtor collection period increase when many loans approve by the bank to the customer. Thus, the bank has lesser cash in hand which cause the liquidity buffer decrease. Moreover, when creditor payment period increase, the bank has longer time to pay back to the creditors, so liquidity buffer increases as the bank have more reserved to keep. In addition, creditor payment period negatively affects liquidity risk because when creditor payment period increase, the liquidity increase. This means that the bank has more cash in hand and liquidity risk decrease. Lastly, liquidity buffer negatively affects the liquidity risk. The bank has more cash in hand when liquidity buffer increase, so the bank is more liquid. Hence, the liquidity risk decrease.

4.6 Panel Variance Decomposition

Table 4.6: Result of Forecast-error variance decomposition

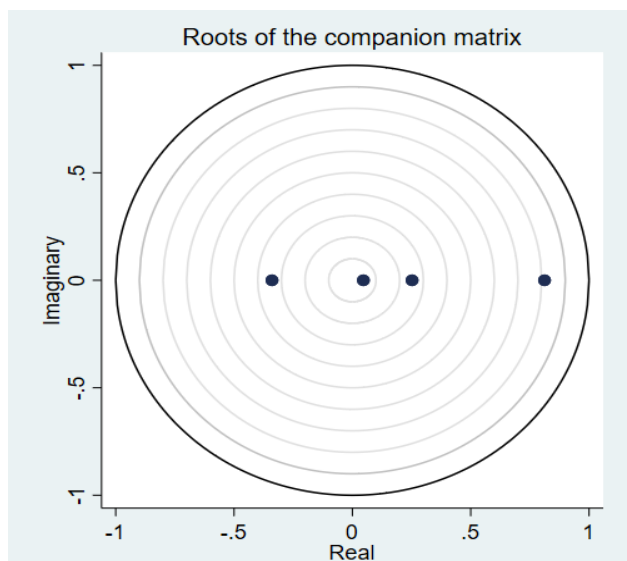
Response variable and Forecast horizon	Impulse variable			
	lr	dcp	cpp	lb
lr				
0	0	0	0	0
1	1	0	0	0
2	0.9541563	0.0216707	0.0038626	0.0203103
3	0.9120914	0.0265022	0.0086468	0.0527595
4	0.8893365	0.0304367	0.0110136	0.0692132
5	0.8758533	0.0322817	0.0124553	0.0794097
6	0.8679855	0.0334517	0.0132838	0.085279
7	0.863146	0.0341412	0.0137961	0.0889167
8	0.8601214	0.0345791	0.0141155	0.0911841
9	0.858191	0.0348565	0.0143195	0.0926331
10	0.8569466	0.0350358	0.014451	0.0935666
dcp				
0	0	0	0	0
1	0.0105684	0.9894316	0	0
2	0.044778	0.768416	0.0184669	0.1683443
3	0.0484516	0.7619194	0.0188908	0.1707382
4	0.0531731	0.7583821	0.0187666	0.1696783
5	0.0553289	0.755691	0.0188503	0.701297
6	0.0569333	0.7541716	0.0188538	0.1700412
7	0.0579204	0.7530908	0.0188737	0.170115
8	0.0585851	0.7524006	0.0188825	0.1701318
9	0.0590178	0.7519398	0.0188896	0.1701528
10	0.0593041	0.7516378	0.018894	0.1701642
cpp				
0	0	0	0	0
1	0.0361896	0.1691701	0.7946402	0
2	0.0558308	0.1265302	0.4355939	0.3820451
3	0.0882306	0.1207249	0.3918502	0.3991942
4	0.1125736	0.1179961	0.3743835	0.3950468
5	0.1286551	0.1162913	0.3645861	0.3904674
6	0.1390312	0.1152096	0.358556	0.3872032
7	0.1457234	0.1145131	0.3547212	0.3850423
8	0.1500628	0.1140622	0.3522456	0.3836294
9	0.1528904	0.1137684	0.3506347	0.3827065

	10	0.15474	0.1135763	0.3495814	0.3821023
lb	0	0	0	0	0
	1	0.0170558	0.0358049	0.0897551	0.8573842
	2	0.0485516	0.0459022	0.0867187	0.8188276
	3	0.0701339	0.0461272	0.0850556	0.7986833
	4	0.0851714	0.0466587	0.0837457	0.7844242
	5	0.0947857	0.0467672	0.0829266	0.7755206
	6	0.1010555	0.0468694	0.0823842	0.7696909
	7	0.1051201	0.0469215	0.0820341	0.7659244
	8	0.1077764	0.0469582	0.0818047	0.7634607
	9	0.1095149	0.0469812	0.0816547	0.7618492
	10	0.1106562	0.0469966	0.0815562	0.7607909

As shown in Table 4.6, the result shows that liquidity risk majority affected by itself with 100% of forecast-error variance in the 1-year horizon. Whereby, debtor collection period with 98.9% and creditor payment period with 79.5% of forecast-error variance in 1-year horizon has shown majority of debtor collection period and credit payment period affected by itself. The forecast-error variance liquidity buffer with 81.8% is also shows that majority of liquidity buffer affect by itself.

4.7 PVAR Stability Test

Figure 4.7 Result of PVAR Stability Test



A PVAR stability test has been conducted to determine the stability condition of PVAR model. As clearly shown in the Figure 4.7, all the characteristic values lie inside the unit circle. Thus, it can be concluded that condition of PVAR model in this study is considered as stable.

4.8 Interpretation of Major Findings

In fact, the significant relationship between the variables can be presented in long term effect and short-term effect. For long-term relationship, it has been presented in PVAR result while the short-term relationship has been shown in impulse response functions.

From the PVAR result, it clearly shown all of the explanatory variables which are debtor collection period, creditor payment period and liquidity buffer are significantly affect the dependent variable which is liquidity risk in long run. Besides, the liquidity risk also able to influence the independent variable in long run and there is an important long-term relationship between the explanatory variables itself.

First and foremost, the debtor collection period will significantly affect the liquidity risk in positive direction. This result has been proved by Sohail, Rasul and Fatima (2016), Kimani et al (2014) as well as Yeboah and Agyei (2012) who are stated that the liquidity risk of bank will be reduced if they able to use the shortest time in collection of cash from debtors. This is because the faster the banks in cash collection from debtors, the better the cash flows and the greater the banks' liquidity.

Moreover, the liquidity risk will be affected negatively by creditor payment period and liquidity buffers. As stated by Sohail et al (2016), Kimani et al (2014) as well as Mathuva (2010), the creditor payment period has a negative impact in liquidity risk because the longer the creditor payment period, the banks can keep more cash on hand and the lower the liquidity risk. This statement has been supported by

Wieczorek-Kosmala, Doś, Błach, and Gorczyńska (2016) who mentioned that the better the working capital management, the lower the liquidity risk. This means that when the creditor payment period increased, the Cash Conversion Cycle will be reduced which present good working capital management and the liquidity risk will be decreased.

In addition, the liquidity buffers will affect the liquidity risk negatively. This statement has been supported by many researchers which are Bindseil and Lamoot (2011), Centralny (2012), Bianchi and Bigio (2014), Bonner, Van Lelyveld and Zymek (2015), Singh and Sharma (2016) and so on. This is because the banks that have adequate liquidity buffer able to better cope with the uncertainty that required immediate cash outflows such as huge deposit withdrawal. This indicates that the greater the liquidity buffer hold by banks, the better the ability of banks to absorb liquidity shock and reduce the liquidity risk. Kochubey and Kowalczyk (2014) also mentioned that the liquidity risk of banks can be decreased when the liquidity buffer holds more than the depositor's withdrawal.

Apart from that, the liquidity risk can affect the debtor collection period inversely in long run has been supported by few researchers. For instances, Mora (2010) stated that the banks that experienced liquidity shock will have less intensive to offer loans and reluctant to introduce new lending program because of incapable of providing funds. This also has been supported by Lama (2018) who said that the banks that faced the funds shortage problem tend to reduce their loans offering. Moreover, Schiozer and de Freitas Oliveira (2016) as well as Dombret, Foos, Pliszka, and Schulz (2018) present that the higher the liquidity risk, the lower the loans volumes supplied by banks and eventually lead to the lower debtor collection period that presented by total loans over the net income ratio.

Meanwhile, the debtor collection period will affect the liquidity buffers negatively in long run. This statement has been supported by Calomiris, Heider and Hoerova (2015) as well as Hoerova, Mendicino, Nikolov, Schepens and Van den Heuvel (2018) who stated that the higher the loans liquidated to convert into cash will cause the decline of debtor collection period and enable the liquid assets such as cash to increase. Besides, as mentioned by Tran, Nguyen, Nguyen and Tran (2019), the

higher the loans for long term period being offered, the lower the cash on hand and the lower the liquidity buffer being reserved.

Based on the impulse response functions, the independent variables which are creditor payment period and liquidity buffer significantly affect the dependent variable liquidity risk in short run. In addition, there is a crucial short-term relationship between the explanatory variables itself. Firstly, the liquidity buffer will affect the debtor collection period negatively in short run. This statement has been supported by Kapan and Minoiu (2013) who stated that the banks with liquidity problem tend to hold more liquid buffer to solve the liquidity crisis. As a result, the loans offered of banks will decrease and lead to the decline of debtor collection period. Moreover, Alper, Binici, Demiralp, Kara and ÖZLÜ (2018) also stated that the banks with low liquidity buffer may use the amounts to lend money to public and cause the loans to raise and cause the debtor collection period to increase as well.

In addition, debtor collection period will affect liquidity buffers negatively. The study from Nzioki, Kimeli, Riwo Abudho, and Nthiwa (2013) shows lesser collection period will provide more profit to the firm and the firm is more liquid, so it has more cash in hand to keep as reserve. Thus, liquidity buffer was increased. Hoerova, Mendicino, Nikolov, Schepens and Van den Heuvel (2018) mentioned that the loans that are risky may cause the bank to take longer time to collect back the money, so debtor collection period tend to increase and the bank will have lesser liquid asset to hold which cause the liquidity buffer decrease.

Moreover, creditor payment period affects liquidity buffer positively to overcome the risk undertake by the bank. The bank with sufficient money able to cope with the risk when the depositor withdrew the money in once. When the amounts of deposits increase, the creditor payment period will also increase which means that the bank take longer time to pay back to customers (Calomiris, Heider and Hoerova, 2015). According to Lamberg and Vålming (2009). The bank delay in payment to the customer manage to keep more cash in hand which shows that longer time to pay the creditor, the bank will have higher liquidity buffer.

Apart from that, creditor payment period negatively affects the liquidity risk. According to Kimani, Nyangáu, Karungu, & Kirui (2014), the result is similar to our finding where the creditor payment period positively affects the liquidity because the bank can hold more reserves by having a longer period to pay their creditor. Therefore, the bank liquidity risk decrease.

Other than that, from the study of Chagwiza, Garira and Moyo (2015), it also concludes that liquidity buffer negatively affect liquidity risk and it is similar with our finding. The bank with more liquidity buffer tend to be more liquid; hence, it has lower liquidity risk. Another study of Bassey, Tobi, Bassey and Ekwere (2016) proved that there is a positive relationship between cash reserve requirement which is similar to liquidity buffer and cash deposit that represent the liquidity. Bhati, Zoysa, and Jitaree, (2015) also proved the positive relationship of liquidity and cash reserve ratio. This means that the bank with higher reserve in cash will have higher liquidity and liquidity risk decrease.

CHAPTER 5: CONCLUSION AND IMPLICATIONS

5.0 Summary

In fact, liquidity risk should not be neglected by all the banks since its' impact to the performance of banks cannot be contemplated. This is because the banks have high possibility to face failure with high liquidity risk. If a lot of banks fail at the same time during the financial crisis due to the liquidity risk, the economy will be also greatly affected. However, many researchers focusing on the determinants of the banks' profitability instead of liquidity risk. Hence, this study put more emphasize in determining the liquidity risk management methods for the banks by having an optimal internal control. In this study, the dependent variable is liquidity risk while there are three independent variables which are debtor collection period, creditor payment period and liquidity buffer.

In order to determine the dynamic changes of the variables over time and be more informative, the panel data analysis has been applied in this study. The panel data consists of cross-sectional data that combined 59 banks in 13 exporting oil countries and time-series data of 5 years within the period 2014 and 2018; thus, the total sample size of the study is 295 observations. Panel vector autoregression (PVAR) models that is famous to be used has been applied in this study to run the panel data.

By referring to the Chapter 4, the major findings showed the relationship between the explained variable which is liquidity risk and the three explanatory variables which are debtor collection period, creditor payment period and liquidity buffer in long term and short term. Thus, from the result, the objectives in this study able to be validated.

Effectiveness Of Lower Debtor Collection Period In Managing Bank Liquidity Risk

The results indicated that the debtor collection period will positively affect the bank liquidity risk in long-term effect for the oil exporting countries' banks. This is because the bank will have more cash on hand if they able to collect back the money from receivables in a shorter time. The result is consistent with this study's objective which is the lower the debtor collection period, the lower the liquidity risk. Hence, it can be concluded that the bank liquidity risk able to be managed by maintaining a low debtor collection period.

Effectiveness Of Optimal Creditor Payment Period In Managing Bank Liquidity Risk

The results presented that there is a negative relationship between the creditor payment period and bank liquidity risk in both long-term and short-term effect for the oil exporting countries' banks. This is due to the bank will be more liquid if they able to hold the cash for a longer period before paying back to the creditors. This is similar with the objective in which mentioned that the higher the creditor payment period, the lower the liquidity risk. Thus, it can be summarized that the bank liquidity risk able to be managed by maintaining a greater creditor payment period.

Effectiveness Of Adequate Liquidity Buffer In Managing Bank Liquidity Risk

As shown in the results, there is an inverse relationship between the liquidity buffer and bank liquidity risk in both long-term and short-term effect for the oil exporting countries' banks. This is because banks will have high liquidity if they reserve more liquidity buffer on hand. This is also constant with the objective in this study which mentioned that the greater the liquidity buffer, the lower the liquidity risk. Therefore, it can be concluded that the bank liquidity risk able to be managed by having adequate liquidity buffer.

5.1 Implications of the Study

Financial status of a financial institution will always be concentrated by every country because it is important for a country in maintaining the wealth status. The bank run cases as mentioned in Chapter 1 show that the bank liquidity risk will trigger the financial crisis and economic development of a country. The recent financial crisis reflects that the banking sector acts as the major player in the economic. In further, they have the responsibility to adjust their working capital management and liquidity buffer in order to identify their risk protection and risk level.

This study presents the importance of implementation of bank liquidity risk management methods. A clear objective and action plan of risk management is very essential for the bank institution because some cases of the bank failure or financial crisis have been mentioned on this research; it shows that lack of risk management has become a significant reason behind these cases. Risk management of bank has become more important not only for financial sectors but also economic development. Hence, the purpose of the study is providing some suggestions to all banking institutions to ensure they have a proper risk management to adjust their risk level and avoid the liquidity risk. As the decision makers of the bank, they have the responsibilities to review their bank risk management strategies, as well as monitoring and advancing the strategies. Liquidity is the key elements which reflect

the banks' ability in controlling cash flow can bring a good implication to banks. They will have a better understanding of the liquidity ratio and risk while realize the impact of liquidity risk. Liquidity risk and ratio help the banks to determine their ability when there is demand on emergency of cash as well as know their possibility of survival if any crisis or event happens. By understanding the risk, the risk manager can prevent the crisis or loss if they realize their shortage in early stage. In short, maintenance of high liquidity status is crucial for a bank to enhance the confidence of the depositors and citizens; otherwise, it will generate the wave of the bank runs in the country due to the huge withdrawals of funds by the depositors.

From the viewpoints of economic sector, if economy policymakers want to ensure the financial stability, they need to know the function and the operating status of every banks. This study can assist the economic policymakers to have deeper knowledge regarding the bank risk management method in bank institutions. By observing these findings, the policymakers may realize the issue of bank risk management and provide some assistances to enhance the laws and regulations of the banking sectors. Besides, this study can provide some direction for the decision making if the government wants to implement some policy relating to bank risk management. If every sector recognizes the concept of risk management well, it can stimulate the GDP growth and stabilize the financial system of the country.

5.2 Limitations of the Study

This study put more emphasize on the banks specific factors in managing liquidity risk. However, there are other macroeconomic factors that may also affect the bank liquidity risks such as GDP growth rate, inflation rate, interest rate and so on. The methods suggested to manage the bank liquidity risk in this study are solely from micro perspective and more focus on internal control of banks.

5.3 Recommendations for Future Research

The future investigators are suggested to analyse the topic from both macro and micro views. For example, the bank specific factors can be coupled with macroeconomic factors when analysing the topic since this study more concerned with the bank-specific factors. In brief, microfinancial linkages of this topic are recommended to be conducted in future.

REFERENCES

- Abrigo, M., & Love, I. (2015, February). *Estimation of panel vector autoregression in stata:A package of programs*. Retrieved from <http://paneldataconference2015.ceu.hu/Program/Michael-Abrigo.pdf>
- Abrigo, M., & Love, I. (2015, February). *Estimation of panel vector autoregression in stata:A package of programs*. Retrieved from <http://paneldataconference2015.ceu.hu/Program/Michael-Abrigo.pdf>
- Akindele, J., & Odusina, O. (2015). Working capital management and firm profitability: Evidence from Nigerian quoted companies. *Journal of Finance and Accounting*, 6(7), 148-153.
- Alper, K., Binici, M., Demiralp, S., Kara, H., & ÖZLÜ, P. (2018). Reserve requirements, liquidity risk, and bank lending behavior. *Journal of Money, Credit and Banking*, 50(4), 817-827.
- Andrews, D. W., & Lu, B. (1999). *Consistent model and moment selection criteria for GMM estimation with application to dynamic panel data models*. Cowles Foundation for Research in Economics at Yale University.
- Armstrong, J., & Caldwell, G. (2008). Liquidity risk at banks: Trends and lessons learned from the recent turmoil. *Financial system review*, 47-52.
- Atseye, F. A., Ugwu, J. I., & Takon, S. M. (2015). Determinants of working capital management. *International Journal of Economics, Commerce and Management*, 3(2), 1-11.
- Bank Negara Malaysia (n.d.). *The importance of Financial Stability*. Retrieved on 21 July 2020 from <https://www.bnm.gov.my/index.php?ch=fs&pg=fsovrimp&ac=114>
- “Basel Accords” (n.d.). Retrieved on 20 July 2020 from <https://corporatefinanceinstitute.com/resources/knowledge/finance/basel-accords/>

- Bassey, F. A., Tobi, E. G., Bassey, I. F., & Ekwere, R. E. (2016). Liquidity management and the performance of banks in Nigeria. *International journal of academic research in accounting, finance and management sciences*, 6(1), 41-48.
- Baum, C. F., Schaffer, M. E., & Stillman, S. (2003). Instrumental variables and GMM: Estimation and testing. *The Stata Journal*, 3(1), 1-31.
- Bhati, S., Zoysa, A. D., & Jitaree, W. (2015). Determinants of liquidity in nationalised banks of India.
- Bianchi, J., & Bigio, S. (2014). *Banks, liquidity management and monetary policy* (No. w20490). National Bureau of Economic Research.
- Bindseil, U., & Lamoot, J. (2011). The Basel III framework for liquidity standards and monetary policy (No. 2011-041). SFB 649 discussion paper.
- Bonner, C., Van Lelyveld, I., & Zymek, R. (2015). Banks' liquidity buffers and the role of liquidity regulation. *Journal of Financial Services Research*, 48(3), 215-234.
- Calomiris, C. W., Heider, F., & Hoerova, M. (2015). A theory of bank liquidity requirements. *Columbia Business School Research Paper*, 2, p10.
- Centralny, E. B. (2012). Financial Stability Review, June 2012. *ECB, Frankfurt nad Odrą, czerwiec*.
- Chagwiza, W., Garira, W., & Moyo, S. (2015). Managing liquidity buffer through core liquidity portfolio. *Investment management and financial innovations*, (12, № 1), 70-77
- Chisti, K. A. (2013). The relationship between working capital efficiency and profitability. *The Journal of Accounting and Management*, 2(3).
- Corporate Finance Institute (n.d.). What is a Bank Run? Retrieved on 20 July 2020 from <https://corporatefinanceinstitute.com/resources/knowledge/other/bank-run/>
- Das, S. (2015). Impact of cash conversion cycle on cash holding—A study on FMCG sector. *Accounting*, 1(1), 1-16.

- Deloof, M. (2003). Does working capital management affect profitability of Belgian firms? *Journal of business finance & Accounting*, 30(3-4), 573-588.
- Deloof, M., & Jegers, M. (1996). Trade credit, product quality, and intragroup trade: some European evidence. *Financial management*, 33-43.
- Dombret, A., Foos, D., Pliszka, K., & Schulz, A. (2018). What are the real effects of financial market liquidity? Evidence on bank lending from the Euro area.
- Dong, H. P., & Su, J. T. (2010). The relationship between working capital management and profitability: a Vietnam case. *International Research Journal of Finance and Economics*, 49(1), 59-67.
- Eljelly, A. M. A. (2004). *Liquidity - profitability tradeoff: An empirical investigation in an emerging market*. *International Journal of Commerce and Management*, 14(2), 48–61. doi:10.1108/10569210480000179
- Filbeck, G., & Krueger, T. M. (2005). An analysis of working capital management results across industries. *American journal of business*.
- Firat, H. (2016). Is real GDP stationary? Evidence from some unit root tests for the advanced economies. *Journal of Social and Economic Statistics*, 5(2), 60-80.
- Hamilton, J. D. (1994). *Time series analysis*. Princeton University Press Princeton, New Jersey. Retrieved from http://www.ru.ac.bd/stat/wp-content/uploads/sites/25/2019/03/504_02_Hamilton_Time-Series-Analysis.pdf
- Hoerova, M., Mendicino, C., Nikolov, K., Schepens, G., & Van den Heuvel, S. (2018). Benefits and costs of liquidity regulation.
- Kapan, M. T., & Minoiu, M. C. (2013). Balance sheet strength and bank lending during the global financial crisis. International Monetary Fund.
- Kimani, J. G., Nyangáu, B. O., Karungu, R. M., & Kirui, K. (2014). What are the implications of working capital management on liquidity risk? A case of listed commercial banks in Kenya. *Research Journal of Finance and Accounting*, 5(10), 34-49.

- Kimberly, A. (n.d.). How WaMu Went Bankrupt. Retrieved on 27 January 2021 from The Balance website: <https://www.thebalance.com/washington-mutual-how-wamu-went-bankrupt-3305620>
- Kochubey, T., & Kowalczyk, D. (2014). The relationship between capital, liquidity and risk in commercial banks. Center for Economic Research and Graduate Education.
- Lama, P. (2018). A Study on the Effect of Liquidity Crisis on the profitability of Bank of Kathmandu Limited (Doctoral dissertation, Kathmandu University).
- Lamberg, S., & Vålming, S. (2009). Impact of Liquidity Management on Profitability: A study of the adaption of liquidity strategies in a financial crisis.
- Mathuva, M.D. (2009). The influence of working capital management components on corporate profitability: a survey on Kenyan listed firms. *Research Journal of Business Management*.
- Mawutor, J. K. M. (2014). The failure of Lehman brothers: causes, preventive measures and recommendations. *Research Journal of Finance and Accounting*, 5(4).
- Mora, N. (2010). Can banks provide liquidity in a financial crisis?. *Economic Review-Federal Reserve Bank of Kansas City*, 31.
- Mugenyah, L. O. (2015). Determinants of liquidity risk of commercial banks in Kenya (Doctoral dissertation, University of Nairobi).
- Nzioki, P. M., Kimeli, S. K., Riwo Abudho, M., & Nthiwa, J. M. (2013). Management of working capital and its effect on profitability of manufacturing companies listed on Nairobi securities exchange (NSE), Kenya.
- Olaniyi, T. A., & Olabisi, O. Y. (2011). Causes and impacts of global financial crisis on the performance of Nigerian banks (a case study of selected banks). *Journal of Business Management and Economics*, 2(4), 164-170.
- Oluwapelumi, A., & Olaride, O. B. (2017). Granger Causality between Growth in the Education Sector and Socio-Economic Services in Nigeria. *Equatorial Journal of Social Sciences and Human Behaviour*, 2(1), 44-55.

- Parente, P. M., & Silva, J. S. (2012). A cautionary note on tests of overidentifying restrictions. *Economics Letters*, 115(2), 314-317.
- Raheman, A., & Nasr, M. (2007). Working capital management and profitability—case of Pakistani firms. *International review of business research papers*, 3(1), 279-300.
- Sahlman, W. A. (2010). Management and the financial crisis (“We have met the enemy and he is us...”). *Economics, management, and financial markets*, 5(4), 11-53.
- Sathyamoorthi, C. R., Mapharing, M., & Dzimiri, M. (2020). Liquidity Management and Financial Performance: Evidence From Commercial Banks in Botswana. *International Journal of Financial Research*, 11(5).
- Schiozer, R. F., & de Freitas Oliveira, R. (2016). Asymmetric transmission of a bank liquidity shock. *Journal of Financial Stability*, 25, 234-246.
- Sekoni, A. (2015). The Basic Concepts and Feature of Bank Liquidity and Its Risk.
- Shajahan, U. S., & Suganya, M. (2017). The Impact of Working Capital Management On Firm’s Performance Of Selected Companies In Bombay Stock Exchange. *International Journal of Advanced Scientific Research & Development*.
- Sheefeni, J. P. (2016). The Impact of Bank-Specific Determinants on Commercial Banks’s Liquidity in Namibia. *Business, Management and Economics Research*, 2(8), 155-162.
- Sims, C. A. (1980). Macroeconomics and reality. *Econometrica: journal of the Econometric Society*, 1-48.
- Singh, A., & Sharma, A. K. (2016). An empirical analysis of macroeconomic and bank-specific factors affecting liquidity of Indian banks. *Future Business Journal*, 2(1), 40-53.
- Sohail, S., Rasul, F., & Fatima, U. (2016). Effect of Aggressive & Conservative

Working Capital Management Policy on Performance of Scheduled Commercial Banks of Pakistan. *European Journal of Business and Management*, 8(10), 40-48.

Stojanovic, S. (2014). Cash Conversion Cycle as a Company Liquidity Measure. *Interdisciplinary Management Research*, 10, 358-368.

Tran, T. T., Nguyen, Y. T., Nguyen, T. T., & Tran, L. (2019). The determinants of liquidity risk of commercial banks in Vietnam. *Banks and Bank Systems*, 14(1), 95-110.

Usama, M. (2012). Working capital management and its effect on firm's profitability and liquidity: In other food sector of (KSE) Karachi stock exchange. *Arabian Journal of Business and Management Review (Oman Chapter)*, 1(12), 62.

Wang, W. (2016). *Achieving inclusive growth in China through vertical specialization*. Chandos Publishing.

“What are the world’s safest banks and how to evaluate them” (2017). Flag Theory. Retrieved on 29 January 2021 from <https://flagtheory.com/world-safest-banks/>

Wieczorek-Kosmala, M., Doś, A., Błach, J., & Górczyńska, M. (2016). Working capital management and liquidity reserves: The context of risk retention. *Journal of Economics & Management*.

Yeboah, B., & Agyei, S. K. (2012). Working capital management and cash holdings of banks in Ghana. *European Journal of Business and management*, 4(13), 120-130.