

ISLAMIC BANKING SYSTEM – CONSCIENTIOUS  
REVELATION OF CREDIT RISK

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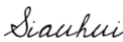




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DECLARATION

We hereby declare that:

- (1) This undergraduate research project is the end result of our own work, and that due acknowledgement has been given in the references of ALL sources of information be they printed, electronic, or personal.
- (2) No portion of this research project has been submitted in support of any application for any application for any other degree or qualification of this or any other university, or other institutes of learning.
- (3) Equal contribution has been made by each group member in completing the research project.
- (4) The word count of this research report is 25,406 words.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller Test
BIG4	Type of Audit Firm
BIMB	Bank Islam Malaysia Berhad
BOD	Size of Board of Director
BPLM	Breusch-Pagan Lagrange Multiplier
BS	Bank Size
CAR	Capital Adequacy Ratio
CEO	Chief Executive Officer
CEOD	CEO Duality
ESG	Environmental, Social, and Governance
FEM	Fixed Effect Model
FEMALE	Female Director on Board
FER	Fixed Effect Model Robust Standard Errors Clustered by Islamic Banks
FINANCE	SSB Members Expertise in Finance-Related Areas
GDP	Gross Domestic Product
GLS	Generalized Least Square
GMM	Generalized Method of Moments
IMF	International Monetary Fund
INDIR	Independent Director on Board
INF	Inflation Rate

IRAP	Italian Tax Rates on Productive Activities
LR	Linear Regression
MGT	Management Efficiency
MRA	Multiple Regression Analysis
NPF	Non-Performing Financing
NPL	Non-Performing Loans
NSSB	Size of Shariah Supervisory Board
PHD	PhD Degree Holder on SSB
POLS	Pooled Ordinary Least Squares
REM	Random Effect Model
ROE	Return on Equity
SSB	Shariah Supervisory Board
TAX	Taxation Ratio
UAE	United Arab Emirates
VAR	Vector Auto-regression

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## PREFACE

This study titled “Islamic Banking System – Conscientious Revelation of Credit Risk” is conducted as our final year research project. This research project considers the credit risk of 59 Islamic banks in different countries. The data is taken from the year 2010 to 2019 meanwhile Stata software is used to examine how the determinants influence the credit risk of Islamic banks.

Five categories of determinants, including bank specific factors, bank governance factors, Shariah governance factors, audit factor, and macroeconomics factors, had been identified that they may affect the credit risk of Islamic banks. The factors include Bank Size (BS), Capital Adequacy Ratio (CAR), Return on Equity (ROE), Management Efficiency (MGT), Taxation Ratio (TAX), Board Size (BOD), Independent Director on Board (INDIR), CEO Duality (CEOD), Female Director on Board (FEMALE), Size of Shariah Supervisory Board (NSSB), PhD Degree Holder on SSB (PHD), SSB Member Expertise in Finance-Related Areas (FINANCE), Type of Audit Firm (Big4), Gross Domestic Product Growth Rate (GDP), and Inflation Rate (INF). In order to confirm whether these factors would affect the credit risk of Islamic banks, few tests are conducted, such as Poolability Test, BPLM Test, Hausman Test and Sargan-Hansen test. The main purpose of conducting this research is to identify and ensure the related determinants that are significant in explaining the Islamic bank’s credit risk.

With the effort and hard work paid, we believe that this research could make crucial contributions to the future research of every relevant party.

**ABSTRACT**

The aim of this study is to investigate the relationship of Islamic banks' governance and some specific factors to the defaulting risk in Islamic banking industry from year 2010 to 2019. The variables of Islamic banks' governance are bank specific factors, corporate governance factors, Shariah governance factors, audit factors and macroeconomics factors. Additionally, we used panel data in this study and data collection is based on annual basis from 2010 to 2019. We have been accessing to Islamic banks' annual report, banks' website, and world bank data to gather the data. We have decided to form our samples from 59 Islamic banks in the world. From this study, we have proved that our independence variables which are stated above have a significant relationship with the credit risk of Islamic banks.

## **CHAPTER 1: RESEARCH OVERVIEW**

### **1.0 Introduction**

Throughout this chapter, Islamic banks' history will be studied, and the organization of Islamic banks will be deeply investigated. After that, the issues faced by Islamic banks will also be examined. Moreover, continue by the issues and purposes of this research. Lastly, the discussion on the importance of this research will enhance the knowledge to Islamic banks.

### **1.1 Background of Study**

In 1970s, people started delivering banking services with the principles of Shariah law, known as Islamic bank. Islamic banks perform better as compared with the overall banking sector as their growth rate of 16.67% is higher than conventional banks with 13.5% in 2020 (New Age, 2021). Moreover, Islamic banking sector had contributed USD 1.99 trillion of financial assets in the global banking financing assets in 2019 (Mordor Intelligence, n. d.). During these years, Islamic banking has grown rapidly and globally as they are strongly involved in the investments of Halal sector, Sukuk bond and infrastructure, even though it does not pay interest like traditional banks (Mordor Intelligence, n. d.).

The goals of Islamic banks can be segregated into five (Etcherera, 2015). Firstly, the wealth of the economic are depending on the full employment and the optimum economic growth rate. Secondly, interactions between social and economic factors are equally contributed to income and wealth. Thirdly, a stable value of money ensures the exchange medium more reliable. Fourth, sufficient savings enable to

reach the goals more efficiently. Fifth, all the services are expected from banking system. To reach the goals through Islamic banking, investors are needed to follow Shariah-compliance which is known as Halal investment. There are six rules in Shariah-compliance, which are profit sharing, prohibition of riba (interest) and gambling, only allowed to invest in lawful activities, always stucked to ethical and moral values and lastly successful investments are rely with the real economy status (Wealthface, 2020).

According to Islamic law, collection by an Islamic financial institution or payment of interest to any counterparty is prohibited. Late fees are not permitted in Islamic Shariah, and lenders are only permitted to collect the actual amount owed (Islamic Market, n. d.). Since Islamic banks do not charge for late and default payments, Islamic banks are experiencing a loss on profit as borrowers can default or make late payment which resulted the cost of finance in Islamic bank is higher than conventional bank. If penalties are charged, it will be counted as “riba” which is prohibited in Islamic Shariah.

Informed by Chen and Pan (2020), credit risk is the greatest risk facing by most of the banks. Additionally, study of Arunkumar and Kotreshwar (2005) shows that the credit risk holds 70% of the total risk of banks. Kabir, Worthington and Gupta (2015) found that the reason Islamic banks are facing higher credit risk is the limited practical usage of risk management techniques.

The unpredictable variance in the creditworthiness of issuer then lead to the portfolio exposed to risk is known as credit risk (McNeil, 2005). Credit risk has two main components, which are quantitative and qualitative. The total amount of losses is the quantity of credit risk, where the bank’s profitability realise on the loss is the qualitative of credit risk (Vodova, 2003). It is normally used to determine the credit risk of banks. It is essential for forecasting, ensuring the economic policy proposals are made correctly and that the banks are operating in a healthy manner. Credit risk can be classified into many categories, which are default risk, concentration risk and country risk (CFI, n. d.). This study is focusing on the risk of defaulting in Islamic banks. In the perspective of bank, they will meet default risk when the borrower of loan, bond issuers fail to clear its obligation on time (Finance Train, n.

d.). To measure the default risk of financial institution, researchers will investigate non-performing loans (NPL), also known as expired loans, are the leading indicators of the economy performance in the term of micro and macro.

Figure 1.1: Bank NPLs to Total Gross Loans of MENA Countries from 2010 to 2019

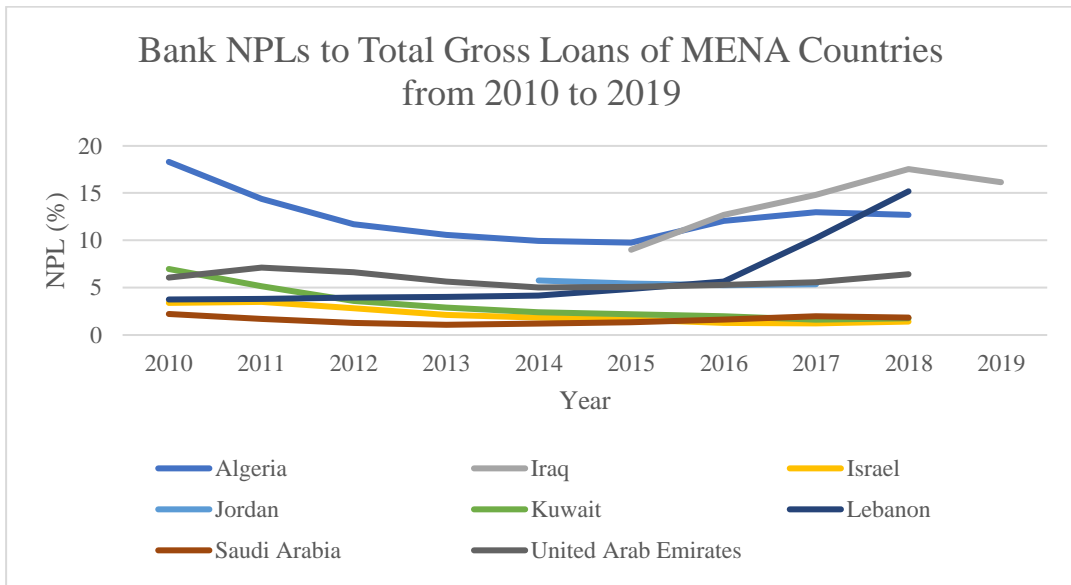
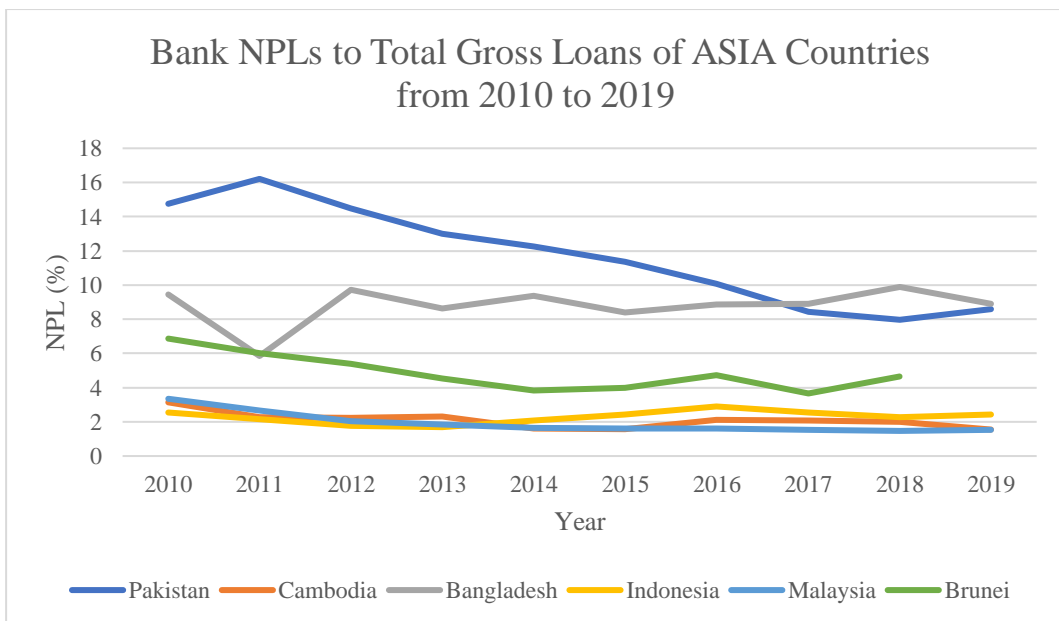


Figure 1.2: Bank NPLs to Total Gross Loans of ASIA Countries from 2010 to 2019





Referring to Figure 1.1 and 1.2, there are only 8 out of 18 MENA countries having the records of the data of NPL. Overall, MENA country had an upward trend for the bank NPL to total gross loans. As an impact of increment in NPL, the bank's stock price will drop as investors believe that the banks will earn lesser profit and might suffer loss in the future (CFI, n. d.). Generally, ASIA country had a downward trend for the bank NPL to total gross loans. As an impact to economy, decrease in NPL reduces the probability of business failure and economy performance will be better (Balgova et al., 2018).

Banking sector is the main support of the economy, a recession of a country's economy is affected by the credit risk of banks. (Rehman et al., 2019). Consequently, the unemployment rate of the country will rise, and people tend to borrow loan from banks to sustain its daily activities (Pettinger, 2020). However, once they have lost the income source, it is hard for them to payback their loan accordingly. Additionally, the value of securities or financial assets drops when recession. Drop in securities value will deeply influence the financial stability of the firms. Firms without sufficient income are hard to clear its obligation. Hence, credit risk in banks rise.

Poor credit risk management directly gives impact on the growth and survival of banks as credit borrowings are the main income source of banks. As an evidence, the incorrect credit guarantees, ineffective credit risk management in the lending procedures affecting the bank specific factors and the wealth of the bank governance (Ekinici & Poyraz, 2019). In the case of Islamic banks, Shariah knowledge plays an important role in monitoring operating activities. Existence of credit risk has affected the effectiveness of Shariah governance in solving the issues with the compliance of Shariah. High credit risk may lead to the activeness of risk management affected and influence the quality of audit reports, especially for Islamic banks (Ariffin & Kassim, 2014).

## 1.2 Problem Statement

Financial institutions are exposed to many risks, which are liquidity, operational, market, and credit risk. Credit risk was chosen as the dependent variable of this study after reviewing many business failures of financial institutions. However, Islamic banks' exposure to credit risk is controversial due to its nature of profit sharing. Islamic banks have lower credit risk comparing to conventional banks as Islamic banks have larger liquidity, greater capitalization, and low-cost inefficiency (Chamberlain et al., 2020). Factors causing credit risk include inappropriate credit policies, poor bank management and institutional capacity (Sandada & Kanhukanwe, 2016). Based on the research by Khan and Ahmed (2001), Musharakah and Mudarabah are facing higher credit risks, which are 3.69 and 3.25 respectively from a total score of 5. To implement profit and loss sharing modes in Islamic banks, the credit risk exposed to the investment will be transferred by Islamic banks as their assets are uncollateralized (Sundararajan & Errico, 2002).

Risk management and corporate governance for financial institutions are essential to survive in long term. Assuming the target participants, Islamic banks are vulnerable to credit risk, so this research will be conducted on finding out the main factor contributing to it. The findings may not only for academic purposes, but for market participants and regulators as references in order to build a more comprehensive system for Islamic banking in the future.

During the financial crisis in 2007 and 2008, the banks' asset quality was affected and directly reflected on the non-performing ratio of banks. The increment in default loans is strongly affected by the bank specific aspects (Arrina et al., 2018). This can be proved by the study of Arrina et al. (2018) as they found out that internal determinants like CAR and BS are correlated to loan defaults.

In the case of Islamic bank of South Africa (IBSA), which is being investigated by Deloitte and Touche, the bank was closed in the November of 1997 with ZAR 70 million in debts (Miskam, 2017). From the investigation, accounting firm found out that the bank was lending out a huge number of unsecured loans. The bank's large

number of NPLs were reflected on its balance sheet. The bank lacked the supervision from the regulatory authority, and weak risk management. There was no risk committee to monitor the activities of the bank. The decision was made through an informal framework, as evidence, directors of the bank lend out huge amount of loan to insiders such as bank's director and shareholders.

Other than the case above, Miskam also found out that Bank Islam Malaysia Berhad (BIMB) faced the similar issue. BIMB's board of director are not familiar with the banking industry, hence they have no proper debt and credit collection system. As a result, BIMB experienced a total of RM 2.2 billion of non-performing loans.

Shariah governance plays an essential role in managing Islamic banks. It is hard to ensure all their activities comply with the rules of Shariah if Shariah committee is not expertise. To illustrate, the Islamic banks in Bangladesh are facing several issues arising from their Shariah governance. According to Alam et al. (2019), Islamic banks in Bangladesh lack of complete advisory and regulatory on Shariah Governance Framework. Without a team of professionals in Shariah, the banks can hardly monitor and supervise the banking system. Shariah board and the bank governance of Islamic banks failed to supervise the internal control, resulting in the reputation of Islamic banks deteriorate. According to Khalid et al. (2017), an Islamic bank without auditing makes it difficult to supervise financial risk, thus, the smoothness of the banking system may suffer because transactions in an Islamic bank differ from those in a conventional bank. Hence, auditing is necessary to ensure the bank has a sound and effective banking system (Muhammad, 2018).

From the research of Nawaz (2019), the growth rate in Islamic banking industry is strongly correlated with country's economic growth. Indonesia is experienced a slow growth rate in 2015, the non-performing finance of the Islamic banks in Indonesia reached the maximum of 5%. The non-performing financing (NPF) ratio reached its peak in May of 2015 at 5.44%. NPF is the ratio used to calculate the banks' non-performing activities. Setiawan and Sherwin (2009) believe that the failure in banking system is related to the instability of financial system.

## **1.3 Research Objectives**

### **1.3.1 General Objective**

The research's general objective is to examine the determinants of credit risk of Islamic banks.

### **1.3.2 Specific Objectives**

- i. To identify the determinants affecting the Islamic bank's credit risk.
- ii. To investigate the relationships between bank specific, bank governance, Shariah governance, audit, and macroeconomics determinants, and Islamic bank's credit risk.

## **1.4 Research Questions**

- i. What are the determinants that might affect the Islamic bank's credit risk?
- ii. What are the relationships between bank specific, bank governance, Shariah governance, audit, macroeconomic determinants, and Islamic bank's credit risk?

## 1.5 Significance of Research

This research intends to strengthen on previous researches and explores the determinants that affecting the Islamic banks' credit risk. NPL is adopted to identify the credit risk in this research paper. Lower level of NPL indicates lower credit risk, vice versa.

Moreover, this study is beneficial as it shows the variables that give the greatest and least impact on an Islamic bank's credit risk, as well as variables that the Islamic banks should focus on in order to lower the credit risk. This study comprises five categories of explanatory variables which are bank-specific determinants, bank governance determinants, Shariah governance determinants, audit determinants, and macroeconomics determinants to review the association with the explained variable which is credit risk.

Furthermore, this research gives a greater awareness and knowledge to the related parties such as management of banks, investors, regulator, and future researchers.

### **i. Management of bank**

This study benefits bank management by providing determinants that increase or decrease the Islamic bank's credit risk. Bank management is able to reduce the credit risk of Islamic banks and make more effective decision for the Islamic banks.

### **ii. Investors**

Investors can serve this study as an additional information for their future investment. By understanding the variables that may affect Islamic banks' credit risk, investors enable to make better investment decisions and choose which Islamic banks they want to invest in.

### **iii. Regulators**

This study gives the regulators a better image and knowledge of the relationship between the country's economic performance and the credit risk

of Islamic banks. By referring this research, the regulators will understand the positive and negative impacts of country's economic performance on credit risk of Islamic bank. Therefore, the regulators may implement policies to stimulate economic growth in order to lower the Islamic bank's credit risk.

**iv. Future researchers**

This study will be useful for the future researchers since five different categories of variables are included in this study, whereas earlier studies on the determinants of credit risk in Islamic banks only used two or three different types of variables. Hence, this study will give the future researchers a greater understanding of this topic compared to other previous studies.

Lastly, this study includes more types of variables which were rarely included or omitted in the previous studies. In the previous studies, bank specific variables and macroeconomic variables are the most popular factors used to examine the Islamic bank's credit risk. As an outcome, this study will be more dependable than those of previous studies, which they may have omitted some essential variables related to bank and Shariah governance as well as audit factor.

## **1.6 Conclusion**

Based on the study above, the understanding to Islamic banking industry will be getting better. During research, several issues faced by Islamic banks were found, which had guided to the research questions and objectives. Last but not least, hopefully this research can provide useful knowledge to other researchers.

## CHAPTER 2: LITERATURE REVIEW

### 2.0 Introduction

This chapter covers the analysis of past studies that are related to banks' credit risks, including relevant theories, proposed frameworks, and conclusion. The reviews are classified into five types, including bank-specific determinants, bank governance determinants, Shariah governance determinants, audit determinant, and macroeconomics determinants. Under bank-specific determinants, the literature review covers Bank Size (BS), Capital Adequacy Ratio (CAR), Return on Equity (ROE), Management Efficiency (MGT), and Taxation Ratio (TAX); in bank governance factors, it includes Board Size (BOD), Independent Director on Board (INDIR), CEO Duality (CEOD), and Female Director on Board (FEMALE); in Shariah governance factors, it involves Size of Shariah Supervisory Board (NSSB), PhD Degree Holder on SSB (PHD), and SSB Member Expertise in Finance-Related Areas (FINANCE); in audit factor, it covers Type of Audit Firm (Big4); and in macroeconomics factors, it comprises Gross Domestic Product Growth Rate (GDP), and Inflation Rate (INF). Additionally, this study focuses on ASIA countries such as Malaysia, Indonesia, Bangladesh and Pakistan, as well as MENA countries such as Bahrain, Qatar, Jordan, Saudi Arabia, and Kuwait. Additionally, the conceptual framework and hypothesis development are to be discussed in detailed.

## 2.1 Underlying Theories

### 2.1.1 Asymmetric Information

Asymmetric information is also known as information failure, which is a characteristics of credit market (Bloomenthal, 2021). During the process of lending loan, borrowers are required to provide some documents like proof of income and purpose of borrowing loan for lenders to determine their creditworthiness.

Rodoni and Yaman (2018) had emphasized that the presence of non-performing loan is the result of weak bank internal management. The increment of non-performing loan is mainly caused by the moral hazard issue, for example inappropriate lending or borrowing process. As illustration, lenders might forget to collect necessary information from borrowers, which lead the lenders misprice the loan interest rate and reflected on the probability of default.

To prove the statement above, banking industry of Turkish was in trouble with the default risk due to the asymmetric information (Okuyan, 2014). Slightly different from conventional banks, Islamic banks are promoting profit sharing financing.

From the aspect of Islamic finance, gharar is known as asymmetric information which is strictly prohibited. Scholars think that it is unfair to the other party in sale contract, as it leads them expose to excessive risk. Nagaoka (2010) pointed out that musharaka contract (partnership) is less attractive to public because of high asymmetric information, hence people wish to not hold risk.

In the study of Benamraoui and Alwardat (2019), they explained that the defaulting cases occur in Islamic finance because the transactions are lack of transparency. Moreover, with the transformation of the era, scholars of Islamic finance are acceptable to minor gharar because they understood that risk cannot be fully eliminated in every business. To reduce the rate of asymmetric information, Islamic banks increase its bank reserve and capital to protect the banks from emergency.



### 2.1.2 Agency Theory

Informed by Jensen (1976) and Himaj (2014), a firm's efficiency is highly associated with Agency Theory. However, Agency theory is still a debatable theory (Eisenhardt, 1989). The theory was introduced to solve issues from the aspects of risk sharing which occurred arising from different viewpoints from both the principal and agents towards risks. Due to the different risk preferences, principal and agent tend to behave dissimilarly. In this study, Eisenhardt investigated that there were conflicting interest and governance systems occurred among principal and agent.

Additionally, the BoD are successful in monitoring and compensating top-level decisive managers, enabling to supervise important managers' judgement (Fama & Jensen, 1983). The independent director on board would increase the efficiency of bank and help banks to mitigate the interest conflict to the minimum and handle the agency issue carefully was acknowledged by Liang et al. (2013).

The principal-agency problem can cause incautious risks into the growth of loans (Jesus & Gabriel, 2006). Once the managers achieve satisfactory return for shareholders, they will involve in activities for their own interest, instead of company's worth maximization. For instance, they may involve in imprudent credit growth that may elevate the social existence of banks. Thus, managers should focus on business activities that motivate banks to growth.

Besides, Hussain, Shamsudin, Salem, Sajilan, Rahman and Ani (2015) declared that the shareholders' desire to mitigate principal-agent conflict would result underfunding issue. They will then, compensate management by embracing equity. Managers who acquire specific forms of possessions are more likely to include themselves in risky activities that bring benefits to shareholders because the increasing risks would generate satisfactory return. However, high leverage ratio will lead to the decrement of agency cost outside equity indirectly, enhancing firms' value and urging banks' managers to take more initiatives in helping shareholders to gain more interest (Berger & Patti, 2006).

### 2.1.3 Resource Dependence Theory

Resource dependence is applicable on the organization that need to rely on other's organization resource to operate its activities (Sustainable Transitions Blog, n. d.). In banking industry, every decision is relied on the board, and it influences the performance of the firm directly. It can be proved with the study of Pugliese et al. (2014), they explained that resource dependence theory assumed board as assets in sustaining the value of banks.

Besides, resource dependence theories are potential to enhance the given information by the board. Although the decision-making process is time-consuming, but it can protect the banks from uncertainty (Meca et al., 2015). Hillman et al. (2014) also commented that the capacity of BoD is positively related to the firm's performance. Bigger board size increases the probability of the firm turns to internalization.

Reduction on risk is one of the advantages after a firm being dependent on resources, for example, human resources, and finance (Yilmaz, 2014). In the scenario of banks, sharing of board of directors able to clearly identify the potential risk might face by the banks and take necessary action before getting worse. Moreover, resources dependency is more vital to Islamic banks. Since the transactions made in Islamic banks are complied with Shariah principles, therefore members of board can share proper components of Shariah compliance in their operating activities. Briefly, the limitations of Islamic banks on making proper policy and decision are enhanced, and protecting the banks from uncertainty (Alam et al., 2022).

### 2.1.4 Trade-Off Theory

Trade-off theory was introduced by Kraus and Litzenberger (1973), which declares that the tax bias tilts the financing structure of firms towards an optimal debt-to-equity ratio, causing a leverage effect resulting from the interest deductibility of interest payments on debt relative to equity financing.

In the discussion of trade-off theory of debt, the tax shield of interest is correlated with debt financing, pushing corporations towards elevated target leverage. On the contrary, the expected costs associated with default causes corporations to lower target leverage. Therefore, the ideal debt level equals the marginal advantage of the interest tax shield and the marginal cost of the additional exposure to default.

Furthermore, theoretical model predicts that non-debt corporate tax shields, for example, depreciation deductions or investment tax credits are crucial factors in determining the firm's target leverage (DeAngelo & Masulis, 1980). Hence, taxes act as a vital character in corporations' target leverage. Corporations' target leverage ratios are also a vital determinant of their default likelihood and many corporations adjust their capital structure towards leverage targets actively (Löffler & Maurer, 2011).

Tax policy is one of the biggest causes that result in policy uncertainties correlated with tax policies. It may also result difficulty to corporations in determining optional debt level (Baker et al. 2016). Resulting from tax shield on interest payments, debt financing would increase a corporation's value (Graham, 2000).

On the other hand, some corporations argued that the tax advantages of debt are not assured because the tax policies are uncertain, and they prefer to avoid using too much debt.

### 2.1.5 Life-Cycle Hypothesis

In 1950s, the life-cycle hypothesis (LCH) was introduced by Franco Modigliani and Richard Brumberg (Deaton, 2005). It was then, further extended by Lawrence in 1955. LCH declares the spending and saving behavior of people over their lifetime. It also claims that individuals tend to have smooth consumption over their lifetime by borrowing when the income decreases, while saving when the income increases. LCH declares the likelihood of default based on macroeconomic determinants such as the inflation rate, unemployment rate and GDP, as well as bank-specific determinants such as the total loan amount taken.

Several research have used inflation rate, unemployment rate and GDP as explanatory variables in their studies. For instance, several authors have disclosed a negative association running from GDP to problem loans and credit risk (Salas & Saurina, 2002; Thiagarajan, 2011; Castro, 2012). Additionally, inflation rate and unemployment rate are found negatively associated with the problem loans (Rinaldi & Sanchis-Arellano, 2006; Castro, 2012).

## 2.2 Literature Review

### 2.2.1 Dependent Variable

#### Non-Performing Loans (NPL)

The previous studies have been using non-performing loans (NPL) ratio to quantify credit risk in banking systems. NPLs are the loans that have been overdue by 90 days or more. According to the International Monetary Fund (IMF), a loan is categorized as NPL if it does not create interest and principal payments for a minimum of 90 days. Once the loans become NPLs, they are no longer expected in future dates. NPLs are expressed as the ratio of NPLs to total loans. Informed by Garla and Boruah (2018), non-performing loans ratio is also known as bad debts and troubled debts, which indicates the closed-to-default loans or default loans.

Credit risk represents the likelihood that unsuccessful lender can finance the loan within the promised period made within the contract. Unlike the conventional banks, there may be a special credit risk profile within Islamic banks because of the various funding ways. Non-performing loans could give impact on the types of borrowers, management of bank, and unfavourable shifts in economic circumstances.

Emphasis on the measuring and examining NPL ratio, it has an inverse correlation with the banks' total profitability, causing banks to involve in lending behaviour (Kingu et al., 2018). Resulting from the greater non-performing loans, banks might suffer lower profit margins, leading to a crisis if the issue becomes more severe. On the contrary, with lower non-performing loan ratio, banks might be convinced to permit more credit, improving depositors' confidence and trust towards the banks (Christaria & Kurnia, 2016).

Additionally, according to Vasiliki (2019), inflated credit risk may be faced by Islamic banks, resulting from constraints of religion on the employment of credit risk management instruments, for instance, credit derivatives. Other than that,

contract forms between banks and borrowers will mitigate credit risk owing to information asymmetry. In this context, the adverse selection problems will arise, fostering a higher understanding of the borrowers' trustworthiness. Moreover, the weakening in the worth of disposition triggers banks to create higher provisions for losses, increasing the implicit credit risk level (Misman, 2015).

## 2.2.2 Independent Variables

### Bank Size (BS)

Bank size is denoted by the total assets held by a bank. It can be computed as the contrary function to exponentiation of the total assets' worthiness (Laeven et al., 2014). Informed by Muhammad (2019), assets are the capitals managed by Islamic organization as the outcomes of past events, from which it may gain economic benefits in the future. The total assets of Islamic banking include cash, equity participation, placement at Business Intelligence, placement in other banks, fixed assets, inventory, financing distributed, provision of loan losses. Bank size can give impact to NPLs (Muhammad et al., 2020).

Some empirical studies concluded that the size of bank has an inverse relationship to NPLs. Alzoubi and Obeidat (2020) investigated the relationship between bank size and credit risk of 48 Islamic banks from 16 countries from 2008 to 2018. They explained that comparatively large market share banks have more opportunities to diversify loans, allowing large size banks to be benefited from lower market discipline by regulators.

Previous studies by Mokni, Rajhi and Racdhi (2015) discovered that the greater the bank size, the lower the likelihood of defaulting. With less concentrated portfolio, large size banks are allowed for diversification opportunities.

Supiyadi et al. (2017) also investigated the presence of significantly adverse relationship between size of bank and NPLs in Indonesian Islamic banking system.

An increasing asset owned by a bank can improve the financing volume which can be distributed by the bank. In other words, the bank can provide more of the total funding. With higher total funding, smaller of NPL ratio would be generated.

Small bank size leads to higher insolvency risk in business activity performed by the banks, this has been proven by Zolkifli et al. (2018). By adopting GLS and regression panel data, and historical data of conventional banks and Islamic banks from 2008 to 2016, the final results indicate the bank size and NPLs are significantly and negatively correlated.

Although the studies by Mokni et al. (2015) and Zolkifli et al. (2017) involved conventional banks, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.1: Summary of Past Studies on Bank Size and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Methodology	Findings
Alzoubi & Obeidat	2020	Islamic banks from 16 countries	2008 – 2018	FEM	Negative relationship
Mokni, Rajhi & Rachdhi	2015	Islamic and conventional banks from MENA region	2002 – 2009	GLS random effect, GMM	Negative relationship
Supiyadi, Mulyadi, Fithriani, Syaiful, Ikhsan & Rahman	2017	Indonesian Islamic banks	2007 – 2016	ANOVA	Significant and negative relationship
Zolkifli, Hamid & Janor	2018	Malaysian Islamic and	2008 – 2016	GLS	Significant and negative relationship

		conventiona l banks			
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### Capital Adequacy Ratio (CAR)

The capital adequacy ratio, which is also known as capital to risk-weighted assets ratio, evaluates a bank's capital availability. It becomes an essential indicator in banking in assessing the bank's performance as it acts as an indicator of bank's financial strength with its capital and assets which protect depositors and facilitate the efficiency and stability of financial systems across the globe.

In respect of the relationship between CAR and non-performing loans, using data set for Indonesian Islamic banks over a 7-year period, Poetry and Sanrego (2011) have proven the significant and negative correlation between them in long term. Resulting from higher CAR, Islamic banks may have judicious capital management policy, thus decreasing the problem financing level.

Having consistent results, Astrini et al. (2014) claimed that the CAR has a significantly negative association on NPLs. They further explained that the declined in NPLs is resulted from the rising capability of banks to assume the risk of any credit or risky earning assets.

On the basis of the quarterly data, Astrini et al. (2014) affirmed an inverse correlation between CAR and NPLs. In other words, higher CAR tends to enhance the bank's capability in mitigating the arising credit risk. Thus, the NPLs in bank would be dropping with the amount of funding reserves acquired.

Farika et al. (2018) studied the existence of co-integrating relationship between CAR and credit risk of Islamic and conventional banking from 2008 to 2016. By applying Augmented Dicker-Fuller (ADF) Test, they disclosed a negative relationship running from CAR to credit risk. Informed by them, Islamic banks can be enhanced by retaining higher CAR owing to diligence and discipline in risk exposures management.



Although the studies by Poetry and Sanrego (2011), as well as Farika et al. (2018) involved conventional banks, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.2: Summary of Past Studies on Capital Adequacy Ratio and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Meth odology	Findings
Poetry & Sanrego	2011	Indonesian conventional banks	2004 – 2010	VAR, VECM	Significant and negative relationship
Astrini, Suwendra & Suwarna	2018	Indonesia	2014 – 2017	Moderated Regression Analysis	Negative relationship
Farika, Achsani & Johan	2018	Indonesian conventional and Islamic banks	2008 – 2016	Augmented Dicker-Fuller (ADF) Test	Negative relationship

### **Return on Equity (ROE)**

Return on equity (ROE) shows how a bank’s equity capital is used successfully. It can be computed by the net income proportion to average total equity. It represents the bank management effectiveness in utilizing shareholders’ equity to create earnings or profits (Lee et al., 2019).

Sheefeni (2015) studied the non-performing loans and investigates the existence of co-integrating relationship among variables in the case of Namibia. By employing co-integration, time-series econometric techniques of unit root, forecast error variance decomposition, and impulse response functions on the quarterly data over the period from 2001 to 2014, a negative relationship was disclosed running from

ROE to NPL. The findings show that higher profitability banks are less tempted to create profits. As a result, banks become less constrained to employ in high-risk activities of allowing uncertain loans.

Studies by Alandejani et al. (2015) have employed OLS, FEM and REM to study the correlation between ROE and non-performing loans by using the data set from 2010 to 2015 in GCC. Empirically, the result is shown that ROE is significantly and negatively affecting the NPL. This study suggests that the short-term impact of the management of Islamic banks may be inefficient in managing the portfolios of credit risk.

Additionally, the negative effect of ROE on NPLs shows the existence of previous bad decisions on bank management that prompts a decline in bank performance or health, resulting a rise in non-performing loans.

Shkodra and Ismajli (2017) had conducted research to examine the correlation between return on equity and non-performing loans in Kosovo banking system from 2006 to 2015. Using t-test, the results disclose a significant relationship between ROE and NPL at significance level of 5%.

Although the studies by Sheefeni (2015) and Shkodra and Ismajli (2017) involved conventional banks, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.3: Summary of Past Studies on Return on Equity and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Methodology	Findings
Sheefeni	2015	Namibia	2001 – 2014	Co-integration, time-series econometric techniques of unit root, forecast error variance	Significant and negative relationship

				decomposition, and impulse response functions	
Alandejani, Maha & Abdulaziz & Y	2014	Islamic banks from GCC	2010 – 2015	OLS, FEM and REM	Significant and negative relationship
Shkodra & Ismajli	2017	Kosovo	2006 - 2015	T-test	Significant and negative relationship

### Management Efficiency (MGT)

Management efficiency is described as the return generated by a management team relative to the capital they direct and expenses they incur. It can be measured by dividing a bank’s revenue by total assets. It is one of the important determinants in influencing NPLs in Islamic banking.

In the contemplation of testing the effect of management efficiency towards NPLs, Zolkifli et al. (2018) ran a Generalized Least Square (GLS). This study involves 16 Malaysian Islamic banks and 21 conventional banks from Malaysia over the period 2008 to 2016. A significantly negative relationship was found between management efficiency and NPL by authors. The findings reflects that if a bank’s efficiency in managing earning asset reduces, its banking system tends to face higher risk.

Using the same method as Zolkifli et al. (2018), Misman and Bhatti (2020) also discovered consistent results. They used 40 Islamic banks form nine countries from 2000 to 2011. Refer to their findings, management efficiency is statistically significant and gives negative influence on credit risk in Islamic banking system. They further explained that the global financial crisis could not significantly affect the management efficiency of Islamic banking system. This has been proven when

the management efficiency reflects a significantly negative correlation on credit risk when the models are managed for the group dummy.

These discovery are in agreement with the past empirical studies on Islamic banks in the Indonesia from January 2008 to September 2014. According to Havidz and Setiawan (2015), their Data Envelopment Analysis results shows a significant association running from management efficiency towards non-performing loans. When the management efficiency in banking system improves, their credit risk would be lower. They believe that the risks faced by banks would decrease, if the banks put more effort in reducing average costs, enhancing their efficiency levels, as well as achieving a climate of financial stability. Besides, they also suggest banks to increase competitiveness in order to reduce credit risk. To illustrate, banks could develop alternative distribution channels for banking services.

Although the study by Zolkifli et al. (2017) involved conventional banks, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.4: Summary of Past Studies on Management Efficiency and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Metho dology	Findings
Zolkifli, Hamid & Janor	2018	Malaysian Islamic and conventiona l banks	2008 – 2016	GLS	Significant and negative relationship
Misman & Bhatti	2020	Islamic banks from ASEAN and GCC	2000 – 2011	Pairwise correlation testing	Significant and negative relationship
Havidz & Setiawan	2015	Indonesian Islamic banks	January 2008 –	Data Envelopment	Significant and negative relationship

			September 2014	Analysis (DEA)	
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### Taxation Ratio (TAX)

Taxation ratio is measured by tax and zakat divided by pre-tax profit. Zakat is an element of the conception of responsibility that gives proof against to the social interest than the interest of the corporation (Khasanah & Roziq, 2019). Zakat management is applied by accountability, responsibility, transparency, and capability in solving the issues of society, particularly within the economic and social fields. According to Law No. 17 Year 2000 on Income Tax, Article 4, paragraph 3, it is specified that the zakat expenses stated as a discount of non-exempt income for the provision zakat. The law is anticipated financial condition of corporations is not burden. Associate rising number of Islamic banks proves the capability of Islamic banking is extremely optimistic. Therefore, it will boost the amount of obligatory zakat for the company.

Luo and Tanna (2014) investigated the connection between taxation and bank risk-taking. Using the dataset from 2561 commercial banks from 2000 to 2011, they found that the taxation has significantly positive impact towards the NPL ratio. In other words, higher corporate income tax rate can result higher credit risk.

Using the data set of 462 mutual banks from various regions of the Italian territory over the period of 1999 to 2011, Gambacorta et al. (2017) discovered a significant and positive correlation running from Italian tax rates on productive activities (IRAP) rate change to non-performing loans. Informed by them, when the tax rate was reduced, poorly capitalized banks tend to clean up their balance sheet by writing off NPLs and obtain more securities issued by government with lower risk and smaller regulatory capital charges. That is to say, banks with lower capital ratios are more likely to deleverage by rising their equity, transferring the asset composition to less risky groups of assets. As a result, the tangible equity ratios could be enhanced, while the cost of non-equity funding could be reduced.

On the other side, it has been disclosed that, to trim down the ratio of NPL to total asset by 11 basis points (0.11 percentage points), banks would reduce 100 basis points (1 percentage point) in the IRAP rate. As a consequence, banks that are close to minimum capital requirements, may employ tax savings to scrub up the balance sheets and acknowledge losses or to allocate assets from more volatile to more secure ones.

Although the studies by Luo and Tanna (2014), as well as Gambacorta et al. (2017) involved conventional banks, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.5: Summary of Past Studies on Taxation Ratio and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Methodology	Findings
Luo & Tanna	2014	Commercial banks from 96 countries	2000 – 2011	Static model, dynamic model	Significant and positive relationship
Gambacorta, Ricotti, Sundaresan & Wang	2017	Italian territory	1999 – 2011	Dynamic model	Significant and positive relationship

### **Board Size (BOD)**

Board size means to the quantity of directors on the board of company. The prior character of the BoD is to supervise the firm’s managers who are in control of daily running of business. The monitoring quality of directors reflects the performance of a company; while the board members number indicates the depth knowledge and experience of the board. Besides, a large board size showcased the stakeholders’ supervising management. Among the independent variables, board size becomes a vital determinant in examining bank’s NPL performance.

In their study, Mathew, Ibrahim and Archbold (2016) used 260 companies' secondary data on FTSE 350 in the United Kingdom over the period 2005 to 2010. Using the GLS and REM, they observed an inverse correlation running from board size to credit risk. They claimed that a large size of board will lower the extremity in decision-making process, achieving more agreement. In other words, when small-sized board involves executive directors who possess a large proportion of firm equity and institutional investors who have substantial ownership, the risk of firm might rise.

With the consistent results as study by Mathew et al. (2016), Bourakba and Zerargui (2015) have proven an adverse effect on board size towards credit risk whereby big board size could bring low risks to companies. They examined Islamic banks from Emirates, Kuwait, KSA, Qatar and Bahrain over the period of 2005 to 2012. In the end, the findings suggest that firms with larger board size tend to receive less risks in the future.

Additionally, Fakhrunnas and Ramly (2017) tested the impact of board size towards credit risk using the data from 24 Islamic banks from 2009 to 2014 by using GLS Random Effect estimator. They have disclosed a significantly negative relationship among them. In large BOD, the communication and coordination may become difficult and inconvenient, causing the phenomenon of free riding to occur among chief executives. As a result, the effectiveness of the board would be reduced.

Although the study by Mathew et al. (2016) involved conventional banks, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.6: Summary of Past Studies on Board Size and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Methodology	Findings
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Mathew, Ibrahim & Archbold	2016	United Kingdom	2005 – 2010	GLS, REM	Negative relationship
Bourakba & Zerargui	2015	Islamic banks from Emirates, Kuwait, KSA, Qatar, Bahrain	2005 – 2012	Least square	Significant and negative relationship
Fakhrunnas & Ramly	2017	Southeast Asian Islamic banks	2009 – 2014	Random effect model	Significant and negative relationship

### Independent Director on Board (INDIR)

Independent director on board refers to the quantity of independent directors on board. It is expressed as the percentage of independent directors on the board, including non-executive directors who do not hold a management position in the organization (Ballester et al., 2020). Even though board independence is supposed to be a good indicator in corporate governance, however, its influence on credit risk is mixed. Hence, independent director on board can be an important element on examining credit risk of Islamic banking system.

Enlightened by Frakhunnas and Ramly (2017), independent director is a crucial element in affecting credit risk in banking system. They used REM to examine the impact of independent director on credit risk in six Southeast Asia Islamic banks for the period 2009 to 2014. As a result, independent director has positive relationship on credit risk. Authors declared that greater number of independent directors tends to involve Islamic banks in higher risk activities, thus causing greater credit risk level and non-performing loans.

In European, Andries and Brown (2017) studied on 156 banks from Central and Eastern Europe over the period from 2005 to 2012. The findings illustrate a positive correlation running from board independence to credit risk. Informed by them,



board independence reduced credit risk over the period of financial crisis. However, the impact is insignificant for the rest of the period.

Ballester, Urteaga and Martinez (2020) also found similar findings. They discovered a positive correlation running from board independence to credit risk. When number of independent director decreases, the credit risk reduces. This can be explained using shareholder perspective. Directors who are from outside the business would be good for the firm as they may fulfill their responsibility of supervising the managers, thus diminishing the credit risk. In contrast, when board independence level increases, the credit risk increases. This can be explained using debtholder perspective. When independent directors fight for shareholders' rights at the expense of creditors, the agency cost of debt will increase, causing the organization's credit risk given their risk-taking incentives to rise. Also, the independent board may lack specialized expertise and understanding on the firm that they work on.

Although the studies by Andries and Brown (2017), as well as Ballester et al. (2020) involved conventional banks, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.7: Summary of Past Studies on Independent Director on Board and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Meth odology	Findings
Fakhrunna s & Ramly	2017	Southeast Asian Islamic banks	2009 – 2014	Random effect model	Positive relationship
Andries & Brown	2017	Central and Eastern Europe	2005 – 2012		Positive relationship
Ballester, Urteaga & Martinez	2020	Egypt, Tunisia, Malaysia, Bangladesh, Philippines, Indonesia, India,	1990 – 2019	Anglo-Saxon model	Positive relationship

		UK, Italy, Australia, Canada			
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### CEO Duality (CEOD)

CEO duality exists when the characters of Chief Executive Officer and chairman are managed by same person. It represents the degree of executive entrenchment the CEO of the bank practices. Some research debate that a more powerful manager will reduce the effectiveness of BoD in monitoring and managing the activities of the manager. An influential manager is important in controlling the strategic judgments of the bank. Higher independence in managerial decision making may arise agency conflicts and agency costs, resulting dropping of firm value, credit rating and cash flows as well as higher costs of debt. Hence, CEO duality can be a significant factor in examining the NPLs in Islamic banking.

Tadele and Kalyebara (2020) studied on the correlation between CEO duality and credit risk in the United Arab Emirates (UAE) using dataset of 19 UAE banks over the period of 2015 to 2018. By adopting a Pearson pairwise correlation, they discovered a significantly negative association among the variables. Informed by them, whoever holds both CEO and BoD position tends to loan lesser credits and are related to lower return variability and bank failure risk. Besides, CEO duality also tends to enhance firm's asset quality by reducing NPLs and retaining an optimum level of loan loss reserves.

The result is consistent with earlier study done by Sheikh (2019), which disclosed an inverse correlation between CEO duality and NPLs. He claimed that the firm's CEOs are less diversified, thus, they prevent accepting risky activities. Furthermore, Pathan (2009) also found an inverse correlation between CEO duality and credit risk. He mentioned that CEO duality can reduce the risk level in bank holding companies.

According to research done by Grassa (2015), a negative relationship was revealed between CEO duality and credit risk in Islamic banking systems of GCC and

Southeast Asia. From the agency theory perspective, high credit risk could be arisen from the lessening in supervising. Extreme authority focused in one person who can seize other shareholders. Moreover, the agency theory disputes that the excessive authority of CEO because it debilitates the board supervising ability and surges both agency costs and risks. Moreover, duality allows CEOs to utilize their authorities for their own advantages, which can result harm to shareholders' value (Al-Malkawi & Pillai, 2018).

Although the studies by Tadele and Kalvebara (2019), Sheikh (2019), and Pathan (2009) involved conventional banks, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.8: Summary of Past Studies on CEO Duality and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Methodology	Findings
Tadele & Kalvebara	2020	Banks from United Arab Emirates	2015 – 2018	Pearson pairwise correlation	Significant and negative relationship
Sheikh	2019	United States	1992 – 2015		Negative relationship
Pathan	2009	US banks	1997 – 2004	Two-index market model	Negative relationship
Grassa	2015	26 Southeast Asian Islamic banks and 54 GCC Islamic banks	2005 – 2011	Logistic regression model	Negative relationship
Al-Malkawi & Pillai	2018	Islamic banks in GCC	2005 – 2015	GLS	Negative relationship

### **Female Director on Board (FEMALE)**

Female director on board indicates the total number of female directors in boardroom. It can be expressed by dividing the quantity of female directors by the total quantity of directors. It becomes a vital element in exploring the impact towards NPLs as gender diversity in the board has always been an ongoing debate in academic and empirical findings are inconclusive.

Several empirical studies discovered an inverse association between female director on board and credit risk. Their findings showed that growth in gender diversity on the board can reduce risk-taking (Gulamhussen & Santa, 2015), minimize additional risk-taking behaviour of firms (Khaw et al., 2016), decrease the lending cost (Karavitis et al., 2021), as well as reduce bank conduct risk (Arnaboldi et al., 2021).

Conversely, there are some arguments that cast doubt on the positive impact of existence of female directors on performance in Islamic banking. Studies by Faccio et al. (2016) found that women are more risk averse as compared to men. In addition, women in finance may have similar or lower risk aversion level compared to men (Adams & Ragunathan, 2017). Therefore, presence of women on board might persuade the management to employ conservative strategies, thus reducing the competitiveness of the Islamic banks. As a result, with stronger monitoring of female directors, well-governed corporations can be adversely affected.

Chen et al. (2019) disclosed that boards with diverse gender are more risk aware as compared to boards with all males. This could be explained that the existence of women in the boardroom fosters management to take financing risks which escalate the value of firm and prevents managers from taking reputational risk which could result harm to the firm's value.

Khan, Fraz, Hassan, and Abedifar (2019) examined the association between board gender diversity and risk-taking from dual banking system. Using the data of 120 conventional banks and 71 Islamic banks from 11 Muslim countries over the period of 2010 to 2017, with random effect GLS technique, the result shows that female

director is insignificant, indicating that the existence of female directors in the boardroom has no influence on loan quality.

Although the studies by Gulambussen and Santa (2015), Khaw et al. (2016), Karavitis et al. (2021), Arnaboldi et al. (2021), Chen et al. (2018), and Khan et al. (2019) involved conventional banks, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.9: Summary of Past Studies on Female Director on Board and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Methodology	Findings
Gulambussen & Santa	2015	134 listed banks from OECD countries	-	-	Significant and negative relationship
Khaw, Liao, Tripe & Wongchoti	2016	China	1999 – 2010	Weighted least square regression	Negative relationship
Karavitis, Sokas & Tsoukas	2021	386 banks	1999 – 2013	Baseline model	Negative relationship
Arnaboldi, Casu, Gallo, Kalotychou & Sarkisyan	2021	European banks	2007 – 2018	Negative binomial count model	Negative relationship
Chen, Gramlich & Houser	2019	S&P firms	1997 – 2013	Baseline model	Negative relationship
Khan, Fraz, Hassan & Abedifar	2019	Conventional and Islamic banks from	2010 – 2017	Random effect GLS technique	Insignificant relationship

		Muslim countries			
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### Size of Shariah Supervisory Board (NSSB)

Shariah Supervisory Board size represents the total number of Shariah committee in Shariah Supervisory Board (SSB). It is an important in examining the impact towards NPLs.

Bourakba and Zerargui (2015) observed Islamic banks from Emirates, Kuwait, KSA, Qatar and Bahrain from 2005 to 2012. The researchers found a very strong inverse correlation between size of SSB and NPLs. The outcome indicates that the monitoring role of SSBs is effective in reducing risk-taking among Islamic banks. Besides, they also discovered that, resulting from conflict, the effectiveness of SSBs in decision making would decline when the average number of SSB is more than four.

Furthermore, adopting REM, unbalanced panel data of 4 Islamic banks in Southeast Asia over six periods from 2009 to 2014, Fakhrunnas and Ramly (2017) claimed that the size of SSB and credit risk is negatively correlated. When SSB size increases, the company would face less risks.

Moreover, Safiullah and Shamuddin (2018) tested the correlation between SSB size and credit risk. Using the observations of banks from 28 countries, including 94 conventional banks and 94 Islamic banks over the period from 2003 to 2014, it is concluded that the variables are negatively correlated. They argue that a larger SSB may have impact on the capability of that board to enhance existing Shariah screening of loan quality, strategies, policies, as well as to diminish managers' moral hazard issue of executing less strict supervising of the borrowers' business. The greater Shariah oversight ability of a larger SSB tends to restrict a manager's aggressive financing and lending behaviour, resulting lower Islamic banks' risk.

In addition, with the implementation of competing hypotheses, Najwa, Ramly and Haron (2019) have discovered a negative correlation between SSB size and credit risk. In large SSBs, Shariah advisors can enjoy advantage by sharing tasks and workload as well as benefit from various of knowledge and experience. Hence, SSB members can provide appropriate advice to the board of directors, allowing them to make quality decisions, thus, reducing the involvement in high-risk activities.

Although the study by Safiullah and Shamsuddin (2018) involved conventional banks, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.10: Summary of Past Studies on Size of Shariah Supervisory Board and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Methodology	Findings
Bourakba & Zerargui	2015	Islamic banks from Emirates, Kuwait, KSA, Qatar, Bahrain	2005 – 2012	Least square	Significant and negative relationship
Fakhrunnas & Ramly	2017	Southeast Asian Islamic banks	2009 – 2014	Random effect model	Negative relationship
Safiullah & Shamsuddin	2018	94 conventional banks and 94 Islamic banks	2003 – 2014	GMM estimator	Negative relationship
Najwa, Ramly & Haron	2019	Islamic banks from Malaysia, Indonesia, Brunei	2011 – 2015	GLS	Negative relationship

### **PhD Degree Holder on SSB (PHD)**

PhD degree holder on Shariah Supervisory Board denotes to the total quantity of committees on SSB who hold PhD qualification. It is expressed as the level of education who obtained PhD among the SSB in percentage. Based on Hambrick and Mason (1984), academic qualification is correlated to risk attitude, cognitive ability, and skill base. A high academic qualification tends to improve the ability of directors in analyzing and evaluating information (Bantel, 1993), and to adopt an in-depth judgement of the implications of decisions made (Chen, 2014). Hence, this variable is an important resource in this study.

Ginena and Hamid (2015) review the impact of education composition on bank risk-taking. It was found that when executives who hold PhD degree increase, the portfolio risk decreases. They further argue that due to the advanced academic qualifications such as PhD degrees and cognitive abilities of directors, the necessary Shariah guidelines would be provided and the effectiveness in decision-making would be increased, leading to more powerful supervising of opportunistic risk-taking behavior in management.

Besides, according to Safiullah and Shamsuddin (2018), with sophisticated academic qualifications, SSB members are able to enhance their capabilities to operationalize Islamic principles into banking practices, for instance, moral prohibition enforcement on excessive risk-taking. To illustrate, by having advanced academic qualifications, SSB members can provide accurate and appropriate evaluation on implications of Shariah-compliant banking and rules to employ internal procedures to hedge risks.

However, using the data from 188 Islamic banks from 28 countries, over the period of 2003 to 2014, Safiullah and Shamsuddin (2018) found that the academic qualifications does not give impact towards credit risks. Other than that, it was claimed that the SSB members' academic qualifications is not statistically significant the level of education among SSB members does not gave moderating at all (Ramly & Nordin, 2018). The stronger board independence tends to minimize



risk-taking when SSBs comprise of greater percentage of shariah advisors who have prior experience in Shariah and banking-related areas.

The summary of the past studies is shown below:

Table 2.11: Summary of Past Studies on PhD Degree Holder on SSB and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Methodology	Findings
Ginena & Hamid	2015	-	-	-	Negative relationship
Safiullah & Shamsuddin	2018	188 Islamic banks from 28 countries	2003 – 2014	GMM estimator	Insignificant relationship
Ramly & Nordin	2018	Malaysian Islamic banks	2010 – 2015	Generalized least square panel data regression	Insignificant relationship

### **SSB Members Expertise in Finance-Related Areas (FINANCE)**

SSB members expertise in finance-related areas represents that total number of Shariah members who have experience in finance. It is expressed in percentage of SSB members qualified in finance-related fields. This is one of the vital elements in studying the influence on NPLs.

Jabari and Muhamad (2021) studied the educational diversity and non-performing loans in Islamic banks using data of 87 Islamic banks over the period of 2010 to 2018. Using Generalized Method of Moments (GMM) estimator, the findings showed that the SSB members specialization in finance-related areas is not significant towards credit risk.

Although it is assumed that business graduates are better in understanding financial statements and give accurate surveillance of management decisions, however, the insignificant relationship might be attributed to the various roles of the SSB as compared to BoD. Conflicting with BOD, SSB committees do not gain any incentive to enhance financial performance by perceiving higher risk, as their character is restricted to approving management compliance with Shariah laws.

Moreover, it is argued that the finance expertise in SSB has no impact towards credit risk among Indonesian Islamic banks from 2013 to 2017 (Nugraheni & Muhammad, 2019). By employing random effect model, they argued that it should also be approved that professional does not indicate the specialization and attitude of the board members completely. Apart from the formal education, soft skills are also the key in running and supporting the company's business.

On the other side, Grassa (2015) claimed that SSB should include members who have financial knowledge or banking experience, to assess carefully the financial contracts adopted to banking products and services of Islamic banks. Veltrop et al. (2017) also claimed that understanding financial statements is essential for BOD committees as it improves the capabilities to evaluate strategic decisions and supervise firm's performance, resulting effective oversight.

Although the study by Veltrop et al. (2017) involved Dutch organizations, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.12: Summary of Past Studies on SSB Members Expertise in Finance-Related Areas and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Methodology	Findings
Jabari & Muhamad	2021	Islamic banks from 26 countries	2010 – 2018	Difference -GMM estimation method	Insignificant relationship

Nugraheni & Muhammad	2019	Indonesian Islamic banks	2013 – 2017	Random effect model	Insignificant relationship
Grassa	2015	26 Southeast Asian Islamic banks and 54 GCC Islamic banks	2005 – 2011	Logistic regression model	Negative relationship
Veltrop, Molleman & Ees	2017	Dutch organizations	-	-	Negative relationship

#### Type of Audit Firm (BIG4)

Type of audit firm refers to the audit firm that reviews banks' performance and financial records. Audit firms can be categorized into two, which are Big 4 and non-Big 4. The Big-4 group composes of four audit firms such as Deloitte Touche Tohmatsu, KPMG International, Ernst & Young Global, and Pricewater Coopers. Type of audit firm is one of the vital elements in the study of impacts towards non-performing loans.

Balakrishnan, George, Ertan, and Scobie (2021) study two benchmarks to bank risk where role of auditors is more distinguishable and where they may have better information and insight than regulators. Their findings showed that problem loans are subjective and is significant in audit effort. They claimed that enhanced audit outputs can improve the superior of bank risk. By examining “problem loans”, they observed that the total of problem loans rises in the two years following the implementation of the reporting mandate immediately but reduces in long term.

Regulators frequently depend on the findings of outside auditors to evaluate and understand bank performance and the quality of the information reported. In these interactions, auditors are anticipated to judge on issues regarding valuation, earnings quality, significant accounting decisions and their observations on quality.

The organizations and managements related to the preparation of the financial statements. Eisenbach et al. (2017) declared that, with increased reporting and interactions, auditors can emphasize more on audit viewpoints that are important to regulators, and resource-constrained regulators can improve the effectiveness of their oversight efforts. Once regulators received much information from banks through regulatory reporting, the usefulness of information from auditors tends to come from areas that require a high level of judgement. To illustrate, excessive information on metrics like NPLs is likely to be less relevant for regulators as NPL classification is based on rules with minimal discretion. Rather, the auditors' input in areas like problem loans, measurement of the fair values of Level 2 and Level 3 assets and liabilities, the adequacy and subjectivity of the provision for credit losses and uncertain taxes. Risk can be decisive for regulators given the judgment and discretion involved. Regulators may also take advantage from additional information from auditors on specific transactions that are significant at the entity level but are not considered significant at the group level, or transactions that are not acknowledged on the balance sheet. regulators could use the information gathered by auditors to expose previously unknown or 'hidden' risks and enhance overall bank risk assessments.

Informed by Heningtyas, Widagdo and Ika (2019), from the perspective of loan loss provision, Islamic banks is stronger in organizations that are audited by the non-Big-4 group than that of audited by Big-4 group. This result indicates that good audit quality can weaken income smoothing activities in Islamic banks.

Although the studies by Balakrishnan et al. (2020) and Heningtyas et al. (2019) involved conventional banks, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.13: Summary of Past Studies on Type of Audit Firm and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Meth odology	Findings

Balakrishnan, George, Ertan & Scobie	2020	European banks	2009 – 2018	Difference-in-difference model	Significant and negative relationship
Heningtyas, Widagdo & Ika	2019	Indonesia	2014 – 2018	Structural Equation Modelling (SEM)	Significant and negative relationship

### Gross Domestic Product Growth Rate (GDP)

GDP determines the worth of every finished good and service produced within a certain time frame of the whole country. Commonly, GDP indicates the health of a country or the standard living of a country. GDP growth indicates the changes in volume of GDP which is the changes in the size of economics. It is a macroeconomics determinant that giving impact on the credit risk of Islamic bank.

In the earlier studies, it was found that GDP has significantly negative relationship with credit risk (Kabir et al., 2015). Owing to the higher payment capacity of banks' clients, GDP growth can negatively influence credit risk. Indeed, GDP growth gives information about economic development of a country. An increasing GDP growth will increase the community's payment capacity for the credit taken of a country, thus causing the bank's credit risk to decrease. The outcome is in line with the earlier studies which have determined the inverse association between GDP and credit risk of Islamic banks (Haryona et al., 2016; Yuniarti & Effendi, 2018).

Tabash and Anagreh (2017) have identified an inverse correlation between GDP growth and credit risk in Islamic banking industry of United Arab Emirates (UAE). They mentioned that the loan given by bank will become more volatile and real fund rate will be reduced when the country is undergoing recession. Additionally, a bank will be experiencing a huge risk owing to the availability of set loan is becoming more volatile for a bank to sustain.

Havidz and Setiawan (2015) conducted research on the correlation between GDP and credit risk of Indonesian Islamic banks from January 2008 to September 2014 using Data Envelopment Analysis (DEA). The results show that GDP has a significant inverse association to credit risk. GDP gives impact to the borrower's capability to repay the loans significantly.

Wiryono and Effendi (2018), the FEM method was used to test the consequences of GDP towards credit risk of seven Indonesian Islamic banks from 2010 to 2016. The result from FEM indicates that GDP negatively significant to credit risk.

Although the studies by Kabir et al. (2015) and Haryono et al. (2016) involved conventional banks, but those models are applicable to Islamic banks. The summary of the past studies is shown below:

Table 2.14: Summary of Past Studies on Gross Domestic Product Growth Rate and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Meth odology	Findings
Kabir, Worthington & Gupta	2015	37 Islamic banks and 156 conventional banks from 13 countries	2000 – 2012	Merton's distance-to- default model	Significant and negative relationship
Haryono, Ariffin & Hamat	2016	11 full- fledged Islamic banks and 22 Islamic business units in conventional	2004 – 2012	Generalized Method of Moments	Significant and negative relationship

		banks from Indonesia			
Yuniarti & Effendi	2018	Indonesian Islamic banks	2009 – 2016	Panel data regression with random effect model	Negative relationship
Tabash & Anagreh	2017	United Arab Emirates Islamic banks	1990 – 2014	Co-integration and error correction model	Significant and negative relationship
Havidz & Setiawan	2015	Indonesian Islamic banks	January 2008 – September 2014	Data Envelopment Analysis (DEA)	Significant and negative relationship
Wiryono & Effendi	2018	Indonesian Islamic banks	2010 – 2016	FEM	Significant and negative relationship

### Inflation Rate (INF)

Inflation measures the rate of increase in the level of prices of goods and services within a certain time period. Typically, it can also be used to measure the growth in the cost of living in a country. The Consumer Price Index (CPI) as an indicator of inflation, determines the percentage change in the price of basket of goods and services consumed by households. Inflation is a macroeconomic determinant influencing the Islamic banking's credit risk.

In their study, Aysan et al. (2018) have tested the connection between inflation rate and credit risk. They adopted panel-VAR model and used the quarterly data of Turkey Islamic banks from 2004Q3 to 2012Q4. They discovered that inflation rate

has a significant and negative relationship to the NPLs. Inflationary pressure from the cost side may be a crucial source of inflation in price formation. In this context, an organization could take advantage by rising the prices of goods and services. This helps boost the organization’s profits, resulting improvements on organization’s capability to repay bank loans or financing. Thus, credit risk in Islamic banking will reduce.

Wiryo and Effendi (2018) studied the association between inflation rate and credit risk in Indonesian Islamic banking. By applying FEM and data set from 2010 to 2016, they disclosed a significantly negative relationship running from inflation rate to credit risk. High inflation rate is related to high nominal interest rate and may be a sign of poor management of macroeconomy. During inflationary, high relative price volatility may result in banks hard to make accurate evaluation of credit and market risks, thus causing credit risk exposure increases.

This outcome is similar as the previous research which have determined the negative correlation between inflation and NPLs (Bahloul et al., 2017). An increase in inflation will in turn lower the bank’s income or profits, reducing its financing expansion. The decline in financial growth could result in lower NPF level of Islamic banks.

The summary of the past studies is shown below:

Table 2.15: Summary of Past Studies on Inflation Rate and Non-Performing Loans (Credit Risk)

Author(s)	Year	Countries	Time Period	Model/Methodology	Findings
Aysan, Disli & Ozturk	2018	Turkey Islamic banks	2004Q3 – 2012Q4	Panel-VAR model	Significant and negative relationship
Wiryo & Effendi	2018	Indonesian Islamic banks	2010 – 2016	FEM	Significant and negative relationship

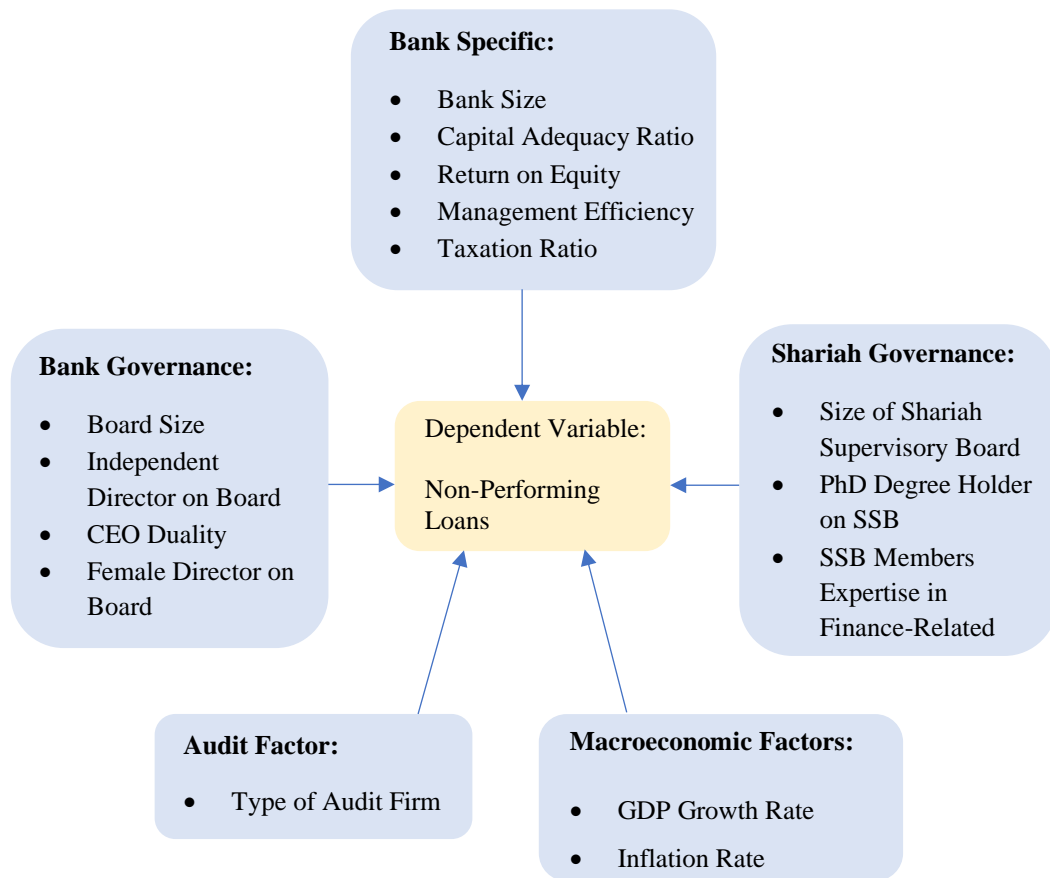


Bahloul, Mroua & Naifar	2017	Turkey Islamic banks	2002 – 2014	MS-VAR model	Negative relationship
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### 2.3 Conceptual Framework

The framework is designed to investigate the Islamic banks’ credit risk, joint with concepts to form a theoretical framework. The illustration is shown as below:

Figure 2.1: The Effects of Bank-Specific Determinants, Bank Governance Determinants, Shariah Governance Determinants, Audit Determinant, and Macroeconomic Determinants on Credit Risk of 59 Islamic Banks from ASIA and MENA Countries from Year 2010 to 2019



In this study, non-performing loans (NPL) will be used as the dependent variable and the rest of the variables are adopted as explanatory variables which are bank size (BS), capital adequacy ratio (CAR), return on equity (ROE), management efficiency (MGT), taxation ratio (TAX), board size (BOD), size of independent director (INDIR), CEO duality (CEOD), number of female director on board (FEMALE), Shariah supervisory board size (NSSB), PhD degree holder on SSB (PHD), SSB members experts in finance-related areas (FINANCE), the type of audit firm (BIG4), Gross Domestic Product growth rate (GDP) and inflation rate (INF). The banks chosen are from ASIA countries and the study period is scoped from 2010 to 2019. The predicted model is as below:

**Model 1:**

$$NPL_{it} = \beta_0 + \beta_1BS_{it} + \beta_2CAR_{it} + \beta_3ROE_{it} + \beta_4MGT_{it} + \beta_5TAX_{it} + \beta_6BOD_{it} + \beta_7INDIR_{it} + \beta_8CEOD_{it} + \beta_9FEMALE_{it} + \beta_{10}NSSB_{it} + \beta_{11}PHD_{it} + \beta_{12}FINANCE_{it} + \beta_{13}BIG4_{it} + \beta_{14}GDP_{it} + \beta_{15}INF_{it} + \mu_{it} + \varepsilon_{it}$$

*Note: NPL=Non-Performing Loans, BS=Bank Size, CAR=Capital Adequacy Ratio, ROE=Return on Equity, MGT=Management Efficiency, TAX=Taxation Ratio, BOD=Board Size, INDIR=Independent Director on Board, CEOD=CEO Duality, Female=Female Director on Board, NSSB=Shariah Supervisory Board Size, PHD=PHD Degree Holder on SSB, Finance=SSB Members Expertise in Finance-Related Areas, BIG4=Type of Audit Firm, GDP=Gross Domestic Products Growth Rate, INF=Inflation Rate*

## 2.4 Hypothesis Development

### 2.4.1 Bank-Specific Determinants

H<sub>0</sub>: Every bank-specific determinants have no important connection with the credit risk of Islamic bank.

H<sub>1</sub>: Minimum one bank-specific determinant has important connection with the credit risk of Islamic bank.

In their study, Uda et al. (2018) have tested the correlation of bank size on credit risk using the annual data of 191 banks from 2010 to 2017 with FEM. They have noticed that bank size is positively significant to credit risk. Since larger banks may attempt to develop Too-Big-To-Fail safety net subsidies, so they might be riskier.

Examining the nexus between CAR and NPLs with the data of Indonesian banks for the 2012 to 2016 period, Yulianti and Ibrahim (2018) found that CAR has a negatively significant impact towards NPLs by using FEM Panel data model. In other words, when a bank's CAR increases, its bad debts would be reduced and minimized.

Rahman and Jahan (2018), using the data of Bangladesh Islamic banks from over the period 2011 to 2015, to study the relationship between ROE and NPLs. It is shown that, empirically, ROE has a negative influence on NPLs. High profitability banks may experience less pressure in generating profits, thus less constrained to involve in risky credit offerings.

In their study, Zolkifli, Hamid and Janor (2018) discovered a significant and inverse correlation between management efficiency and NPL. By improving a bank's management, the problem of credit risk could be reduced.

Gamabacorta et al. (2017) studied the association between tax rates and non-performing loans. It is found that tax rate is a negatively significant to NPLs. They claimed that a decline in tax rates could result a greater amount of after-tax earnings with the bank, a bank may choose to raise its lending.

Thus,  $H_0$  will be rejected since there is at least one bank-specific determinant having significant association with the non-performing loans.

## 2.4.2 Bank Governance Determinants

H<sub>0</sub>: Every bank governance determinants have no important connection with the credit risk of Islamic bank.

H<sub>1</sub>: Minimum one bank governance determinant has important connection with the credit risk of Islamic bank.

Rachdi, Trabalesi and Trad (2013) examined the banking governance associated with risk owned by Tunisian banks using Generalized Least Square Random Effect. Their findings show an inverse influence running from board size towards credit risk. Having large board might reduce the performance of the board, thus affecting the business activities of banks.

Lu and Baoteng (2018) have disclosed a positive association from board independence to credit risk using the data from the banks in UK from 2000 to 2014. Using Pooled Ordinary Least Squares (POLS), FEM, and REM, they mentioned that a board with high proportion of independent directors may suffer from lacking specific skills and experiences about the firm, resulting poor decisions and analysis as well as decreasing the credit management monitoring quality.

Mansoor et al. (2020) discovered a negative correlation between CEO duality and NPLs by using the dataset of 22 Islamic banks from 2006 to 2018. This result is in agreement with the agency theory perspective, where reductions in supervision and extreme authority focused in one person who can seize other shareholders, thus increases the firm's credit risk.

Perryman et al. (2016) disclosed a positive correlation between female director on board and NPLs because of the more risk averse behaviour of women than men.

Thus, H<sub>0</sub> will be rejected since there is at least one bank governance determinant having significant association with the non-performing loans.

### 2.4.3 Shariah Governance Determinants

*H<sub>0</sub>*: Every Shariah governance determinants have no important connection with the credit risk of Islamic bank.

*H<sub>1</sub>*: Minimum one Shariah governance determinants has important connection with the credit risk of Islamic bank.

Fakhrunna and Ramly (2017) studied the relationship between Shariah Supervisory Board size and credit risk. Using random effect model and the data form 24 Southeast Asia Islamic banks from 2009 to 2014, they discovered an inverse association between size of SSB and credit risk. Size of Shariah Supervisory Committee is negatively significant to credit risk in Islamic banking because SBB opts not to engage in excess risk business activity.

Safiullah and Shamsuddin (2018) tested the relationship between academic qualifications of SSB members and credit risk. Using the data of Islamic banks form 28 countries, they found no evidence of a significant correlation between the percentage of SSB members with a PhD degree and Islamic banks' credit risk. They believe that SSBs with greater participation of Shariah advisors who have relevant experience, are capable to provide appropriate advice on the credit risk associated.

Ramly and Nordin (2016) investigate the correlation between SSB members expertise in finance-related areas and non-performing loans with the data of 16 Malaysian Islamic banks from 2010 to 2015. Using GLS, they discovered a negative relationship among them. The result indicates that higher percentage of Sharia advisors having skills and experience in banking-related fields tend to experience lower credit risk.

Thus, *H<sub>0</sub>* will be rejected since there is at least one Shariah governance determinant having significant association with the non-performing loans.

#### **2.4.4 Audit Determinant**

H<sub>0</sub>: Audit determinant has no significant association with the credit risk of Islamic bank.

H<sub>1</sub>: Audit determinant has significant association with the credit risk of Islamic bank.

Balakrishnan et al. (2021) investigate the correlation between type of audit firm and non-performing loans. Using the data of 28 national bank regulators within EU, they found that the amount of problem loans could be following the implementation of the reporting mandate in short term. The evaluation of loan loss provisions and problem loans are subjective and encompass significant audit effort.

Thus, H<sub>0</sub> will be rejected since the audit determinant has significant association with the non-performing loans.

#### **2.4.5 Macroeconomic Determinants**

H<sub>0</sub>: Every macroeconomics determinants have no important connection with the credit risk of Islamic bank.

H<sub>1</sub>: Minimum one macroeconomic determinant has important connection with the credit risk of Islamic bank.

Researchers suggested that the GDP has significantly and negatively linked to the NPLs (Marouf & Guellil, 2017). High economic growth increases loan repayment capacity of the borrowers within an economy due to the growth in the income level. As a result, the level of NPLs in banking sector will reduce.

Supriani and Sudarsono (2018) mentioned that inflation rate has a significant and inverse effect on NPLs. During inflationary, the income of a bank will reduce,

resulting a decrease in banks' financing expansion. In the end, the NPLs level will decrease.

Thus,  $H_0$  will be rejected since there is at least one macroeconomics determinant having significant association with the non-performing loans.

## 2.5 Conclusion

In conclusion, Chapter 2 delivered an enhanced comprehension and strong argument between independent variables such as bank size, capital adequacy ratio, return on equity, management efficiency, taxation ratio, board size, independent director on board, CEO duality, female director on board, size of Shariah supervisory board, PhD degree holder on SSB, SSB member expertise in finance-related areas, type of audit firm, gross domestic growth rate, and inflation rate with non-performing loans with 59 Islamic banks within ASIA and MENA countries. In addition, the decisive variables listed were being studied and analyzed specifically and precisely. Moreover, theoretical models disclosed during the investigation have been discussed and explained accordingly, and the theoretical framework of this research project have been proposed.

## **CHAPTER 3: METHODOLOGY**

### **3.0 Introduction**

Research methodology will be discussed in detail in this section. It indicates a specific procedure used for collecting data and creating statistic. Besides, this section contains of research design, way of data collection, sampling design, research instruments and data analysis techniques. In this study, it involves the dependent variable which is credit risk while the independent variables have been categorized into five main types which are bank specific determinants, bank governance determinants, Shariah governance determinants, audit determinant and macroeconomic determinants. The association between explanatory variables and explained variable able to identify and explain through research methodology. Moreover, this research is using panel data regression to study the credit risk of 59 Islamic banks in 9 selected from ASIA and MENA countries which range from 2010 to 2019. At the end of this chapter, the acceptable econometric model and different type of tests for the research implementation will be explained.



### 3.1 Research Design

The intention of this study is to explore the association between the Islamic banks' credit risk and the five main types of factors. In bank specific, the literature review covers Bank Size (BS), Capital Adequacy Ratio (CAR), Return on Equity (ROE), Management Efficiency (MGT), and Taxation Ratio (TAX); in bank governance, it covers Board Size (BOD), Independent Director on Board (INDIR), CEO Duality (CEOD), and Female Director on Board (FEMALE); in Shariah governance, it covers Size of Shariah Supervisory Board (NSSB), PhD Degree Holder on SSB (PHD), and SSB Member Expertise in Finance-Related Areas (FINANCE); in audit factor, it covers Type of Audit Firm (BIG4); and in macroeconomic factors, it covers Gross Domestic Product Growth Rate (GDP), and Inflation Rate (INF).

This research is adopting quantitative research method. Quantitative research is concerning on testing theories and hypotheses (Streefkerk, 2019). It examines through mathematical and statistical analysis and mostly convey in numbers, graphs, and tables. This research method can be used to form generalizable facts about a topic and find an association between the variables. Correlational design is one of the quantitative research techniques going to be adopted in this research. It can point out the importance of the variables and the strength of connection between two or more variables via statistical analysis (Combes, 2021). Besides, quantitative data comprise distinctive numerical data that is countable and measurable. All the variables in this research are calculated and stated in numerical structure as well as in percentage structure. Hence, the quantitative data are applied in this research to investigate the association between the explanatory variables and explained variable to show the strength of connection between the determinants.

## 3.2 Data Collection Methods

Data is an information in the form of facts or figures from which conclusions can be made. A process of collecting and sorting data is required before information can be presented and interpreted (Ajayi, 2017). Secondary data source is selected to be used in this research and it is directed into a set of panel data.

Panel data known as longitudinal data, refers to a mixture of cross-sectional and time series data (Hsiao, 2014). Panel data is applied because it is more specific and informative. It is the most useful tool at the moment that the outcome variable based on the independent variables which are not observable but having a connection with the observed independent variables. If such excluded variables remain unchanged, then the panel data estimators allow for the consistent estimation of the effect of observed independent variables (Schmidheiny, 2021). Moreover, balance panel data are used for the regression which comprise of the identical period of observations for each of individual Islamic bank.

Besides, secondary data are more reliable as the data are generally collected by governmental research institutions or certain agencies as part of organizational record keeping (Wagh, 2021). It is also less time-consuming to collect the data and cost effective as opposed to the primary data because they can easily be obtained through online resources (Vartanian, 2011). Moreover, all the data are suitable for this research as the data collected has been filtered out and modified properly through natural log or percentage form so as to able to represent each variable accurately and can facilitate the analysis process. Furthermore, the data are also adequate for this research because all the data required can be found in the database.

In this research, some of the secondary data are extracted based on annually basis and retrieved from Fitch Ratings as well as banks' annual reports that obtained from banks' official website. Furthermore, World Bank database is also used to collect data for macroeconomic variables. In addition, Islamic Markets is used to find out the characteristics of each shariah supervisory board members.

Table 3.1: Proxies, Explanations, Unit Measurement and Sources of the Variables

<b>Explained Variable</b>	<b>Proxy</b>	<b>Explanations</b>	<b>Unit Measurement</b>	<b>Sources</b>
Credit Risk	NPL	Ratio of non-performing loans to gross loans	Percentage (%)	Fitch Ratings
<b>Explanatory Variable</b>	<b>Proxy</b>	<b>Explanations</b>	<b>Unit Measurement</b>	<b>Source</b>
Bank Size	BS	The contrary function to exponentiation of the value of total assets	-	Own Calculation
Capital Adequacy Ratio	CAR	Total equity divided by total assets	Percentage (%)	Fitch Ratings
Return on Equity	ROE	Ratio of net profit after tax to total equity	Percentage (%)	Fitch Ratings
Management Efficiency	MGT	Ratio of total earning assets to total assets	Percentage (%)	Own Calculation
Taxation Cost	TAX	Tax and Zakat are divided by pre-tax profit	Percentage (%)	Fitch Ratings
Board of Director	BOD	Number of directors on board	-	Bank's Annual Reports
Independent Director	INDIR	Percentage of independent director on board	Percentage (%)	Bank's Annual Reports
CEO Duality	CEOD	A dummy variable if the CEO holds the position of Chairman of the BoD will take the value of 1, otherwise, 0	-	Bank's Annual Reports

Female Director on Board	FEMALE	Percentage of female director on board	Percentage (%)	Bank's Annual Reports
Size of Shariah Supervisory Board	NSSB	Number of Shariah Supervisory Board members	-	Bank's Annual Reports
PhD Degree Holder on SSB	PHD	Quantity of Shariah Supervisory Board members with PHD degree qualification	Percentage (%)	Islamic Markets
SSB Members Expertise in Finance-Related Areas	FINANCE	Shariah Supervisory Board members who experts in Finance	Percentage (%)	Islamic Markets
Type of Audit Firm	BIG4	A dummy variable that the bank's annual reports are audited by big four audit firm	-	Bank's Annual Reports
Gross Domestic Product Growth Rate	GDP	Annual percentage growth rate of GDP in the market price based on the local currency.	Percentage (%)	World Bank Database
Inflation Rate	INF	Annual percentage of consumer price index for all the goods and services. of the country	Percentage (%)	World Bank Database

## **3.3 Sampling Design**

### **3.3.1 Target Population**

The target population for this research is the Islamic banking industry in developing countries around the world. Nevertheless, it is impossible to consider all developing countries in this research. Thus, nine countries have been chosen as our target population across ASIA and MENA region with most of its Islamic banks having at least 10 years of data and annual reports available in Fitch Ratings and bank official website respectively. The data and annual report availability for all these banks is contributed to the main factor for choosing as our target population. The nine countries included Malaysia, Indonesia, Bahrain, Bangladesh, Jordan, Kuwait, Pakistan, Qatar and Saudi Arabia.

### **3.3.2 Frame and Location Sampling**

The period of analysis for this research consists of total 10 years ranged from 2010 to 2019. There is total 59 Islamic banks being selected to conduct this research. 14 of them from Malaysia, 11 of them from Pakistan, 9 of them from Indonesia, 7 of them from Qatar, 6 of them from Bahrain, 5 of them from Bangladesh, 3 of them from Kuwait, 2 of them from Jordan, and lastly 2 of them from Saudi Arabia.

#### **1. Malaysia**

- Affin Islamic Bank Berhad
- Al Rajhi Banking & Investment Corporation (Malaysia) Berhad
- Bank Muamalat Malaysia Berhad
- CIMB Islamic Bank Berhad
- Hong Leong Islamic Bank Berhad
- HSBC Amanah Malaysia Berhad
- Kuwait Finance House (Malaysia) Berhad

- Maybank Islamic Berhad
- MBSB Bank Berhad
- OCBC Al-Amin Bank Berhad
- Public Islamic Bank Berhad
- RHB Islamic Bank Berhad
- Standard Chartered Saadiq Berhad
- Ambank Islamic Berhad

## 2. Pakistan

- Bank Islami Pakistan Limited
- Askari Bank Ltd
- Bank Al Habib Islamic Banking
- Bank Alfalah Islamic
- Faysal Bank (Islamic)
- Habib Bank Limited
- MCB Islamic Banking
- Meezan Bank Limited
- National Bank of Pakistan
- Soneri Mustaqeem Islamic Bank
- United Bank Limited

## 3. Indonesia

- Bank BCA Syariah
- Bank BNI Syariah
- Bank Jabar Banten Syariah
- Bank Mega Syariah
- Bank Muamalat Indonesia
- Bank Syariah Bukopin
- Bank Syariah Mandiri
- Bank Victoria Syariah
- PT Bank Syariah Indonesia Tbk

4. Qatar

- Doha Bank
- Al Khaliji Bank
- Masraf Al Rayan
- The Commercial Bank (P.S.Q.C.)
- Qatar First Bank
- Qatar International Islamic Bank
- Qatar Islamic Bank

5. Bahrain

- Arab Banking Corporation (ABC Islamic Bank)
- Al Baraka Banking Group
- Bahrain Islamic Bank
- First Energy Bank
- Khaleeji Commercial Bank BSC (KHCB)
- Kuwait Finance House (Bahrain)

6. Bangladesh

- Islamic Bank Bangladesh Limited
- Al-Arafah Islami Bank Limited
- Social Islami Bank Limited
- Shahjalal Islami Bank Limited
- Export Import Bank of Bangladesh Limited

7. Kuwait

- Boubyan Bank
- Ahli United Bank Kuwait
- Kuwait Finance House (Kuwait)

8. Jordan

- Jordan Islamic Bank
- Islamic International Arab Bank

9. Saudi Arabia

- Alinma Bank
- Bank AlBilad

### **3.3.3 Sampling Technique**

Probability sampling technique is employed as the sampling technique in this study. In this technique, we include cluster sampling method in our research. Firstly, we use cluster sampling to divide the countries around the world into subgroup by using region. After selecting ASIA and MENA region, we divide again into subgroup by classified them using the availability of 10 years data and annual report, then we randomly select the entire subgroup. Moreover, there are 59 Islamic banks involved and the study period is 10 years from 2010 to 2019. Therefore, the sample size for this research is 590 (59 Islamic banks  $\times$  10 years). A greater sample size gives higher chance to achieve normal distribution. It can also generate a better significant test and more accurate outcome.

Furthermore, this research is adopting STATA to generate result and to create output for the study. This is due to the reason where it supplies valuable methods for the process of data analysis, manipulation, estimation, and construction of research models automatically. In addition, it consists of more than hundred types of statistical features in the software. STATA can also carry out a unique quality of graphs and tables through econometric and statistical analysis. In fact, this software mixed with superior modern technology that fulfil comprehensive data science needs. In order to examine POLS, FEM, and REM, some tests can be carried out from this software such as the Poolability F-test, Breusch-Pagan Lagrange Multiplier (BPLM) Test and Hausman test. Hence, it can assist the study to discover a best-fitted model and achieve research objectives simultaneously.



## 3.4 Data Analysis

### 3.4.1 Model Alternative

#### 3.4.1.1 Pooled Ordinary Least Squares Model (POLS)

POLS as the simplest form of model, does not consider the panel data structure such as firm-specific and time-specific effects. All the coefficients are directly estimated as equally distributed as well as not correlated with other regressors (Norman, 2015). Besides, there are few problems arises from this model such as it will not take into account the heterogeneity and the heterogeneity appear among the inspections across periods will affect the estimated parameter values become biased, not efficient as well as not consistent. As compared to FEM and REM, POLS model is much more restrictive.

There are several assumptions involved in this POLS model. Firstly, the parameter in this model is assumed to be linearity. Secondly, disturbances and regressors are expected to be exogeneity where both are not correlated. Thirdly, the disturbances of this model are presumed to have a constant variance also known as homoscedasticity. Besides, the disturbances are not related with each other which implies that there is no autocorrelation in this model. Next, values X must have variability and fixed in repeating sampling. Other than that, it is assumed to be no multicollinearity in this model. If individual effects are zero, then the heterogeneity may influence the second and third assumptions. Therefore, this will cause the OLS estimator to become not in a best unbiased linear estimator.

Furthermore, there are two tests needed to be implemented to evaluate the appropriateness of the POLS model to be used in this research. Firstly, the BPLM test is utilized to do comparison among the POLS model and the Random Effect Model (REM). Next, in order to identify either FEM or POLS model can enhance

the model fitness more significantly, the Poolability F-test is implemented. In addition, STATA may be used to generate both tests.

Based on POLS model, the econometric model in this study is expressed as follows:

$$NPL_{it} = \beta_0 + \beta_1 BS_{it} + \beta_2 CAR_{it} + \beta_3 ROE_{it} + \beta_4 MGT_{it} + \beta_5 TAX_{it} + \beta_6 BOD_{it} + \beta_7 INDIR_{it} + \beta_8 CEOD_{it} + \beta_9 FEMALE_{it} + \beta_{10} NSSB_{it} + \beta_{11} PHD_{it} + \beta_{12} FINANCE_{it} + \beta_{13} BIG4_{it} + \beta_{14} GDP_{it} + \beta_{15} INF_{it} + \varepsilon_{it}$$

### 3.4.1.2 Fixed Effect Model (FEM)

FEM is a statistical model with the assumption of the unnoticed variables can have any coalitions with the observed variables. This model forecasts several excluded factors from a size of the sample with a large population within the period to eliminates the excluded variable prejudice (Kropko & Kubinec, 2020). Besides, it assumes that the differences between individuals can be served from different intercept. Dummy variable technique is used to estimate the FEM panel data in order to capture the differences between individuals. In addition, FEM has become a solution to the strict exogeneity assumption in POLS models for consistency through getting rid of the idiosyncratic which means from both sides of the equation. Nevertheless, time-varying covariates must not be interrelated with the time-varying error term so as to reach the purpose of consistency in this model (Collischon & Eberl, 2020).

Moreover, one must be aware of using FEM because it has very high chances of getting multicollinearity. All the dummy variables are tended to correlate with each other. In addition, this model might face the problem of losses of degree of freedom due to the loss of information in the data. FEM also not suitable to use for estimating absolute group variances like gender and wage gaps because it cannot evaluate the coefficients of time-constant covariates at the same investigation level. Other than that, this model is more sensitive to measurement error as compared to POLS model as it may cause the coefficient estimates to become biased (Angrist & Pischke, 2010). There is also a severe reverse causality problem arises from this model (Vaisey & Miles, 2014). Furthermore, there is a problem where researchers must be

aware of the external validity when using this model. It is a generalizability of the estimation results (Bell & Jones, 2015). Moreover, FEM having a problem of large standard error. Hence, researchers should not only consider the statistical significance only but also the size of coefficients to get an accurate result (Hill, Davis, Roos, & French, 2019).

Furthermore, it is widely utilized by researchers to investigate the banks' credit risk. The Hausman test is applied to choose between FEM and REM (Cooper & Hedges, 1993). For instance, FEM is being used in the research that study the Islamic bank credit risk (Misman, Bhatti, Lou, Samsudin, & Rahman, 2015). The result presented that the ratio of total equity to total asset, loan loss provision to total assets, total financing to total assets, TIER 1 & TIER 2 to total assets, and the net profit margin are all significant to explain the credit risk of Malaysia Islamic Banking system. Other than that, Rahman and Shahimi (2010) also mentioned that FEM are much superior to the REM after generating the R-squared test and Durbin Watson (D.W) statistics. Moreover, FEM is applied to identify the relationship on how size affects the credit risk in Islamic bank (Alzoubi & Obeidat, 2020).

In this research, the econometric model is demonstrated as follows according to the Fixed Effect Model:

$$NPL_{it} = \beta_0 + \beta_1 BS_{it} + \beta_2 CAR_{it} + \beta_3 ROE_{it} + \beta_4 MGT_{it} + \beta_5 TAX_{it} + \beta_6 BOD_{it} + \beta_7 INDIR_{it} + \beta_8 CEOD_{it} + \beta_9 FEMALE_{it} + \beta_{10} NSSB_{it} + \beta_{11} PHD_{it} + \beta_{12} FINANCE_{it} + \beta_{13} BIG4_{it} + \beta_{14} GDP_{it} + \beta_{15} INF_{it} + \mu_{it} + \varepsilon_{it}$$

### **3.4.1.3 Fixed Effect Model Robust Standard Errors Clustered by Islamic Banks (FER)**

FER is an additional model that makes the dependence form of data become sturdy to develop unprejudiced standard error associated with precise confidence intervals. The advantage of the robust estimator increases when the time-series become longer where it does not get biased or significantly more disperse. After applied the robust effect, all the data is not only consistent but also behaves well in finite samples. The

robust estimator is unbiased in a normal size sample even though it is slightly biased downward if the cross-sectional sample is very small. The variance of the estimator generally rises when the sample becomes small but stay moderate at normal sample sizes (Kezdi, n. d.). The larger the difference of the robust standard errors, the stronger the evidence for misspecification.

Besides, there must be some limitation appear in this model like it is not possible for robust standard errors to be consistent and diagnostic under all types of misspecifications. There will be a bias where no robust estimator can raise the omitted variables that are unrelated to those included but still crucial. There are also a lot of various test and diagnostic procedures should be used to assess whether the assumptions of the model are consistent with the data. This model also does not take into account the problem of endogeneity, measurement error, and missing data (King & Roberts, 2014).

The Fixed Effect Model Robust Standard Errors in this study can be illustrated as follows:

$$NPL_{it} = \beta_0 + \beta_1 BS_{it} + \beta_2 CAR_{it} + \beta_3 ROE_{it} + \beta_4 MGT_{it} + \beta_5 TAX_{it} + \beta_6 BOD_{it} + \beta_7 INDIR_{it} + \beta_8 CEOD_{it} + \beta_9 FEMALE_{it} + \beta_{10} NSSB_{it} + \beta_{11} PHD_{it} + \beta_{12} FINANCE_{it} + \beta_{13} BIG4_{it} + \beta_{14} GDP_{it} + \beta_{15} INF_{it} + \mu_{it} + r\beta\epsilon_{it}$$

#### 3.4.1.4 Random Effect Model (REM)

REM is also a panel data regression model. This model estimates panel data where interference variables may be interconnected between time and individuals. The variance between intercepts is served by the error terms of individual (Zulfikar, n. d.). Besides, REM follows the principle of maximum likelihood also known as general least square method. This model can also eliminate the heteroscedasticity. All the unnoticed variables are assumed to be statistically independent of or uncorrelated with all the observed variables (Allison & Waterman, n. d.). The estimator should generate more essential outcomes with an extremely variable data set in this model (Francis, 2013).

Furthermore, there are some advantages in estimating REM like the number of unknown parameters have been reduced as compared to FEM. Besides, the number of independent variables has been reduced and hence there is less possibility to have multicollinearity problem appear in this model. The time invariant variables such as gender can also be included in this model.

In addition, there is research conducted by Yuniarti and Effendi (2018) in respect of the effect of macroeconomic variables including inflation rate, unemployment rate, and GDP on the credit risk of Islamic banking of Indonesia. The result of this research is significant when using REM in the panel data regression. Besides, Nugraheni and Muhammad (2019) also applied the REM to investigate the empirical evidence on credit risk in Indonesian Islamic banks.

The random effects model in this study is constructed as follows:

$$NPL_{it} = \beta_0 + \beta_1 BS_{it} + \beta_2 CAR_{it} + \beta_3 ROE_{it} + \beta_4 MGT_{it} + \beta_5 TAX_{it} + \beta_6 BOD_{it} + \beta_7 INDIR_{it} + \beta_8 CEOD_{it} + \beta_9 FEMALE_{it} + \beta_{10} NSSB_{it} + \beta_{11} PHD_{it} + \beta_{12} FINANCE_{it} + \beta_{13} BIG4_{it} + \beta_{14} GDP_{it} + \beta_{15} INF_{it} + w_{it}$$

### 3.4.2 Panel Data Analysis

#### 3.4.2.1 Poolability F-Test

In order to determine the model with greater significance among POLS and FEM to improve the model goodness-of-fit, the Poolability F-test is utilized. This test used to examine the constant cross-sections or constant in times in case of POLS model. Poolability F-test is used in this study to assess the poolability over the cross-sections in panel data models.

Hypothesis:

H<sub>0</sub>: POLS regression model is applicable.

H<sub>1</sub>: FEM is applicable.

The F-test statistic formula is as followed:

$$F = \frac{(R^2_{FEM} - R^2_{Pooled}) / (k_{FEM} - k_{pooled})}{(1 - R^2_{FEM}) / [n - (k_{FEM} + 1)]}$$

The test statistic is considered as an asymptotic extension of ANOVA where the statistic evaluates the difference between the null and the alternative models using the ANOVA form (Yoshida, 2002).

#### **3.4.2.2 Breusch-Pagan Lagrange Multiplier (BPLM) Test**

BPLM test also known as LM test. It helps researcher to determine the appropriate model that can be used in the research between random effects regression and a POLS regression (Reyna, 2007). Meanwhile, to identify the existence of the spatial error correlation along with the random region effects in the panel data regression model, BPLM test is developed (Baltagi et al., 2012). LM test can also be used for testing the heteroscedasticity available in the model (Pedace, 2016). If there is some linear relationship between the error variances and the regressors only then the test is fulfilled the consistency (Zaman, 2000).

Hypothesis:

H<sub>0</sub>: Pooled OLS is recommended.

H<sub>1</sub>: REM is recommended.

#### **3.4.2.3 Hausman Test**

Hausman test provides researcher a way to select which model is best fit in this study between the REM and FEM (Hausman, 1978). It used to test the availability

of endogeneity in a panel model. The Hausman test is applicable when the null hypothesis involved one of the contrast models provides compatible and efficient outcomes and another model is compatible but inefficient. Meanwhile the alternative hypothesis required the initial model is incompatible and the following model is compatible (Chmelarova, 2007).

Hypothesis:

H<sub>0</sub>:  $Cov(\mu_i, x_{it}) = 0$  (REM is preferable) (Exogeneity)

H<sub>1</sub>:  $Cov(\mu_i, x_{it}) \neq 0$  (FEM is preferable) (Endogeneity)

Exogeneity means that the relationship among the error term and the independent variables in the panel data model is zero while endogeneity refers to the relationship among the error term and the independent variables in the panel data model is statistically significant (Sheytanova, 2014).

### **3.4.3 Econometric Diagnosis Testing**

#### **3.4.3.1 Multicollinearity**

When there are multiple independent variables highly associated with each other, multicollinearity issue occurs. The result of the regression model is complicated to be interpreted when multicollinearity problem arises in the model. The null hypothesis will be hard to reject because the estimators will have large variances and the standard error will increase and cause the t-statistic value to reduce which may leads to a wider confidence interval. Hence, this multicollinearity problem should be detected in this study by using pairwise correlation analysis through STATA. If the association between two factors is greater than 0.8, then the problem of multicollinearity is likely to occur. The reason of choosing pairwise correlation analysis to test the multicollinearity is because it is easier to be identify the problem and does not required formula to do so.

### 3.4.3.2 Normality

Normality is where error terms must be normally distributed based on the assumption of Classical Linear Regression Models (CLRM). If not, there might be led to the regression result inaccurate. Thus, it is important to utilize Jarque-Bera test to find out the skewness and kurtosis of a sample data in order to examine the normality. The reason of choosing this test to examine the normality is because it is commonly to be used and straightforward. However, the sample mean is assumed to be normally distributed if the sample size rises which based on the Central Limit Theorem (Kwak & Kim, 2017). When the sample size exceeds 100, the spread of sample means will automatically normalize. Therefore, skewness and kurtosis test will be adopted if researchers fail to apply JB test in the large sample.

Hypothesis:

H<sub>0</sub>: Error terms are normally distributed.

H<sub>1</sub>: Error terms are not normally distributed.

### 3.4.3.3 Heteroscedasticity

Heteroscedasticity problem happens when the variance of error term is inconstant across the observations discussed. In other words, heteroscedasticity take place if there is some misspecification caused by unrealized nonlinear predictors situation or neglected predictors excluded out from the regression model. The effect of heteroscedasticity will cause the least square estimator to be unbiased and inefficient. Therefore, this problem can be detected by using graphical method or formal test such as white test and modified Wald test. White test is commonly used by researcher while modified Wald test is for groupwise heteroscedasticity that is used when FEM is applied.

Hypothesis:

H<sub>0</sub>: Homoscedasticity exists in the model.

H<sub>1</sub>: Heteroscedasticity exists in the model.



#### **3.4.3.4 Autocorrelation**

Autocorrelation happens when error terms are correlated in spatially or serially. There are two classes of autocorrelations including pure serial correlation and impure serial correlation. Pure serial correlation problem is directly related to the error term of the true specification of an equation. Meanwhile, the impure serial correlation problem lies on other than the error term like specification bias including omitted variables or an incorrect functional form. This problem will lead to the least square estimation to be unbiased and inefficient. Its variance will be understated or overstated as well as not in an asymptotic condition. Furthermore, a greater t-statistic will be obtained because of a smaller standard error as well as result to the variables change from insignificant to significant. Besides, the optimistic characteristic for a least square estimation will not be satisfied. One of the techniques to find out autocorrelation problem is making use of the Wooldridge test. This test is chosen because it can be implemented under general conditions and is easy to apply. This test also has good size and power properties in soundly sized samples (Drukker, 2003).

Hypothesis:

H<sub>0</sub>: There is no autocorrelation problem.

H<sub>1</sub>: There is autocorrelation problem.

### **3.5 Gradually Analysis**

Gradually analysis is applied to investigate the relationship and significance between each independent variable towards each category of determinants including bank specific, bank governance, Shariah governance, audit, and economics factors.

### **3.6 Conclusion**

In the nutshell, this chapter identifies the sources of data obtained, generates model alternative, and determines the relevant statistical testing as well as empirical testing to be used in this study. STATA is the software that going to be applied to analyze the data. The empirical results and the explanation of the findings in this study will be discussed in Chapter 4.

## **CHAPTER 4: RESULTS AND INTERPRETATION**

### **4.0 Introduction**

Throughout Chapter 4, STATA will be adopted to investigate the determinants affecting Islamic banks' credit risk between different regions. It is crucial to know whether the collected data are properly for interpretation in terms of graphs and tables. Firstly, a descriptive analysis will be conducted to summarize the data before conducting further statistical analysis. Since the collected data is a combination of cross-sectional and time series data, a panel data regression is necessary to be carried out. The empirical findings can help to find out which of the econometric model is the best to be used in the study. Then, some tests such as Poolability F-test will be applied to determine which of the model is more significant to achieve research objectives. Lastly, econometric diagnosis testing must be performed to check for any potential econometric error.

## 4.1 Descriptive Analysis

In this research, 59 Islamic banks from ASIA and MENA region in the range of year 2010 to 2019 are being selected as the sample. Table 4.1 shows the mean, standard deviation, minimum and maximum value, and skewness for banks' credit risk. The respective explanatory variables namely bank size, capital adequacy ratio, return on equity, management efficiency, taxation ratio, size of BOD, size of independent director, CEO duality, female director in BOD, Shariah supervisory board size, PHD degree holder on SSB, SSB members having expertise in finance-related areas, type of audit firm, GDP growth rate and inflation rate.

Table 4.1: Descriptive Statistics

Variable	Obs	Mean	Std. dev.	Min	Max	Median	Variance	Skewness	Kurtosis
NPL	529	4.86	4.62	0.00	28.85	3.49	21.31	1.68	6.17
BS	588	25.24	2.90	19.85	32.47	25.02	8.38	0.34	2.52
CAR	569	18.23	9.76	9.78	123.43	16.27	95.25	6.29	55.62
ROE	555	9.47	9.07	-45.32	37.84	10.41	82.26	-2.01	12.40
MGT	588	0.87	0.13	0.00	1.41	0.88	0.02	-1.68	15.28
TAX	513	22.92	46.90	-665.63	378.35	26.81	2199.37	-8.78	135.44
BOD	589	8.71	3.85	2.00	25.00	9.00	14.82	1.33	5.51
INDIR	461	0.34	0.26	0.00	1.00	0.36	0.07	0.21	2.10
CEOD	464	0.03	0.18	0.00	1.00	0.00	0.03	5.29	28.97
FEMALE	587	0.06	0.12	0.00	0.67	0.00	0.01	2.90	12.26
NSSB	556	4.08	2.30	1.00	12.00	3.00	5.28	1.44	5.54
PHD	525	0.71	0.33	0.00	1.00	0.80	0.11	-0.90	2.60
FINANCE	406	0.12	0.21	0.00	1.00	0.00	0.04	1.96	6.75
BIG4	588	0.72	0.45	0.00	1.00	1.00	0.20	-1.00	1.99
GDP	590	4.70	2.80	-4.71	19.59	4.88	7.85	1.56	12.30
INF	590	3.88	3.06	-2.43	12.94	3.20	9.39	1.01	4.03

#### **4.1.1 Non-Performing Loans (NPL)**

According to Table 4.1, the Non-Performing Loans (NPL) has a mean value of 4.86 and a median value of 3.49. The range of credit risk is from 0 to 28.85 while its standard deviation is 4.62. It is skewed to right at 1.68 which is positive value, and its kurtosis coefficient will be 6.17.

#### **4.1.2 Bank Size (BS)**

Based on Table 4.1, the bank size has a mean value of 25.24 and a median value of 25.02. The range of bank size between the maximum value and minimum value will be 12.62. Its standard deviation is 2.9. It is also skewed to right at 0.34 which is positive figure, and its kurtosis coefficient will be 2.52.

#### **4.1.3 Capital Adequacy Ratio (CAR)**

Referring to Table 4.1, the CAR has a mean value of 18.23 and a median value of 16.27. The range of CAR will be 113.65 while the standard deviation is 9.76. It is skewed to right at 6.29 which is positive value, and its kurtosis coefficient will be 55.62.

#### **4.1.4 Return on Equity (ROE)**

As stated by Table 4.1, the ROE has a mean value of 9.47 and a median value of 10.41. The range of ROE is 83.16 whereas the standard deviation is 9.07. It is skewed to left at -2.01 which is negative value, and its kurtosis coefficient will be 12.4.

#### **4.1.5 Management Efficiency (MGT)**

Referring to Table 4.1, the MGT has a mean value of 0.87 and a median value of 0.88. The range of MGT will be 1.41 as well as the standard deviation at 0.13. It is skewed to left at -1.68 which is negative value, and its kurtosis coefficient will be 15.28.

#### **4.1.6 Taxation ratio (TAX)**

According to Table 4.1, the taxation ratio has a mean value of 22.92 and a median value of 26.81. The range of taxation ratio between the maximum value and minimum value will be 1043.98. Its standard deviation is 46.9. It is skewed to left at -8.78 which is negative value and kurtosis coefficient will be 135.44.

#### **4.1.7 Board Size (BOD)**

According to Table 4.1, the number of BOD has a mean value of 8.71 and a median value of 9. The range of BOD is 23 and its standard deviation is 3.85. It is skewed to right at 1.33 which is positive value, and the kurtosis coefficient will be 5.51.

#### **4.1.8 Independent Director on Board (INDIR)**

According to Table 4.1, the percentage of independent director on board has a mean value of 0.34 and a median value of 0.36. The range of independent director will be 1 while the standard deviation is 0.26. It is skewed to right at 0.21 which is positive value, and its kurtosis coefficient will be 2.1.

#### **4.1.9 CEO Duality (CEOD)**

Refer to Table 4.1, the CEO duality has a mean value of 0.03 and a median value of 0. The range of CEO duality will be 1 and the standard deviation is 0.18. It is skewed to right at 5.29 which is positive value, and its kurtosis coefficient will be 28.97.

#### **4.1.10 Female Director on Board (FEMALE)**

According to Table 4.1, the percentage of female director on board has a mean value of 0.06 and a median value of 0. The range of female director is 0.67 while the standard deviation is 0.12. It is skewed to right at 2.9 which is positive value, and its kurtosis coefficient will be 12.26.

#### **4.1.11 Size of Shariah Supervisory Board (NSSB)**

According to Table 4.1, the number of Shariah Supervisory Board members has a mean value of 4.08 and a median value of 3. The range of NSSB is 11 whereas the standard deviation is 2.3. It is skewed to right at 1.44 which is positive value, and its kurtosis coefficient will be 5.54.

#### **4.1.12 PhD Degree Holder on SSB (PHD)**

Based on Table 4.1, the number of PHD degree holder in Shariah Supervisory Board has a mean value of 0.71 and a median value of 0.8. The range of PHD degree holder is 1 while the standard deviation is 0.33. It is skewed to left at -0.9 which is negative value, and its kurtosis coefficient will be 2.6.

#### **4.1.13 SSB Members Expertise in Finance-Related Areas (FINANCE)**

According to Table 4.1, the percentage of SSB Members expertise in finance-related areas has a mean value of 0.12 and a median value of 0. The range of female director will be 1 and its standard deviation is 0.21. It is skewed to right at 1.96 which is positive value, and the kurtosis coefficient will be 6.75.

#### **4.1.14 Type of Audit Firm (BIG4)**

According to Table 4.1, the type of audit firm has a mean value of 0.72 and a median value of 1. The range of BIG 4 audit firm between the maximum value and minimum value will be 1. The standard deviation is 0.45. It is skewed to left at -1 which is negative value, and its kurtosis coefficient will be 1.99.

#### **4.1.15 Gross Domestic Product Growth Rate (GDP)**

According to Table 4.1, the GDP growth rate has a mean value of 4.7 and a median value of 4.88. The GDP growth rate between the maximum value and minimum value will be 24.3. The standard deviation is 2.8. It is skewed to right at 1.56 which is positive value, and the kurtosis coefficient will be 12.3.

#### **4.1.16 Inflation Rate (INF)**

According to Table 4.1, the inflation rate has a mean value of 3.88 and a median value of 3.2. The range of inflation rate between the maximum value and minimum value will be 15.37. The standard deviation is 3.06. It is skewed to right at 1.01 which is positive value, and its kurtosis coefficient will be 4.03.



## 4.2 Panel Data Analysis

Table 4.2: Panel Data Analysis

FACTORS	VARIABLES	(1)	(2)	(3)	(4)
		POLS NPL	FEM NPL	FER NPL	REM NPL
BANK SPECIFIC	BS	0.23550 (0.14952)	-1.16813*** (0.36647)	-1.16813** (0.50432)	0.11546 (0.18237)
	CAR	-0.07352** (0.03487)	-0.07626** (0.02974)	-0.07626** (0.03221)	-0.08089** (0.03177)
	ROE	-0.20541*** (0.03689)	-0.04340 (0.02850)	-0.04340** (0.02076)	-0.07248** (0.03126)
	MGT	-3.59194* (1.91103)	-3.87056*** (1.22682)	-3.87056*** (1.24285)	-4.17764*** (1.39660)
	TAX	-0.00158 (0.00423)	-0.00356 (0.00263)	-0.00356** (0.00155)	-0.00280 (0.00300)
	BANK	BOD	0.33247*** (0.09476)	-0.22347* (0.11979)	-0.22347** (0.08813)
GOVERNANCE	INDIR	4.64318*** (1.11967)	1.69802* (1.01211)	1.69802 (1.09915)	2.52542** (1.02689)
	CEOD	4.70645*** (1.72094)	-3.39450** (1.36359)	-3.39450*** (0.78258)	-1.17902 (1.48370)
	FEMALE	-5.01927** (2.14014)	1.49548 (1.71804)	1.49548 (2.46907)	-1.67325 (1.82978)
SHARIAH	NSSB	-1.43211*** (0.21914)	-0.91004*** (0.17967)	-0.91004*** (0.25330)	-1.26300*** (0.17785)
GOVERNANCE	PHD	-2.33839*** (0.75798)	-0.31558 (0.77417)	-0.31558 (0.90860)	-1.51688* (0.79091)
	FINANCE	2.85752*** (1.03419)	-2.18874** (1.09456)	-2.18874 (1.54011)	-1.04740 (1.10838)
AUDIT	BIG4	-1.98594*** (0.61554)	1.43737*** (0.47816)	1.43737** (0.69384)	0.36662 (0.51660)
MACROECONOMIC	GDP	-0.13278 (0.11732)	-0.16737* (0.09620)	-0.16737** (0.06606)	-0.06430 (0.09531)
	INF	0.07954 (0.09089)	-0.18831*** (0.06649)	-0.18831* (0.09895)	-0.02389 (0.06821)
	Constant	9.69070** (4.80425)	45.18493*** (9.43698)	45.18493*** (12.61085)	13.09904** (5.45409)
	Observations	245	245	245	245
	R-squared	0.59882	0.35036	0.35036	
	Number of idc		33	33	33

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Before deciding which of the model is the most suitable in determining the factors of credit risk towards Islamic banks, there are three different tests which are the

Poolability F-test, Breusch-Pagan Lagrange Multiplier (BPLM) test and Hausman test.

Firstly, Poolability F-test was conducted to compare whether the POLS model and the FEM model. According to Appendix 4.2, the result shows that the probability  $> F(15,197)$  at 0.0000, which is smaller than 0.05. Therefore, the NPL is significant at the significance level of 5% and the alternative hypothesis is accepted. This can summarize that FEM model increases more significantly in the term of goodness-of-fit and more applicable to determine the credit risk.

Besides, BPLM test was carried out to compare the POLS model and REM. Based on Appendix 4.6, the null hypothesis is rejected as the probability  $> \chi^2$  at 0.0000 that are less than 0.05. Therefore, REM is recommended to be used as the empirical model of this study.

Thirdly, the Hausman test is applied to test whether the REM or FEM providing a better and consistent outcome. According to Appendix 4.5, probability  $> \chi^2$  at 0.0000 that are lower than 5% significance level. Thus, FEM is more desirable, and researchers should reject the null hypothesis.

In conclusion, the tests implicate that there is adequate evidence to prove that FEM will be more appropriate in this study since it fulfilled the F-test and Hausman test. However, an additional model that is known as FER can be adopted because the robust estimators can achieve unbiased parameter estimates.

According to Table 4.2, FER able to generate unbiased standard error and confidence intervals accurately as there are 11 significant independent variables. The variables including bank size, CAR, ROE, management efficiency, taxation ratio, BOD, CEO duality, Shariah supervisory board size, GDP growth rate and inflation rate are having negative association with NPL, which means the higher the ratio, the smaller the credit risk. There is positive association between the type of audit firm and NPL which means the credit risk becomes higher if the bank is audited by Big 4 firm with strict regulations.

### 4.3 Diagnostic Checking

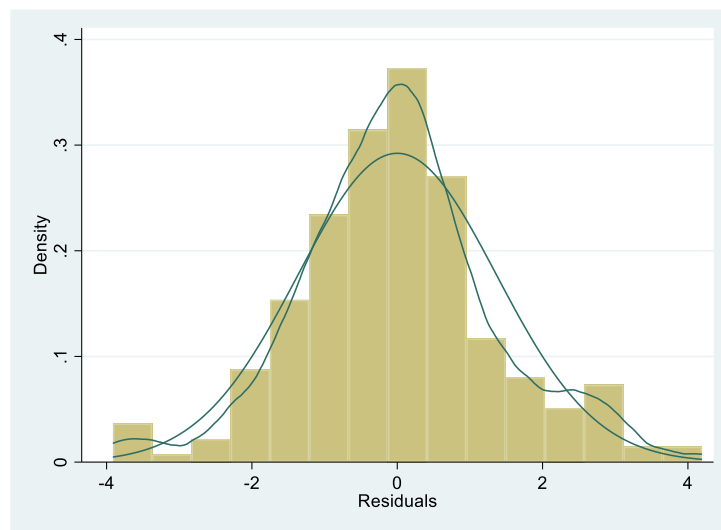
#### 4.3.1 Normality Test

Table 4.3: Skewness and Kurtosis Tests for Normality

-----joint test -----

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	Adj chi2(2)	Prob>chi2
myResiduals	253	0.4459	0.0429	4.72	0.0946

Figure 4.1: Histogram for Normality test



To test the existence of normality, Jarque-Bera (JB) test is usually being utilized. However, it was failed to apply in this research. This is because central limit theorem (CLT) of statistics said the distribution will tend to become normal especially when there are a large number of independent random variables over 30 (Ross, 2000). The distribution of the data collected will be approximately normal because the sample size is 590 (59 banks multiplied by 10 years). In order to substitute the function of JB test, another skewness and kurtosis test is being adopted by using STATA.

Based on Table 4.3, the normal distribution has a skewness of 0.45, indicates that the distribution is approximately symmetric because the skewness is between -0.5 and 0.5. Meanwhile, the histogram shows the bell curve which means the distribution is normal as its standard deviation depicting the curve's relative width with respect to its mean. Hence there is enough proof to suppose that the error term is normally distributed at a significance level of 0.05.

### 4.3.2 Multicollinearity Test

Table 4.4: Pairwise Correlation Analysis

	BS	CAR	ROE	MGT	TAX	BOD	INDIR	CEOD	FEMALE	NSSB	PHD	FINANCE	BIG4	GDP	INF
BS	1														
CAR	-0.2726*	1													
ROE	0.1454*	-0.1735*	1												
MGT	0.2143*	-0.0722	-0.0328	1											
TAX	0.1257*	-0.0534	0.0404	0.0028	1										
BOD	-0.1568*	-0.0792	0.2690*	-0.1403*	0.1385*	1									
INDIR	-0.0908	-0.0066	-0.1014*	-0.0795	-0.0443	-0.2742*	1								
CEOD	-0.0914*	0.012	0.0746	-0.3523*	0.0287	-0.1853*	-0.0891	1							
FEMALE	0.2645*	0.0715	-0.0391	0.1763*	0.0381	-0.2548*	0.0172	0.0446	1						
NSSB	-0.1911*	-0.1486*	0.1291*	-0.0933*	0.1059*	0.5980*	0.0692	-0.1260*	-0.0464	1					
PHD	-0.3941*	0.2453*	-0.2341*	0.0419	-0.1848*	-0.3369*	0.1799*	-0.1026*	-0.0216	-0.2019*	1				
FINANCE	0.2631*	-0.1141*	-0.0123	-0.0902	0.0388	-0.1826*	0.2063*	0.1004	-0.0213	0.0431	-0.3324*	1			
BIG4	-0.5234*	0.1418*	0.0029	-0.0744	-0.1617*	-0.1870*	0.1513*	0.0718	-0.2135*	-0.1444*	0.3215*	-0.0446	1		
GDP	0.1295*	0.0072	0.0572	0.0229	0.0062	0.0744	-0.0375	-0.1198*	0.0816*	0.2117*	-0.1666*	0.1957*	-0.1467*	1	
INF	0.4354*	-0.1909*	0.1491*	0.0026	0.1432*	0.2027*	-0.0852	0.0483	0.0631	-0.0911*	-0.4907*	0.0082	-0.4309*	-0.1006*	1

Multicollinearity issue can be distinguished by using pairwise correlation analysis in STATA. According to Table 4.4, the outcome presenting that all of the pairwise correlation coefficient are between -0.8 and 0.8. In other words, there is no combination of factors are highly connected with each other. Moreover, the NSSB and BOD are the highest positive correlated combination as the value of correlation coefficient at 0.598. In addition, the pair of management efficiency and inflation has the lowest significant positive correlation at 0.0026. Meanwhile, the combination of inflation and PHD have the highest adverse association at -0.4907 whereas the combination of INDIR and CAR have the lowest negative correlation at -0.0066.

### 4.3.3 Heteroscedasticity Test

Figure 4.2: Modified Wald Test for Groupwise Heteroscedasticity in FER

H0:  $\sigma(i)^2 = \sigma^2$  for all i

$$\text{chi2 (33)} = 9579.83$$

$$\text{Prob} > \text{chi2} = 0.0000$$

Heteroscedasticity implies that the variance of margin of error is not constant across the observations, and it can be detected by using modified Wald test. When the probability is less than 0.05, researchers should reject the null hypothesis because there is heteroscedasticity problem. However, this issue can be solved by using robust standard errors in FER model.

### 4.3.4 Autocorrelation Test

Figure 4.3: Wooldridge Test for Autocorrelation in Panel Data

H0: no first-order autocorrelation

$$F(1, 28) = 50.721$$

$$\text{Prob} > F = 0.0000$$

Autocorrelation indicates that the error terms are correlated in spatially or serially and it is usually detected by using Wooldridge test. When the probability is less than 0.05, researchers should reject the null hypothesis because there is autocorrelation problem. However, this issue can also be solved by using robust standard errors in FER model.

## 4.4 Inferential Analysis

### 4.4.1 R-Squared

The definition of R-squared is the goodness of fit of a model as it represents how much percentage of dependent determinants can be explained by every independent determinant. Researchers can use it to find how the factors namely bank size, capital adequacy ratio, return on equity, management efficiency, taxation cost, size of BOD, size of independent director, CEO duality, female director in BOD, Shariah supervisory board size, PHD degree holder on SSB, SSB members having expertise in finance-related areas, type of audit firm, GDP growth rate and inflation rate to clarify the NPL. Table 4.2 shows that the r-squared value for FER model is 0.35036. This implies that there is 35.04% of credit risk variation can be described by the variation of explanatory variables collected ranging year 2010 to 2019.

### 4.4.2 F-Test

Table 4.5: F-Test Result

Source	SS	df	MS
Model	3261.04882	15	217.403255
Residual	2184.74308	229	9.54036278
Total	5445.7919	244	22.3188192

Number of obs = 245

F (15,229) = 22.79

**Prob > F = 0.0000**

R-squared = 0.5988

Adj R-squared = 0.5725

Root MSE = 3.0887

$H_0$  = All explanatory variables are insignificant to explain the credit risk of Islamic banks.

$H_1$  = Minimum one of the explanatory variables is important to describe the Islamic banks' credit risk.

As stated by Table 4.5, the F-statistics probability is 0.0000, which means smaller than the 5% significance level. Hence, the null hypothesis should be rejected as there is enough proof to summarize that minimum one explanatory variable is significant to explain the Islamic banks' credit risk.

#### 4.4.3 Divergent Effects of Variables on Credit Risk

Table 4.6: Summary Table of Overall Findings

Independent Variable	Relationship with Credit Risk	Significance	Consistency with past studies
Bank Size (BS)	Negative	Significant	Yes
Capital Adequacy Ratio (CAR)	Negative	Significant	Yes
Return on Equity (ROE)	Negative	Significant	Yes
Management Efficiency (MGT)	Negative	Significant	Yes
Taxation Ratio (TAX)	Negative	Significant	No
Board Size (BOD)	Negative	Significant	Yes
Independent Director on Board (INDIR)	Positive	Insignificant	Yes
CEO Duality (CEOD)	Negative	Significant	Yes

Female Director on Board (FEMALE)	Positive	Insignificant	No
Size of Shariah Supervisory Board (NSSB)	Negative	Significant	Yes
PhD Degree Holder on SSB (PHD)	Negative	Insignificant	Yes
SSB Members Expertise in Finance-Related Areas (FINANCE)	Negative	Insignificant	Yes
Type of Audit Firm (BIG4)	Positive	Significant	No
Gross Domestic Product Growth Rate (GDP)	Negative	Significant	Yes
Inflation Rate (INF)	Negative	Significant	Yes

After running different tests, researchers can conclude that FER model will be the best model to describe how the independent variables affecting on Islamic banks' credit risk at 5% significance level. According to Table 4.6, the empirical findings (REM Model) show that there are 11 out of 15 variables found that having significant relationship with the NPL.

First of all, bank size is found that having important negative association with NPL. To explain in detailed, the larger the bank size, the lower the NPL. This is because



big banks tend to have more power in financial market and able to diversify loans easily (Alzoubi & Obeidat, 2020). Other supporting journals include of Supiyadi et al. (2017), Mokni et al. (2015) and Zolkifli et al. (2017) illustrate that big banks have better as risk management compared to small banks.

The CAR also poses a significant negative relationship with NPL, indicates that the higher the CAR, the smaller the NPL. A bank with high CAR will be more efficient in managing its assets and risk as well. There are many proofs showing that how a bank simultaneously monitors both of the elements to survive in long term period by referring Poetry and Sanrego (2011), Astrini et al. (2018) and Farika et al. (2018).

The outcomes proved that there is an important negative correlation between ROE and NPL. The higher the ROE, the smaller the NPL since a bank with high ROE usually is more stable to manage equity and loans at the same time. Sheefeni (2015), Shkodra and Ismajli (2017), Alandejani et al. (2014) said that banks must have sufficient knowledge on credit risks to maximize shareholders' benefit such as equity or earning.

Management efficiency is negatively correlated with NPL at 1% significance level referred to Table 4.6. The more efficient of the banks' management team in dealing operation issues, the lower the credit risk that it will face. The results from Zolkifli et al. (2018), Misman and Bhatti (2020), Havidz and Setiawan (2015) research told that an efficient banking system will have lower exposure to credit risks.

Besides, there is an important negative correlation between taxation ratio and NPL, which implies a higher taxation ratio will decrease the credit risks exposure, this is not consistent with previous studies such as Luo and Tanna (2014) and Gambacorta et al. (2017). This is because the zakat expenses and tax savings may help the Islamic banks to gain greater potential in the industry as a better capitalized banks will pay less on their non-equity funding.

The results depict that board size is negatively correlated with NPL where the more the number of directors on the board, the lower the credit risks. A large amount of board members can ensure the quality of risk management and investment decision.

Other studies such as Mathew et al. (2016), Bourakba and Zerargui (2015), Fakhrunnas and Ramly (2017) provide sufficient evidence to prove the negative association between board size and credit risk.

The number of independent directors on board illustrates an insignificant positive relationship with NPL. The reason behind is complex since the higher percentage of independent directors on the board will tend to focus more on shareholders' right such as dividend instead of the banks' performance on managing risk. There are similar discussions found from Frakhunnas and Ramly (2017), Andries and Brown (2017), Ballester et al. (2020) as well.

Table 4.6 depicts that CEO duality having a significant negative relationship with NPL. A leader with extraordinary management skills plays an important role in monitoring banks' performance and risk exposure. Therefore Al-Malkawi and Pillai (2018), Tadele and Kalyebara (2020), Sheikh (2019), Pathan (2009) and Grassa (2015) can explain this phenomenon.

However, the female director on board has an insignificant positive relationship with NPL. The research includes of Gulambussen and Santa (2015), Khaw et al. (2016), Karavitis et al. (2021), Arnaboldi et al. (2021). Chen et al. (2019) cannot explain this phenomenon because there is controversial whether the gender diversity is good to reduce credit risk facing by banks. The positive relationship takes place when female directors are more willing to take financing risks and causing the credit risks to increase.

In Table 4.6, Shariah Supervisory Board size has a significant inverse relationship with NPL, which states that the greater the board size, the lower the credit risk. Bourakba and Zerargui (2015) stated that many Shariah committee will contribute higher effectiveness on decision making such as applying loans. This statement can be justified more details by studying other journals like Fakhrunnas and Ramly (2017), Safiullah and Shamuddin (2018) and Najwa et al. (2019).

Additionally, Shariah Supervisory Board members who have PhD degree or have experience in finance are found that having insignificant negative relationship with

NPL. Ginena and Hamid (2015) and Veltrop et al. (2017) said manager who has higher or specialized academic qualification are assumed to have wiser mindset to improve the banks' profitability. However, based on this study, researchers can conclude that the education level of board members are not very important towards the credit risk facing by the firms. Safiullan and Shamsuddin (2018) and Jabari and Muhamad (2021) already promoted the insignificant relationship between PhD degree holder and NPL and the insignificant relationship between finance expert and NPL.

Moreover, the results show that the NPL will become higher when the type of audit firm is under Big 4. This can be explained by the figure interpreted by professional firms usually is above than average index due to the big firms must follow more policies and regulations. However, the findings from Balakrishnan et al. (2020) and Heningtyas et al. (2019) cannot apply in this study.

Meanwhile, GDP growth rate has a strong negative association with NPL, indicates that the higher the GDP growth rate, the smaller the credit risk. Higher GDP growth represents the economic is expanding and citizens will have greater purchasing power or they able to pay loan on time so Islamic bank's credit risk will subsequently decrease. This statement can be supported by much research such as Kabir et al. (2015), Haryono et al. (2016), Tabash and Anagreh (2017) and Wiryono and Effendi (2018).

Lastly, inflation rate has a significant negative association with NPL, represents that the increasing inflation rate causing the credit risk grow as well. As a result of inflationary pressure, business organization will get benefit as their revenue increases from the rising price level. Thus, they can make their loans repayments quickly and Islamic banks will be less likely to be defaulted. The interpretation can be supported by Wiryono and Effendi (2018), Aysan et al. (2018) and Bahloul et al. (2017).

### 4.4.4 Gradually Analysis

Table 4.7: Gradually Analysis

VARIABLES	(1) Bank Specific	(2) Corp Governance	(3) Shariah Governance	(4) Audit	(5) Economics
NPL					
BS	-0.539 (0.414)	-1.014** (0.475)	-0.751 (0.619)	-0.768 (0.555)	-1.168** (0.504)
CAR	-0.0649* (0.0363)	-0.0736** (0.0351)	-0.0785** (0.0304)	-0.0781** (0.0316)	-0.0763** (0.0322)
ROE	-0.163*** (0.0434)	-0.0911*** (0.0272)	-0.0479* (0.0279)	-0.0370* (0.0209)	-0.0434** (0.0208)
MGT	-2.416*** (0.898)	-2.813** (1.153)	-3.517*** (1.117)	-3.692*** (1.165)	-3.871*** (1.243)
TAX	0.00831*** (0.00193)	0.00509*** (0.00117)	-0.00420*** (0.000873)	0.00330*** (0.00112)	0.00356** (0.00155)
BOD		-0.117 (0.0774)	-0.226** (0.0930)	-0.247*** (0.0895)	-0.223** (0.0881)
INDIR		1.333 (1.135)	1.285 (1.114)	1.255 (0.991)	1.698 (1.099)
CEOD		-2.737*** (0.559)	-3.553*** (0.813)	-3.434*** (0.770)	-3.395*** (0.783)
FEMALE		2.542 (2.010)	1.115 (2.610)	1.470 (2.463)	1.495 (2.469)
NSSB			-0.862*** (0.235)	-0.805*** (0.210)	-0.910*** (0.253)
PHD			-0.715 (0.795)	-0.104 (0.996)	-0.316 (0.909)
FINANCE			-1.477 (1.300)	-1.704 (1.315)	-2.189 (1.540)
BIG4				1.403** (0.607)	1.437** (0.694)
GDP					-0.167** (0.0661)
INF					-0.188* (0.0990)
Constant	23.31** (10.79)	35.82*** (12.51)	34.30** (15.06)	33.13** (13.94)	45.18*** (12.61)
Observations	438	321	245	245	245
R-squared	0.207	0.161	0.295	0.323	0.350
Number of idc	54	42	33	33	33

Robust standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Gradually analysis is taken to determine the relationship and significance between each explanatory variable towards each category of factors which are bank specific, bank governance, Shariah governance, audit, and macroeconomic factors.

Firstly, most of the components under bank specific category have significant relationship with NPL except bank size. The bank size is not significant before introducing to the other category. The relationship between credit risk with CAR, ROE and MGT is significantly negative, which means these financial ratios can help a bank to manage its asset, profitability and NPL well. These 3 variables remain statistically significant at least 10% significance level throughout the regression model so they are helpful in guiding Islamic banks to reduce credit risk in the future. The taxation ratio also plays an important role. This could be explained that at significance level of 1%, taxation ratio is significant to NPL until introducing macroeconomic variables. The taxation become significant at 5% significance level because its effect on NPL become not so directly especially when inflation takes place.

Secondly, there is only the CEO duality under corporate governance category have significant negative association with NPL while it remains significant throughout the regression model at significance level of 1%. This indicates that the effect of a good leader is stronger than other variables in monitoring credit risks. Thirdly, there is only the Shariah Supervisory Board size under Shariah governance category has a significant inverse relationship with NPL and it also remains significant throughout the regression model at significance level of 1%. Hence it is crucial about how to set SSB size to conduct meetings before making any decision about risk management. Nevertheless, size of BOD is not significant under its own category but is improved to 1% or 5 % significance level after introducing Shariah governance, audit and macroeconomic variables. In addition, the gender, independence, and education background can be concluded that they have less linkage with the change of NPL when they are not significant throughout the whole model.

Furthermore, in the audit pillar, the relationship between the type of audit firm (BIG4) and NPL is significantly positive, and it can remain significant at 5% significance level even after introducing economics variables. Hence, audit firm must be considered as one of the powerful explanatory variables to explain the credit risk. The last category will be economic, both GDP growth rate and inflation rate are significantly related with NPL but in reverse direction. GDP growth rate is more significant than inflation rate as it is 5% significance level rather than 10%. Therefore, it shows that macroeconomic factors can contribute largely into measurement of credit risks among Islamic banks.

## 4.5 Conclusion

STATA is adopted to run all the test and regression throughout this chapter. Descriptive statistics is conducted at the beginning. After running Poolability F-test, Hausman test and BPLM test, FEM is preferred among the regression models, but FER is chosen at the last stage after considering its robust to standard errors. The quality of the data gathered is satisfactory because it can pass all the tests to detect whether the existence of normality, multicollinearity, heteroscedasticity, and autocorrelation to show that there is no econometric problem in the results. In the FER model, there are 11 significant independent variables out of total 15 variables. The variables are bank size, CAR, ROE, management efficiency, taxation ratio, BOD, CEO duality, Shariah supervisory board size, GDP growth rate and inflation rate. Most of them are having negative relationship with NPL except the type of audit firm and NPL is positively related. Meanwhile, the insignificant variables are size of independent director, female director in BOD, PHD degree holder on SSB and SSB members having expertise in finance-related areas.

## **CHAPTER 5: DISCUSSION, CONCLUSION, AND IMPLICATIONS**

### **5.0 Introduction**

The study's major outcome will be summarised in Chapter 5. The summary of statistical analyses, key findings of results, study's implications and restrictions will be presented. In addition, some recommendations for future research will be made based on this study's limitations. Lastly, conclusion will be made to summarize this chapter at the end. This chapter is organised as follows: statistical analysis summary, discussion of major findings, study's implications, study's limitations, future recommendations, and conclusion.

## 5.1 Summary of Statistical Analysis

Table 5.1: Result of Summary of Diagnostic Checking

Diagnostic Checking	Value	Result
Skewness kurtosis test	P = 0.0000	The error term follows a normal distribution.
Pairwise correlations	Not more than 0.8	The multicollinearity issue not serious
Modified Wald test	P = 0.000	Heteroscedasticity issue is existed
Wooldridge test	P = 0.0000	Autocorrelation issue is existed
R-square	0.35036	The changes of explanatory variables could explain 35.036% of changes of non-performing loans (credit risk).
F-test	P = 0.0000	Minimum one explanatory variable is significant to justify the credit of Islamic bank at significant level of 5%.

Table 5.1 summarizes the results of the diagnostic checking that concluded in Chapter 4. According to the results, the model considered as normally distributed and does not have a multicollinearity problem. Nevertheless, the model encountered heteroscedasticity and autocorrelation problem. Moreover, r-square value indicated the changes of explanatory variables could explain 35.036% of the non-performing loans (credit risk) changes. The F-test result implied that one or more explanatory variable is important to elucidate the credit risk of Islamic banks at a significant level of 5%.



## **5.2 Discussion of Major Findings**

### **5.2.1 Non- Performing Loans (NPL)**

Many past studies have used the non-performing loan (NPL) ratio to measure credit risk in banking systems. Due to the various funding methods, Islamic banks' credit risk profile may differ from that of conventional banks. Kingu et al. (2018) stated that emphasis on the measuring and evaluating NPL ratio, it has an inverse correlation with the banks' total profitability, forcing banks to engage in lending behaviour. Christaria & Kurnia (2016) claimed that banks may face decreased profit margins as a result of the increased non-performing loans, potentially leading to a crisis if the problem worsens. On the contrary, with lower non-performing loan ratio, banks might be convinced to permit more credit, improving depositors' confidence and trust towards the banks.

### **5.2.2 Bank Size (BS)**

By referring the result of our study, the BS has a negatively significant effect on credit risk. This proved that when bank size is smaller, the credit risk will be higher. This statement supported by Alzoubi and Obeidat (2020), Mokni, Rajhi and Racdhi (2015), Supiyadi et al. (2017) as well as Zolkifli et al. (2018). According to Mokni, Rajhi and Racdhi (2015), they discovered that the greater the bank size, the lower the likelihood of defaulting. Large banks are able to diversify their portfolios because their portfolios are less concentrated.

### **5.2.3 Capital Adequacy Ratio (CAR)**

The results showed that increase in the capital adequacy ratio is significant and has a negative effect on credit risk. Astrini et al. (2014) mentioned that a higher CAR tends to enhance the bank's capacity to reduce the credit risk that occurs. The findings were supported by previous studies. For example, the studies of Poetry and

Sanrego (2011) and Farika et al. (2018) also discovered the same outcome with this research. Moreover, Farika et al. (2018) mentioned that based on the diligence and discipline in risk exposure management, Islamic banks can be strengthened by maintaining a higher capital adequacy ratio.

#### **5.2.4 Return on Equity (ROE)**

In this research, a significantly negative association is found between return of equity and credit risk. This statement is supported by the studies of Sheefeni (2015), Shkodra and Ismajli (2017) and Alandejani et al. (2014). As stated by Sheefeni (2015), when banks have higher probability, they are less enticed to earn profits, leading in banks being less restricted to conduct in riskier activities such as allowing risky loans. Moreover, Alandejani et al. (2014) stated that short-term impact of the management of Islamic banks may be inefficient in controlling the credit risk portfolios.

#### **5.2.5 Management Efficiency (MGT)**

Management efficiency was found to be negative and significant to credit risk in this study. The studies of Zolkifli et al. (2018), Misman and Bhatti (2020) and Havidz and Setiawan (2015) agreed on this statement. Zolkifli et al. (2018) declared that when the bank's efficiency in managing earning asset decreases, the bank tends to perceive higher risk. According to Havidz and Setiawan (2015), they believe that if banks put more effort into reducing average costs, improving efficiency levels, and achieving a climate of financial stability, the risks they face would be reduced.

### **5.2.6 Taxation Ratio (TAX)**

The result claimed that taxation ratio has a significantly negative effect on credit risk. In other word, our result claimed that higher the taxation ratio led to lower non-performing loan. However, all the previous studies stated that there is significant and positive correlation between taxation ratio and NPLs. The previous studies are provided by Luo and Tanna (2014) and Gambacorta et al. (2017). According to Gambacorta et al. (2017), poorly capitalised banks tend to clean up their balance sheets by writing off NPLs and acquiring more government securities with lower risk and lower regulatory capital costs when the tax rate is cut.

### **5.2.7 Board Size (BOD)**

The results showed that Board size has negatively significant influence on credit risk. Mathew, Ibrahim and Archbold (2016), Fakhrunnas and Ramly (2017) and Bourakba and Zerargui (2015) agree on the negative relationship between the variables. Ibrahim and Archbold (2016) mentioned that a large board size will result in fewer extreme decisions and more agreement. In other words, when small-sized board involves executive directors who hold a large proportion of firm equity and institutional investors who have substantial ownership, the risks of the company might increase. Furthermore, Fakhrunnas and Ramly (2017) explained that communication and coordination may become difficult and inconvenient in large BOD, resulting in the problem of free riding among chief executives. As a result, the board's effectiveness would decrease.

### **5.2.8 Independent Director on Board (INDIR)**

The result claimed that the number of Independent Director on Board had positive and insignificant relationship with credit risk. This statement is supported by Frakhunnas and Ramly (2017), they stated that having a larger number of independent directors causes Islamic banks to involve in higher-risk activities,

resulting in increased credit risk and NPLs. Besides, the previous studies of Andries and Brown (2017) and Ballester, Urteaga and Martinez (2020) also found out the similar result. Furthermore, Ballester, Urteaga and Martinez (2020) claimed that this can be explained using debtholder perspective. When independent directors fight for the rights of shareholders at the expense of creditors, the agency cost of debt rises, increasing credit risk of the firm.

### **5.2.9 CEO Duality (CEOD)**

The result showed that CEO Duality has a significantly negative effect on credit risk. Based on the agency theory perspective, high credit risk could be arisen from the reductions in monitoring. It is because duality allows CEOs to use their power for their own gain, which can harm the value of their company's stock (Al-Malkawi and Pillai, 2018). Moreover, the result also supported by Grassa (2015), Tadele and Kalyebara (2020), Sheikh (2019) and Pathan (2009). Tadele and Kalyebara (2020) suggested that whoever holds both CEO and board of directors' chairmanship seems to lend lesser loans and are correlated with lower return variability and bank collapse risk. Besides, CEO duality also tends to enhance asset quality by reducing non-performing loans and keeping loan loss reserves at an optimal level.

### **5.2.10 Female Director on Board (FEMALE)**

The results showed that increase in the female director on board had a positive and insignificant impact on credit risk. This statement is supported by Faccio et al. (2016) and Adams & Ragunathan (2017). They mentioned that women in finance may have risk aversion levels similar to or even lower than men.

However, several empirical studies discovered an inverse association between female director on board and credit risk. Their studies revealed that increasing gender diversity on the board can reduce risk-taking (Gulamhussen & Santa, 2015), minimize additional risk-taking behaviour of firms (Khaw et al., 2016), lower

lending costs (Karavitis et al., 2021), as well as reduce bank conduct risk (Arnaboldi et al., 2021). Moreover, Chen et al. (2019), in comparison to all-male boards, they found that gender-diverse boards are more risk-aware. Also, the previous study that conducted by Khan, Fraz, Hassan, and Abedifar (2019) stated that female director is insignificant, indicating that the participation of female directors in the boardroom has no influence on loan quality.

### **5.2.11 Size of Shariah Supervisory Board (NSSB)**

This research stated that the relationship between size of shariah supervisory board and credit risk is negatively significant. According to Bourakba and Zerargui (2015), this statement showed that the function of SSB in monitoring Islamic banks is useful in decreasing risk-taking. They stated that when the average number of SSBs is more than four, the effectiveness of SSB in decision-making decreases as a result of conflict. The previous studies of Fakhrunnas and Ramly (2017) as well as Safiullah and Shamuddin (2018) agree with the negative relationship between the variables. In addition, Najwa, Ramly and Haron (2019) believe that members of the SSB can provide suitable advice to the board of directors, allowing them to make quality decisions, thus, reduce their involvement in high-risk activities.

### **5.2.12 PhD Degree Holder on SSB (PHD)**

According to the result of this paper, PhD Degree Holder on SSB has negatively insignificant effect on credit risk. It proved that if there is more PhD Degree Holder on SSB in the Islamic bank, the credit risk of an Islamic bank will be smaller. It is because a high academic qualification tends to improve the ability of directors to analyse and assess data (Bantel, 1993), and to conduct a thorough assessment of the consequences of decisions made (Chen, 2014). Moreover, Ginena and Hamid (2015) claimed that when executives who hold PhD degree increase, the portfolio risk decreases. In addition, according to Safiullah and Shamsuddin (2018), members of

the SSB could enhance their ability to implement Islamic principles into banking practises by obtaining higher academic credentials.

However, Safiullah and Shamsuddin (2018) mentioned that the academic qualifications do not give impact towards credit risks. Furthermore, The academic qualifications of SSB members are not statistically significant the level of education among SSB members does not provide any moderating at all (Ramly & Nordin, 2018).

### **5.2.13 SSB Members Expertise in Finance-Related Areas (FINANCE)**

Based on the result obtained, the relationship between SSB member expertise in finance-related areas and non-performing loans is insignificantly negative. It is claimed that SSB members who have financial knowledge or banking experience, are capable to assess the financial contracts adopted to banking products and services carefully and precisely (Grassa, 2015). Additionally, by understanding the financial statements, better strategic decisions would be made, and firm's performance would be enhanced, thus, resulting effective oversight (Veltrop, 2017).

Moreover, the findings of Jabari and Muhamad (2021) showed that the SSB members specialization in finance-related areas is not significant towards credit risk. Unlike BOD members, SSB members do not have any motivation to enhance financial performance by perceiving higher risk, because their responsibility is restricted to approving management compliance with Shariah principles. In addition, Nugraheni & Muhammad (2019) also found out same result as Jabari and Muhamad (2021).

### **5.2.14 Type of Audit Firm (BIG4)**

According to the previous chapter result, type of audit firm invited by the Islamic bank to review its performance and financial records has a significantly positive relationship with the credit risk. Balakrishnan, George, Ertan, and Scobie (2021) study two benchmarks to bank risk where role of auditors is more distinguishable and where they may have better information and insight than regulators. Their findings revealed that problem loans are subjective, which is significant in terms of audit effort. Moreover, Heningtyas, Widagdo and Ika (2019) claimed that from the perspective of loan loss provision, Islamic banks is stronger in organisations audited by non-Big-4 groups than in organisations audited by the Big-4 groups. This result indicates that good audit quality can weaken income smoothing activities in Islamic banks. This result indicates that good audit quality can weaken income smoothing activities in Islamic banks.

### **5.2.15 Gross Domestic Product Growth Rate (GDP)**

Based on the outcome generated in this study, GDP growth rate is negatively significant to the credit risk of Islamic bank. This statement is supported by the previous studies of Kabir, Worthington & Gupta (2015), Haryono, Ariffin & Hamat (2016), Yuniarti & Effendi (2018), Tabash & Anagreh (2017), Havidz and Setiawan (2015) and Wiryono and Effendi (2018). Kabir, Worthington & Gupta (2015) pointed that GDP growth can have a negative impact on credit risk due to the increased payment capacity of bank clients. In addition, When the country is in recession, bank loans will become more volatile, and the real fund rate will be decreased. Additionally, a bank will be experiencing a huge risk owing to the availability of set loan is becoming more volatile for a bank to sustain (Tabash and Anagreh, 2017).

### **5.2.16 Inflation Rate (INF)**

The result claimed that the inflation rate had a significant and negative association with credit risk. This statement is agreed by Wiryono and Effendi (2018), Aysan, Disli & Ozturk (2018) as well as Bahloul, Mroua & Naifar (2017). According to Aysan et al. (2018), an organization may profit by raising the pricing of goods and services. This increases the organization's revenues, which improves the organization's ability to repay bank loans or financing. Thus, credit risk in Islamic banking will reduce. Moreover, during inflationary, high relative price volatility during an inflationary period may make it difficult for banks to make accurate evaluations of credit and market risks, resulting in increased credit risk exposure (Wiryono and Effendi, 2018).

## **5.3 Implication of Study**

The research's purpose is to determine the association between the variables studied and the credit risk faced by Islamic banks in ASIA and MENA countries including Malaysia, Pakistan, Indonesia, Qatar, Bahrain, Bangladesh, Kuwait, Jordan, and Saudi Arabia. Four out of fifteen variables were identified to be significant to credit risk based on the findings. With this result, the research may deliver useful and beneficial data to related parties in the financial industry, such as the management of bank, investors, regulators, and future researchers, allowing them to have a greater knowledge on the relationship between the explanatory and explained variables studied. Moreover, this study is recommended to be reviewed by future researchers as it will provide some useful information.

### **5.3.1 Bank Size (BS)**

The size of the bank has negative and significant effect on the credit risk. It means that the larger the bank size, the smaller the chance of default. It can serve as a



reference for investors in determining their bank investment decisions based on the size of the bank.

### **5.3.2 Capital Adequacy Ratio (CAR)**

The capital adequacy ratio and credit risk had a negative and significant relationship in this research. The higher the capital adequacy ratio, the lower the credit risk. The management of bank can use this as a guideline for managing their bank, as the capital adequacy ratio has a substantial influence on banks' credit risk. This variable can be included in future studies by future researchers because it is crucial in determining a bank's credit risk.

### **5.3.3 Return on Equity (ROE)**

In this study, there was a significantly negative relationship between return on equity and credit risk. The negative impact of ROE on non-performing loans implies the occurrence of past poor decisions made by bank management, resulting in a decline in bank performance or health and a rise in NPLs. Therefore, the management of bank need to make a decision carefully in order to avoid non-performing loans.

### **5.3.4 Management Efficiency (MGT)**

This study discovered that the connection between management efficiency and NPLs is significantly negative. It means that when the management efficiency in banking system improves, their credit risk would be lower. Hence, the management of bank need to put more effort in reducing average costs, enhancing their efficiency levels, as well as achieving a climate of financial stability.

### **5.3.5 Taxation Ratio (TAX)**

This research stated that the taxation ratio has a negatively significant impact on credit risk. In other words, higher corporate income tax rate can result higher credit risk. Regulators can develop policies to regulate taxes in order to keep banks stable and reduce credit risk.

### **5.3.6 Size of Board of Director (BOD)**

The size of board of director is significantly negative to the credit risk in this research. In other words, The larger the size of board of director, the lower the credit risk. As a result, this study can be used as a reference to assist bank management in lowering credit risk. Investors can refer this variable when they want to make investment decision.

### **5.3.7 Independent Director on Board (INDIR)**

According to the result, independent director on board has positive and insignificant influence on the credit risk. It claimed that the size of the independent director on board has no effect on the credit risk. As a result, it is encouraged that the future researchers exclude this variable from future studies because it was insignificant for the dependent variables.

### **5.3.8 CEO Duality (CEOD)**

CEO duality is negatively significant to the credit risk. According to our finding, high credit risk could be arisen from the reductions in monitoring and huge amounts of power focused in one person who can expropriate other shareholders. In this case, the bank management should avoid the CEO duality and the investors should avoid to make investment in a bank which obtain CEO duality.

### **5.3.9 Female Director on Board (FEMALE)**

This study showed that number of females on board has a positive and insignificant relationship with credit risk. It claimed that the number of female directors on board has no effect on the credit risk. Although the results were positive and insignificant, some previous researchers provided different explanations, stating that there is a negative relationship between the number of female directors on boards and credit risk. In this situation, future researchers are suggested to use this variable to get a better understanding on the relationship between Female Director on Board and credit risk.

### **5.3.10 Size of Shariah Supervisory Board (NSSB)**

This study claimed that size of shariah Supervisory Board has negatively significant impact on credit risk. This indicates that by expanding the size of SSB, the credit risk faced by the Islamic banks will reduce. In this context, this variable may be included in future research because it is critical in estimating the credit risk of Islamic banks.

### **5.3.11 PhD Degree Holder on SSB (PHD)**

In this paper, the PhD degree holder on SSB is insignificant to credit risk. In other terms, this factor will not influence credit risk. Therefore, this variable may not be included in future studies by the management team or future researchers.

### **5.3.12 SSB Members Expertise in Finance-Related Areas (FINANCE)**

In this paper, SSB members expertise in finance-related areas is not significant to credit risk. This implies that the factor would not affect credit risk. Hence, this

variable is not recommended to be included in future studies by the management team or future researchers.

### **5.3.13 Type of Audit Firm (BIG4)**

The type of audit firm has a negative and significant correlation towards the credit risk of Islamic banks. In other words, if the Islamic bank is audited by Big-4 group, the credit risk will decrease. In this context, future scholars may refer this study and include this variable in their future investigation.

### **5.3.14 Gross Domestic Product Growth Rate (GDP)**

According to the result obtained, the gross domestic product growth rate is negatively significant to the credit risk of Islamic banks. This finding shows that higher GDP growth rate could bring lower credit risk to the Islamic banks. Therefore, regulators can generate relevant policies to control the GDP in order to reduce Islamic banks' credit risk.

### **5.3.15 Inflation Rate (INF)**

This study declares a significantly inverse relationship between the inflation and credit risk in Islamic banking system. This represents that higher inflation rate could result lower credit risk. In this case, regulators can create new guidelines in maintaining or reducing Islamic banks' credit risk.

## **5.4 Limitation of Study**

### **5.4.1 Focus on the Islamic banks in 9 countries from ASIA and MENA region only**

There is total 59 Islamic banks being selected to conduct this research. All of the banks are selected from ASIA and MENA region. There are 9 countries we used in this research. However, there is total 11 ASIA countries and 22 MENA countries. Therefore, the accuracy of the final result of this study might be affected because there are only 9 countries chosen from ASIA and MENA region. Therefore, this research is difficult to represent all Islamic banking industry in ASIA and MENA countries.

### **5.4.2 Use Stata to regress the data only**

The software that employed in this study is Stata. However, there is other software can use to regress data such as E-view. Thus, it limits the study as it relies on the result that regress by Stata only.

### **5.4.3 Focus on using cluster sampling method**

Probability sampling technique is the sampling technique that being utilized in this study. In this technique, cluster sampling method has been included in this study. However, there is other type of sampling technique that can be used in this study such as systematic sampling and stratified random sampling. Therefore, this limits the study since it only focus on the countries that chosen by using cluster sampling method.

## 5.5 Future Recommendations

In future studies, future researchers can broaden their study to other countries from ASIA and MENA region. This is due to the fact that the sample size of this study was limited to only 9 countries from total 31 countries in ASIA and MENA region. It led to the results of this study cannot represents the whole ASIA and MENA countries. Therefore, it is recommended to do the research in more Islamic bank from ASIA and MENA region. For instance, future researchers can include Vietnam, Brunei, Iran, and Algeria to conduct a more reliable and accurate study.

Additionally, future researchers are suggested to use a variety of methodologies to estimate the data's result. This study is used Stata to regress the data. However, there are other similar tools can regress data such as E-View. Future researchers can use E-View to conduct diagnostic checking to improve the study's reliability.

Furthermore, future researchers are recommended to use a different type of sampling method to conduct the future research. This can help the future researchers to have a clearer picture of the similarity and different of the result in using two different type of sampling method.

## 5.6 Conclusion

The objective for this study is to investigate the determinants of credit risk of Islamic banks. This research has identified five bank-specific determinants, four bank governance determinants, four shariah governance determinants, an audit determinant and two economic determinants as the key potential variables of credit risk. The data of 59 Islamic banks in various countries between 2010 and 2019 was collected and empirically tested in this study.

In order to regress the data, FER was chosen as the model for this study. Based on the result, independent director on board (INDIR), female director on board (FEMALE), PhD degree holder on SSB (PHD) and finance-related areas (FINANCE) have an insignificant relationship while other variables are significant related with credit risk. Besides, independent director on board (INDIR), female director on board (FEMALE) and type of audit firm (BIG4) are positively related with credit risk while other variables are negatively related.

In conclusion, the objectives to study the determinants of credit risk of Islamic banks have generally met, as the relationship between each independent variable and Islamic bank's credit risk was clearly stated, the impact of the independent variables categorised under bank-specific, bank governance, shariah governance, audit and economic to the Islamic bank's credit risk were discussed and the result of each independent variables on credit risk of Islamic bank in 9 different ASIA and MENA countries were presented along with some limitations throughout this research. The authors of this study hoped that it would help bank management, investors, regulators, and future researchers understand more deeply on the association between the explanatory variables that have been chosen and dependant variable which is the credit risks of ASIA and MENA Islamic banks.

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APPENDICES

Appendix 4.1: Result of POLS

Source	SS	df	MS
Model	3261.04882	15	217.403255
Residual	2184.74308	229	9.54036278
Total	5445.7919	244	22.3188192

Number of obs = 245

F (15,229) = 22.79

Prob > F = 0.0000

R-squared = 0.5988

Adj R-squared = 0.5725

Root MSE = 3.0887

NPL	Coefficient	Std. err.	t	P> t	[95% conf.	interval]
BS	0.2354988	0.1495245	1.57	0.117	-0.05912	0.530119
CAR	-0.0735205	0.0348682	-2.11	0.036	-0.14222	-0.00482
ROE	-0.2054139	0.036893	-5.57	0	-0.27811	-0.13272
MGT	-3.591937	1.911031	-1.88	0.061	-7.35739	0.173516
TAX	-0.0015778	0.0042348	-0.37	0.71	-0.00992	0.006766
BOD	0.3324727	0.094757	3.51	0.001	0.145766	0.51918
INDIR	4.643176	1.119666	4.15	0	2.437011	6.849341
CEOD	4.706445	1.720938	2.73	0.007	1.315548	8.097342
FEMALE	-5.019269	2.140137	-2.35	0.02	-9.23615	-0.80239
NSSB	-1.432114	0.2191365	-6.54	0	-1.8639	-1.00033
PHD	-2.338386	0.7579815	-3.09	0.002	-3.8319	-0.84488
FINANCE	2.857518	1.034188	2.76	0.006	0.819776	4.895259
BIG4	-1.985938	0.6155442	-3.23	0.001	-3.19879	-0.77308
GDP	-0.1327849	0.1173166	-1.13	0.259	-0.36394	0.098373
INF	0.0795375	0.0908946	0.88	0.382	-0.09956	0.258634
_cons	9.690704	4.804248	2.02	0.045	.2245229	19.15689

Appendix 4.2: Result of FEM

Fixed-effects (within) regression      Number of obs=      245

Group variable: idc                      Number of groups =      33

R-squared:                      Obs per group:  
 Within = 0.3504      min      =      1  
 Between = 0.1031      avg      =      7.4  
 Overall = 0.0760      max      =      10

F(15,197)      =      7.08

corr(u\_i, Xb) = -0.6945      Prob > F      =      0.0000

NPL	Coefficient	Std. err.	t	P> t	[95% conf. interval]
BS	-1.168127	0.3664747	-3.19	0.002	-1.89084 -0.44541
CAR	-0.0762621	0.0297374	-2.56	0.011	-0.13491 -0.01762
ROE	-0.0433994	0.0285036	-1.52	0.129	-0.09961 0.012812
MGT	-3.870558	1.226817	-3.15	0.002	-6.28994 -1.45118
TAX	-0.0035577	0.002629	-1.35	0.178	-0.00874 0.001627

BOD	-0.2234684	0.1197855	-1.87	0.064	-0.45969	0.012758
INDIR	1.698021	1.012112	1.68	0.095	-0.29794	3.693985
CEOD	-3.394505	1.363589	-2.49	0.014	-6.08361	-0.7054
FEMALE	1.495484	1.718035	0.87	0.385	-1.89262	4.883585
NSSB	-0.910042	0.1796733	-5.06	0	-1.26437	-0.55571
PHD	-0.3155837	0.7741701	-0.41	0.684	-1.84231	1.211141
FINANCE	-2.188744	1.094564	-2	0.047	-4.34731	-0.03018
BIG4	1.437365	0.4781623	3.01	0.003	0.494391	2.380339
GDP	-0.1673723	0.096201	-1.74	0.083	-0.35709	0.022344
INF	0.1883104	0.0664921	-2.83	0.005	-0.31944	-0.05718
_cons	45.18493	9.436977	4.79	0	26.57446	63.79539
sigma_u	5.6638915					
sigma_e	1.7480916					
rho	0.91302742					

(fraction of variance due to u\_i)

F test that all u\_i=0: F(32, 197) = 16.19

Prob > F = 0.0000



NPL	Coefficient	Robust std. err.	t	P> t	[95% conf. interval]	
BS	-1.168127	0.5043172	-2.32	0.027	-2.19539	-0.140866
CAR	-0.0762621	0.0322095	-2.37	0.024	-0.14187	-0.010654
ROE	-0.0433994	0.0207568	-2.09	0.045	-0.08568	-0.001119
MGT	-3.870558	1.242848	-3.11	0.004	-6.40216	-1.338959
TAX	-0.0035577	0.0015461	-2.3	0.028	-0.00671	-0.000408
BOD	-0.2234684	0.0881276	-2.54	0.016	-0.40298	-0.043958
INDIR	1.698021	1.099153	1.54	0.132	-0.54088	3.936922
CEOD	-3.394505	0.7825769	-4.34	0	-4.98856	-1.800448
FEMALE	1.495484	2.469067	0.61	0.549	-3.53384	6.524809
NSSB	-0.910042	0.2533046	-3.59	0.001	-1.42601	-0.394078
PHD	-0.3155837	0.9085992	-0.35	0.731	-2.16634	1.535172
FINANCE	-2.188744	1.540113	-1.42	0.165	-5.32585	0.948364
BIG4	1.437365	0.6938403	2.07	0.046	0.024059	2.850672
GDP	-0.1673723	0.0660592	-2.53	0.016	-0.30193	-0.032814
INF	-0.1883104	0.0989542	-1.9	0.066	-0.38987	0.013253
_cons	45.18493	12.61085	3.58	0.001	19.49747	70.87238
sigma_u	5.6638915					
sigma_e	1.7480916					
rho	0.91302742					

(fraction of variance due to u\_i)



Appendix 4.4: Result of REM

Random-effects GLS regression      Number of obs      =      245

Group variable: idc                  Number of groups      =      33

R-squared:

Within = 0.2580

Between = 0.5149

Overall = 0.4591

Obs per group:

min      =      1

avg      =      7.4

max      =      10

Wald chi2(15) = 103.73

corr(u\_i, X) = 0 (assumed)

Prob > chi2 = 0.0000

NPL	Coefficient	Std. err.	z	P> z	[95% conf.	interval]
BS	0.11546	0.182369	0.63	0.527	-0.24198	0.472897
CAR	-0.08089	0.03177	-2.55	0.011	-0.14316	-0.01862
ROE	-0.07248	0.031256	-2.32	0.02	-0.13374	-0.01122
MGT	-4.17764	1.396597	-2.99	0.003	-6.91492	-1.44036
TAX	-0.0028	0.003	-0.93	0.35	-0.00868	0.003079
BOD	-0.04478	0.114193	-0.39	0.695	-0.2686	0.17903
INDIR	2.525424	1.026891	2.46	0.014	0.512755	4.538094
CEOD	-1.17902	1.483698	-0.79	0.427	-4.08702	1.728972
FEMALE	-1.67325	1.829775	-0.91	0.36	-5.25955	1.913041
NSSB	-1.26301	0.177846	-7.1	0	-1.61158	-0.91443
PHD	-1.51689	0.790911	-1.92	0.055	-3.06704	0.033272
FINANCE	-1.0474	1.108377	-0.94	0.345	-3.21978	1.124978
BIG4	0.366621	0.516597	0.71	0.478	-0.64589	1.379133
GDP	-0.0643	0.095314	-0.67	0.5	-0.25111	0.122512
INF	-0.02389	0.068211	-0.35	0.726	-0.15758	0.109807
_cons	13.09904	5.45409	2.4	0.016	2.409222	23.78886
sigma_u	1.851436					
sigma_e	1.748092					
rho	0.528687					

(fraction of variance due to u\_i)

Appendix 4.5: Result of Hausman Test

	Coefficients			sqrt (diag(V <sub>b</sub> -V <sub>B</sub> ))
	(b) FEM	(B) REM	(b-B) Difference	Std.err.
BS	-1.16813	0.11546	-1.28359	0.385703
CAR	-0.07626	-0.08089	0.004627	0.013755
ROE	-0.0434	-0.07248	0.029082	0.011146
MGT	-3.87056	-4.17764	0.307083	0.298985
TAX	-0.00356	-0.0028	-0.00076	0.000607
BOD	-0.22347	-0.04478	-0.17869	0.080044
INDIR	1.698021	2.525424	-0.8274	0.577799
CEOD	-3.39451	-1.17902	-2.21548	0.564537
FEMALE	1.495484	-1.67325	3.168737	0.807692
NSSB	-0.91004	-1.26301	0.352963	0.110109
PHD	-0.31558	-1.51689	1.201301	0.432159
FINANCE	-2.18874	-1.0474	-1.14134	0.628711
BIG4	1.437365	0.366621	1.070744	0.207384
GDP	-0.16737	-0.0643	-0.10307	0.058807
INF	-0.18831	-0.02389	-0.16443	0.036597
_cons	45.18493	13.09904	32.08589	9.536963

b = Consistent under H<sub>0</sub> and H<sub>a</sub>; obtained from xtreg.

B = Inconsistent under H<sub>a</sub>, efficient under H<sub>0</sub>; obtained from xtreg.

Test of H0: Difference in coefficients not systematic

$$\begin{aligned} \text{chi2}(15) &= (\mathbf{b}-\mathbf{B})'[(\mathbf{V}_b-\mathbf{V}_B)^{-1}](\mathbf{b}-\mathbf{B}) \\ &= 65.43 \end{aligned}$$

Prob > chi2 = 0.0000

( $\mathbf{V}_b-\mathbf{V}_B$  is not positive definite)

Appendix 4.6: Result of Breusch and Pagan Lagrange Multiplier Test

$$\text{NPL}[\text{idc},t] = \mathbf{X}\mathbf{b} + \mathbf{u}[\text{idc}] + \mathbf{e}[\text{idc},t]$$

Estimated results:

	Var	SD = sqrt (Var)
NPL	22.31882	4.72428
e	3.055824	1.748092
u	3.427813	1.851435

Test:  $\text{Var}(\mathbf{u}) = 0$

$$\text{chibar2}(01) = 119.07$$

Prob > chibar2 = 0.0000