CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This chapter elaborates the research design and selection of the best methods for gathering and analyzing financial data according to the adopted methodology. The main objective of this chapter is to choose the appropriate methodology to address the research questions and accomplish the research objectives. This chapter contains the following: the selected methodology, research design, research variables and measurements, statistical analysis and tests, and panel regression model.

4.2 Research Ontology

Ontology is interested with the actual world. Social ontological questions are interested with social entities and their nature (Saunders et al., 2012) as cited in Ishtiaq (2015). It is concerned in how social investigator may estimate a phenomenon while being unbiased and a neutral observer. Ontology has two key positions as constructionism and objectivism in management and business research, both of them are possibly to be recognized as producing reliable knowledge (Bryman and Bell, 2011, as cited in Ishtiaq (2015). Objectivism emphasizes that the social phenomenon and its meaning have independent and separate existence from its social actors (Saunders et al., 2012) as cited in Ishtiaq (2015).

An organization is a tangible object under the objectivist position as it has specific regulations and rules. It is distinct from the individuals who manage it, and it follows standardized procedures for getting things done. For example, a bank can be

observed as tangible object that has particular rules and also contains individuals who need to comply these rules, thus individuals are shaped by the organizations. Meanwhile, the constructionism position bears less significance to the objective position for management organizations. Constructionism debates that the social phenomena is constantly being achieved by social actors (Bryman and Bell, 2011) as cited in Ishtiaq (2015). It demonstrates that social phenomenon and categories are produced by a continual state of revision not only through social interaction. Constructionism displays that it is substantial to review the details of the particular situation to improve an understanding of occurrence or the truth behind this occurrence (Saunders et al., 2012) as cited in Ishtiaq (2015). The present study's ontological position is based on objectivism in management and business research.

4.3 Research Epistemology

Epistemology is interested with the acquisition of knowledge. "An epistemological issue concerns the question of what is (or should be) regarded as acceptable knowledge in a discipline". Epistemology is implicated in how a social investigator may get an acceptable knowledge of a specific field. The considerations of a social researcher about admissible knowledge have two main positions as interpretivism and positivism in business research

Positivism is "an epistemological position that supports the application of the methods of the natural sciences to the study of social reality and beyond" (Bryman and Bell, 2011) as cited in Ishtiaq (2015). Positivism disputes that any knowledge that can be accumulated through the application of five senses (taste, touch, smell, sight, and sound) is the reality. For this objective, the inquiry needs to be based on scientific investigation, and thus empirical in nature. Both the social and natural sciences

employ logic with methodological principles in common to accord with facts instead of values. Interpretivism, on the other hand, debates that reality is socially constructed and the social and natural sciences need several types of methods. It deals with individual actions in order to induce theory or laws (Gray, 2009).

The choice of research philosophy follows a particular pattern of beliefs. For instance, interpretivist approach adopts several sets of beliefs; it argues reality is socially constructed and subjective. The social phenomena and its subjective meanings are considered as passable knowledge. The interpretivist approach focuses on the particulars of a specific situation. In contrast, the positivist approach adopts reality as objective and external (separate from the social actors), concentrates on law like causality and generalization. The observable phenomena are only considered acceptable knowledge. (Saunders et al., 2012) as cited in Ishtiaq (2015).

However, the epistemological position in this study is the positivist approach. The positivist paradigm has become a strong scientific method, its evolution and consolidation related to the French sociological tradition then reached to other regions of the globe. It attempts to give the discipline a "scientific status". It was rendered acceptable by the study for objectivity, accuracy, causality, and neutrality of values. Positivistic social scientists have discovered its logical culmination in the mathematization of social phenomena, in the numerical cults, in the desire to reduce qualitative human experiences into quantified statistical figures. Positivist is a philosophical system which excludes the metaphysical and theological speculation and limits itself to the data of experience and experimentation.

Thus, in its pure form this scientific method includes a process of experimentation that is used to investigate findings and answer questions. As mentioned above, Positivist usually confirm that reality is given objectively and the

measurable characteristics independent of the investigator. The study categorizes as positivist when the researcher try to test the hypothesis in an effort to improve the phenomena's predictive knowledge (Majeed, 2019), when there was quantifiable measurements of variables, proof of formal propositions, and drawing the sample to a specified population about a phenomenon (Orlikowski & Baroudi, 1991) as cited in Majeed (2019).

4.4 Research Methodology

An appropriate methodology must be adopted to answer the research questions. Based on these questions, there are several points that help to determine the research methodology:

1. This research is an empirical study that aims to provide more understanding about the significance of having and implementing efficient and effective on management CRE and LRE. It also tested the impact of credit and liquidity risk exposures on the performance of the banking sector.
2. This research also compared between conventional banks and Islamic banks. The empirical evidence in this research was employed to obtain the answers to the predetermined research questions.
3. The appropriate methodology for this research was quantitative because it collected and analyzed numerical data to explain the relationship between the independent variables and the dependent variable.
4. The philosophy of this research was positivism, as it is based on empirical evidence instead of the opinions of groups or individuals in a society. It clarifies the degree to which the implementation of effective and efficient management on CLE may positively affect the performance of banks.

5. This research used the deduction approach, while the research questions were developed based on the theoretical framework discussed in the previous chapter. Then, this research formulated several hypotheses to examine the relationship between credit and liquidity risk exposures and bank performance. These hypotheses were then tested using appropriate statistical techniques, leading to either their rejection or acceptance.

4.5 Research Purpose

Based on the predetermined research questions and objectives, the purpose of this research is explanatory. This type of research is used to explain why something happens and to evaluate the causal relationships between variables (Gratton & Jones, 2010). This research tested the selected variables of credit and liquidity risk exposures and their impact on the performance of banks.

4.6 Research Strategy and Data Collection

The hypotheses testing relied on secondary data, more specifically cross-sectional and time series data of Jordanian, Qatari, and Saudi Arabian banks. The data related to the variables were tested and analyzed to examine their interrelationships. The data covered a five-year period, from 2013 to 2017.

4.6.1 Research Sample

The following criteria were applied in the process of sample selection:

1. The Central Bank of Jordan, Qatar Central Bank, and Saudi Central Bank were excluded.

2. Banks with insufficient financial data from financial year end 2013 to financial year end 2017 were excluded.
3. All merger and acquisition banks in Jordan, Qatar, and Saudi Arabia were excluded.
4. Banks with inadequate annual reports during the study period were excluded.

The study sample was 34 banks in Jordan, Saudi Arabia, and Qatar. In Jordan, the total number of listed banks is 15, consisting of 13 conventional banks and two Islamic banks. Saudi Arabia has 11 listed banks, comprising four Islamic and seven conventional banks. Qatar has eight listed banks, comprising three Islamic banks and five conventional banks (Table 4.1).

Table 4.1: Summary of Research Population and Sample

Country	Population (listed & unlisted banks)	Listed banks	% of listed banks	Listed CBs	Listed IBs
Jordan	25	15	60	13	2
Saudi Arabia	24	11	50	7	4
Qatar	18	8	72	5	3
Total	67	34		25	9

4.6.2 Data Sources

The data for this research were collected manually from the annual reports of the banks. The annual reports were downloaded from the website of the Amman Stock Exchange (www.ase.com.jo), Saudi Stock Exchange (www.tadawul.com.sa), Qatar Stock Exchange (www.qe.com.qa), and the websites of the banks. The sample period was 2013-2017 because the implementation of IFRS 9 in 2018 led to significant improvements in the accounting world. This new standard includes other criteria for measuring and classifying financial instruments and has been a major challenge for banking systems (Elena et al., 2020). If the study included the period after 2017, it would necessitate applying IFRS 9 retroactively on the measures from 2013 to 2017.

4.7 Research Variables and Measurements

This section presents the selected variables of the three constructs: liquidity risk exposures, credit risk exposures, and bank performance.

4.7.1 Proxy Variables for Credit Risk Exposures

CRM aims to develop a clear process for accepting new credits and expanding current ones in banks (Basel Committee on Banking Supervision, 2000b). It is a critical concept that explains the bank's profitability, survival, and growth. Furthermore, it is considered as one of the main sources for generating income in Islamic and conventional banks (Afriyie & Akotey, 2013). Accordingly, effective CRM maintains an acceptable level of credit risk exposure, managing the stability of credit risk in the overall portfolio and in individual transactions or credits (Musyoki & Kadubo, 2012). This research used a number of variables for credit risk exposures. They are explained below.

4.7.1.1 Non-Performing Loan Ratio

This ratio represents the risk of loan defaults. A loan is considered non-performing if the borrower has disregarded or failed to pay the principal amount or its interest for 90 days or more, depending on the case of the loan. NPLs affect the bank's profitability and credit. An increase in NPLs will decrease earnings and thus poor bank performance (Guleria & Laveena, 2016). Meanwhile, a lower NPL ratio indicates the efficiency and effectiveness of banks in controlling their loans and the quality and effectiveness of their risk management (Epure & Lafuente, 2015). This ratio is calculated as the proportion of NPLs over total loans (Musyoki & Kadubo, 2012). This variable has been used as a proxy for credit risk exposures in several

studies (e.g., Alshatti, 2015; Abiola & Olausi, 2014; Afriyie & Akotey, 2013; Danson Musyoki, 2012; Prakash &Poudel, 2012; Singh, 2015; Bhattarai, 2019; Nugraha et al., 2021) .

4.7.1.2 Capital Adequacy Ratio

Capital adequacy ratio indicates the capital strength of banks. It indicates how the bank's equity affects its profitability and evaluates the capacity of banks in absorbing any possible losses. Banks with a higher capital adequacy ratio are sounder, able to protect themselves from operating losses, and are considered secure in the event of liquidation. All these lead to lower external funding and higher profits (Wasiuzzaman & Gunasegavan, 2013; Afriyie & Akotey, 2013).It is measured as Total capital divided by risk weighted assets. This variable has been used as a proxy for credit risk exposures in several studies (e.g., Alshatti, 2015; Abiola & Olausi, 2014; Afriyie &Akotey, 2013; Poudel, 2012; Fredrick, 2012; Singh, 2015; Raci et al., 2021; Pujiati et al., 2020).

4.7.1.3 Cost per Loan Ratio

This ratio explains the efficiency in allocating loans to borrowers (Musyoki & Kadubo, 2012). It is calculated by dividing total operating costs by total amount of loans (Poudel, 2012). This variable has been used as a proxy for credit risk exposures in Poudel (2012) and Musyoki and Kadubo (2012).

4.7.1.4 Loan Loss Reserve Ratio

Loan loss reserve ratio is expressed as the proportion of provisions for any predicted losses from loans to total loans. A lower ratio suggests that the quality of the

loan portfolio is very high and that the loans are less problematic, and vice versa. It is calculated by dividing total loan loss reserve with total amount of loans (Al-Rdaydeh et al., 2017). This variable has been used as a proxy for credit risk exposures in several studies (e.g., Al-Rdaydeh et al., 2017; Abdel Megeid, 2017; Pujiati et al., 2020; Zhang et al., 2020)

4.7.1.5 Loan Growth Ratio

A higher loan growth ratio means that the bank attracts customers who have not been accepted for loans by other banks. These customers typically provide insufficient collateral or ask for overly low loan rates, which would ultimately lead to higher risk for the bank (Foos et al., 2010). Loan growth ratio can be measured as the proportion of current year loans less previous year loans to previous year loans (Tehulu & Olana, 2014). This variable has been used as a proxy for credit risk exposures in some studies (e.g., Tehulu and Olana, 2014; Foos et al. 2010; Sobarsyah et al., 2020).

4.7.2 Proxy Variables for Liquidity Risk Exposures

LRM aims to ensure the bank has the capacity to meet and their obligations on time and accomplish their strategic goals, medium-term investments, and lending commitments (Parashar & Venkatesh, 2010). Ineffective LRM has a negative impact on the profitability of banks and could raise their borrowing costs (Ivanov, 2010) as cited in Abdel Megeid (2017). Sound and effective LRM lowers the possibility of insolvency and bankruptcy and assures the stability and health of the banking sector (Ariffin, 2012). This research employed a number of variables for liquidity risk exposures, which are discussed below.

4.7.2.1 Current Ratio

This ratio is used to measure the liquidity of banks in general; higher liquidity is better (Farooq et al., 2015). It indicates the adequacy of assets to cover the short-term claims of creditors, which are expected to be converted to cash during their maturity. It provides a general view of the adequacy of working capital in the bank (Chakraborty & Krishnankutty, 2011). In other words, it determines the ability of a bank's short-term assets to pay off its short-term liabilities (Farooq et al., 2015). This variable has been employed as a proxy for credit risk exposures in several studies (e.g., Sharma et al., 2018; Farooq et al., 2015; Akinwumi et al., 2017; Alzorqan, 2014; Nuryani & Sunarsi, 2020). Current ratio is obtained by dividing current assets by current liabilities.

4.7.2.2 Loan to Deposit Ratio

Loan to deposit ratio is used to evaluate the liquidity and profitability of banks. A high loan to deposit ratio indicates two issues: first, the bank issues a lot of its deposits in the form of interest-bearing loans; second, the bank generates more earnings. However, if this percentage is too high, it will expose the bank to high risks resulting from loan repayment failures, which will require the bank to repay the investors' deposits. A lower ratio means lower risk, but at the same time it means that the banks do not use their assets to generate profits (Rengasamy, 2014). This variable has been employed as a proxy for liquidity risk exposures by several authors (e.g., Al-Rdaydeh et al., 2017; Alzorqan, 2014; Farooq et al., 2015; Ihsan & Hussain, 2016b; Khan et al., 2016; Faroug et al., 2016; Zarrouk, 2014; Nugraha et al., 2021; Anggari & Dana, 2020) . Loan to deposit ratio is measured as the share of total loans to total deposits.

4.7.2.3 Loan to Asset Ratio

This ratio indicates the proportion of illiquid loans relative to total assets. If this percentage is high, it means that the bank is less liquid (Faroug et al., 2016). Loan to asset ratio is measured as the proportion of total loans to total assets (Chowdhury, 2015). This variable has been employed as a proxy for liquidity risk exposures in a number of studies (e.g., ; Faroug et al., 2016; Noman et al., 2015; Chowdhury, 2015; Nguyen et al., 2020; Lam et al., 2020).

4.7.2.4 Cash to Deposit Ratio

This ratio describes the total cash balance in hand and evaluates how much of the bank's money is being used for lending (Warrad, 2017). It measures the bank's liquidity. A higher ratio means higher liquidity, which translates into higher trust and confidence of the depositors. Thus a higher ratio is better (Attefah & Darko, 2016). This variable has been employed as a proxy for liquidity risk exposures (Warrad, 2017; Siddiqui, 2008; Haralayya & Aithal, 2021; Sathyamoorthi et al., 2020). Cash to deposit ratio is calculated as the sum of cash in hand and balance with RBI divided by total deposits.

4.7.2.5 Leverage Ratio

The leverage ratio evaluates the percentage of debt to shareholder equity in the total financing of the bank. This ratio indicates how much capital is incurred as debt (Pradhan & Khadka, 2017). A higher debt relative to total assets means a higher risk for the bank to be unable to meet its obligation (Ulzanah & Murtaqi, 2015). This ratio is calculated as the proportion of total debt to total equity (Alshatti, 2015). This variable has been employed as a proxy for liquidity risk exposures in several studies

(e.g., Alshatti, 2015; Maaka, 2013; Adeusi et al., 2014; Khan et al., 2016; Zarrouk, 2014; Chazi, 2010; Sharma et al., 2018; Nuryani & Sunarsi, 2020; Mugun, 2019).

4.7.3 Control Variables

To measure the impact of the credit and liquidity risk exposures on the performance of banks, the study considered a number of control variables that may influence bank performance. The variables were identified based on the literature and available data. Therefore, the control variables in this study were bank size, bank type, board size, and gross domestic product.

4.7.3.1 Bank Size

The performance of banks can be affected by external and internal factors (Sufian, 2011). Bank size is an internal factor that affects the performance of banks, and it has been extensively discussed by researchers (Terraza, 2015). Banks have good reasons to believe that size and profitability are linked. Larger-sized banks could realize the economies of scale, which increase the profitability of banks (Regehr & Sengupta, 2016). Furthermore, large banks have higher resource mobilization, more aggressive deposit collection strategy, and lower equity to asset ratio, which lead to higher profitability (Terraza, 2015). Additionally, large banks decrease their risk by diversifying the operations across products, sectors, regions, and lines (Mester, 2010). A lower risk can indirectly improve profitability by making liability holders accept a lower return, reducing the bank's funding costs. It can also directly improve profitability by minimizing losses. Furthermore, the realization of economies of scale may lead to a healthier banking system as risks are reduced and inefficiencies are removed.

However, small banks have less demand deposits and higher liquidity, and they may be able to build stronger relationships with local customers and businesses (Regehr & Sengupta, 2016). This factor appears as a control variable in the measurement of bank performance in many previous studies (e.g., Chowdhury, 2015; Noman et al., 2015; Al-Rdaydeh et al., 2017; Singh et al., 2021; Gupta & Mahakud, 2020)

4.7.3.2 Bank Type

The evaluation of bank performance is necessary for all stakeholders, as it assists their decision making. For instance, it directs investors as to whether they should invest their funds in Islamic or conventional banks (Safiullah, 2010). Islamic banks are expected to have lower technical efficiency than conventional banks for four reasons. First, Islamic banks are typically domestically owned, and there is evidence to support the controversy that domestically owned banks are less technically efficient than their foreign-owned counterparts (Johnes et al., 2014). Second, the loans in Islamic banks are called financing and are expected to have high liquidity, which has a negative impact on performance or profitability, because they provide loans and advances on the basis of profit-sharing (Al-tamimi, 2010). Third, Islamic bank is asset-based banking, and as such it cannot diversify its product portfolio as much as conventional banks can, which leads to higher operational costs. Finally, conventional banks are typically large compared to Islamic banks (Chapra, 2007) as cited in Johnes et al. (2014), and there is evidence that technical efficiency increases with bank size (Chen et al., 2005; Miller & Noulas, 1996).

Numerous studies have used a dummy variable to distinguish between Islamic and conventional banks, whereby Islamic banks are assigned the value of one (1)

while conventional banks the value of zero (0) (Warrad, 2017; Chowdhury, 2015; Hanif, 2012; Abdel Megeid, 2017).

4.7.3.3 Board Size

Board size is the total number of directors in the board, and it is one of the internal governance mechanisms that are designed to ensure that the interests of managers and shareholders are closely aligned, while removing or controlling ineffective managers (Kang et al., 2007) as cited in Zemzem & Kacem (2014). The primary objective of board of directors is to oversee the financial reporting process of the firm. Boards meet routinely with the firm's external auditors and accounting staff to check the internal control mechanisms, audit procedures, and financial statements (Klein, 2002). Firms with small boards exhibit more appropriate values for financial performance and provide stronger CEO performance incentives from the threat of dismissal and compensation (Yermack, 1996).

Furthermore, most studies have argued that when board size increases, communication obstacles and conflicts of interest will increase, which lead to the deterioration of firm performance (Shukeri & Shaari, 2013). However, Coles et al. (2008) found that large boards improve the financial and non-financial performance of firms and emphasize appropriate management and control. Jensen (1993) accordingly suggested an optimal board size of seven to eight directors, while the Jordanian Institute of Corporate Governance indicates an ideal board size should include at least five members and not more than thirteen (Jordan securities commission, 2007). To obtain the data for this variable, the study referred to the banks' annual reports. Numerous studies have used the number of board of directors as a proxy for board

size (e.g., Wasiuzzaman & Gunasegavan, 2013; Aebi et al., 2012; Rohaya & Mahat, 2015; Stefanelli & Cotugno, 2012; Majeed et al., 2020)

4.7.3.4 Gross Domestic Product

One of the most important purposes of macroeconomic strategy is economic growth, which means raising expectations for living standards and comforts, as well as accomplishing economic development.

The performance of banks is considered as a principal part in the national economy. In addition, it is a key for economic growth because it provides financial assistance to both private and government sectors. Furthermore, the strength of most industries depends on the availability of financing provided by the banks to facilitate their economic transactions (Alkhazaleh, 2017).

Economic growth is considered as the improvement in net national production for a specific period of time (Dewett, 2005) as cited in Alkhazaleh (2017). It can be expressed in terms of human development index (HDI) and gross domestic product (GDP). Gross domestic product is one of the most significant economic indicators used by governments and economic decision makers in the preparation and formalization of economic policies, and it is the most fundamental indicator that reflects the overall health of the economy (Alkhazaleh, 2017). This factor appears as a variable in the measurement of bank performance in many previous studies (e.g; Ramadan, 2011; Ariffin & Tafri, 2014; Yüksel et al. 2018; Leon, 2020).

4.7.4 Measurement of Dependent Variable (Bank Performance)

Historically, several measurements have been used to examine bank performance, including return on assets (Al-Rdaydeh et al., 2017; Alshatti, 2015),

return on equity (Abiola & Olausi, 2014; Ariffin, 2012), net profit margin (Mendoza & Rivera, 2017; Rohaya & Mahat, 2015) and Tobin's Q (Karim & Alam, 2013).

Performance measures can be categorized into two groups: accounting-based and market-based. The former considers the current financial performance of the bank, while the latter considers the investor's perception of the bank's potential performance (Daily et al., 2003). Demsetz and Lehn (1985) explained that the stock market rate of return is more reflective of expected future developments rather than actual business conditions, but accounting measures are more representative of the year to year fluctuations of the underlying business parameters. However, Haniffa and Hudaib (2006) argued that the literature has no consensus on which measurement is the best proxy for financial performance, as each has its own weaknesses and strengths.

4.7.4.1 Accounting-Based Measures

Accounting indicators assume a straight relationship between the performance and strategies of banks. Around 80 percent of previous studies specified that the most important variables utilized in measuring bank performance are ROA and ROE (Wulf, 2007). Several studies used ROA and ROE to investigate the impact of credit and liquidity risk exposures on bank performance. As accounting-based measures, ROA and ROE have some advantages. Firstly, they eliminate the problem of firm size and thus provide an easy and effective measure to compare between firms (Lev & Sunder, 1979). Secondly, they indicate the efficiency and effectiveness of the management in using the firm's equities and assets to maximize shareholders' wealth (Ramli, 2014). Thirdly, they might take into consideration the year to year fluctuations in implicit business conditions better than the stock market return, which reflects expected future

changes and hides the current fluctuations in the business circumstances (Demsetz & Lehn, 1985).

However, these accounting-based measures also suffer from some disadvantages. Firstly, ROA and ROE are historical measurements that disregard risk, and earlier earnings might be weak reflections for future profits (Ross et al., 2008) as cited in Marashdeh (2014). Secondly, they fail to consider environmental and industrial variations like customer and employee satisfaction. Thirdly, they are vulnerable to any alterations and changes in accounting methods, standards, and techniques (Alexander et al., 2007) as cited in Marashdeh (2014). Finally, they are unable to reflect current changes and fluctuations in the stock market (Krivogorsky, 2006).

Stakeholder is defined as a legal entity, on the basis of contractual relation or legal regulation, that provides the firm with a clear contribution for an expected return in value (Blažek & Èástek, 2009). Furthermore, the stakeholder theory assumes that if managers focus on all stakeholders, then their financial performance will be higher (Berman et al., 1972).

Therefore, in this study, ROA and ROE are significant indicators that can be used to evaluate the relationship between bank performance and CRM and LRM. ROA and ROE, as part of accounting-based measures, were chosen as proxies for bank performance. ROA is calculated by dividing net earnings by the book value of total assets. This variable has been used frequently as a dependent variable to evaluate bank performance (Al-Rdaydeh et al., 2017; Alshatti, 2015; Wasiuzzaman & Gunasegavan, 2013; Abiola & Olausi, 2014; Afriyie & Akotey, 2013).

Return on equity is an indicator of how much profit the firm generates from investors' funds. It is calculated by dividing the firm's net earnings by its total equity.

This variable has frequently been used as a dependent variable to evaluate bank performance (Al-Rdaydeh et al, 2017; Alshatti, 2015; Kumar et al., 2020; Le & Nguyen, 2020).

4.7.4.2 Market-Based Measure (Tobin's Q)

This ratio has been used in empirical finance, diversification, and investment research (Jose et al., 1987). Tobin (1969) explained the link between current replacement costs and the market value of the company's assets, including stocks and shares. Tobin's Q has been popularly used as a measure of firm performance because it reflects the market's expectation of future profits (Short & Keasey, 1999). Moreover, it can be used as a proxy for future growth opportunities of the firm (Huang & Song, 2006), and it is a good indicator of the firm's ability to survive (Hall, 1986). It explains the association between managerial ownership and firm value, as well as demonstrating cross-sectional returns, implying that it is also a proxy for risk (Morck et al., 1988). In addition, it evaluates the structural features of the firm; this relationship depends on market conditions (Lustgarten et al., 1987).

Tobin's Q equals the ratio of firm market value to replacement value, that is, market value of common equity plus the book value of debt divided by the book value of total assets (Pan & Tian, 2015; Battaglia & Gallo, 2015; Maswadeh, 2021; Rolle et al., 2020). If Tobin's Q is more than one, the bank's market value is higher than the book value of its total assets, and thus the bank is overvalued. On the other hand, if the ratio is less than one, the book value of the bank's total assets is higher than its market value, suggesting that the bank is undervalued (Singh et al., 2018). This study used Tobin's Q mainly because of its popularity and ease to use. Table 4.2 summarizes the variables and their measurement.

Table 4.2: Summary of Variables Used in the Study

Variables	Acronym	Measurement	Reference
Non-performing loan ratio	NPL	$\frac{\text{Nonperforming loan}}{\text{Total loan}}$	Alshatti (2015); Bhattarai, (2019); Nugraha et al. (2021)
Capital adequacy ratio	CAR	$\frac{\text{Total capital}}{\text{Risk weighted assets}}$	Raci et al. (2021); Pujiati et al. (2020)
Cost per loan ratio	CLR	$\frac{\text{Total operating cost}}{\text{Total amount of loans}}$	Poudel (2012); Bhattarai (2017)
Loan loss reserve ratio	LLR	$\frac{\text{Total loan loss reserve}}{\text{Total amount of loans}}$	Al-Rdaydeh et al. (2017); Pujiati et al. (2020); Zhang et al. (2020)
Loan growth ratio	CGR	$\frac{\text{current year loans} - \text{previous year loans}}{\text{previous year loans}}$	Tehulu & Olana (2014); Foos et al. (2010); Sobarsyah et al. (2020)
Current ratio	CR	$\frac{\text{Current assets}}{\text{Current liabilities}}$	Nuryani & Sunarsi.(2020); Mugun (2019); Akinwumi et al. (2017)
Loan to deposit ratio	LDR	$\frac{\text{Total loans}}{\text{Total deposits}}$	Al-Rdaydeh et al. (2017); Nugraha et al. (2021); Anggari & Dana. (2020)
Loan to assets ratio	LAR	$\frac{\text{Total loans}}{\text{Total assets}}$	Faroug et al. (2016); Nguyen et al. (2020); Lam et al. (2020).
Cash to deposit ratio	CDR	$\frac{\text{Cash} + \text{balance with RBI}}{\text{Total deposits}}$	Haralayya & Aithal (2021); Sathyamoorthi et al. (2020)
Leverage ratio	LR	$\frac{\text{Total debt}}{\text{Total equity}}$	Alshatti (2015); Nuryani & Sunarsi. (2020); Mugun (2019)
Bank size	Bsize	Measured by the log total assets	Al-Rdaydeh et al. (2017); Singh et al. (2021); Gupta & Mahakud. (2020)
Bank type	Btype	Conventional banks (0) Islamic banks (1)	Warrad (2017); Ali (2020); Nasib and Faleel. (2021)
Board size	BOZ	Number of directors on a bank's board of directors	Goel and Sharma. (2020); Majeed et al. (2020)
Gross domestic production	GDP	GDP growth rate	Al-Rdaydeh et al. (2017); Leon (2020)
Return on asset	ROA	$\frac{\text{Net income}}{\text{Total assets}}$	Al-Rdaydeh et al. (2017); Nguyen et al. (2020)., Anggari & Dana. (2020)
Return on equity	ROE	$\frac{\text{Net income}}{\text{Common equity}}$	Nguyen et al. (2020); Kumar et al. (2020); Le & Nguyen. (2020)
Tobin's Q	TQ	$\frac{\text{Market value of equity+book value of debt}}{\text{Book value of assets}} *100$	Bassey (2016) Maswadeh (2021); Rolle et al. (2020)

4.8 Statistical Tests and Analysis

This section presents the statistical techniques used to empirically test the relationships between credit risk management, liquidity risk management, and bank performance in Jordanian, Qatari, and Saudi Arabian banks. Before testing the

research hypotheses, descriptive statistics of the dataset, in terms of central tendency and dispersion, were first presented. They described the mean, median, and standard deviation of each variable. In addition, several regression diagnostics were applied on the data to avoid misleading data and to check whether the general assumptions of multiple regressions, for instance outliers, unit root, normality, multicollinearity, heteroscedasticity, and autocorrelation, were met. This study used STATA 14 MP to conduct the following statistical tests.

Firstly, descriptive statistics, a brief descriptive coefficient that summarizes a given data set, which can be either a representation of the entire population or a sample. Descriptive statistics are broken down into measures of central tendency and measures of variability (spread). Measures of central tendency include the mean, median, and mode, while measures of variability include the standard deviation, variance, and minimum and maximum values.

Secondly, outliers, which are data points that are distant from other data points. In other words, they are abnormal values in a dataset. Outliers are problematic for many statistical analyses because they can cause tests to either miss significant findings or distort real results (Hair et al., 2011).

Thirdly, unit root test, which is a test of stationarity in a time series dataset. A time series has stationarity if the shift in time does not change the shape of the distribution. Unit roots are one cause for non-stationarity (Granger & Newbold, 1974).

Fourthly, multicollinearity, which is the linear relationship between two or more independent variables in multiple linear regression models. The presence of multicollinearity may result in unacceptable outcomes when investigating how well the independent variables explain the dependent variables (Hair et al., 2011).

Fifthly, normality, which means the normal distribution of errors or residuals (Amran, 2010) as cited in Makhlouf (2017). To examine normality, graphical or statistical methods can be used. Kurtosis and skewness are the most common methods for describing the shape of distribution (Hair et al., 2009). Kurtosis can be defined as a measurement of the "peakedness" of the possible distribution for a real random variable (Dodge et al., 2003), while skewness is a statistical method that indicates whether the distribution is symmetric or not. Symmetric distribution appears if the right side of the curve distribution is similar to the left side. A positive skew indicates that the distribution is shifted towards the left, while negative skew indicates a shift towards the right (Hair et al., 2009).

Sixthly, heteroscedasticity, which occurs when "when the variance of the errors varies across observations". The heteroscedasticity problem can be corrected by transforming the data using the heteroscedasticity-consistent standard error or by using the weighted least square method (Long & Ervin, 2000).

Seventhly, autocorrelation, which is "a correlation between members of series of observations ordered in time as in time series data or space as in cross-sectional data" (Kendall & Buckland, 1971). There are numerous methods that can be used to detect autocorrelation, for instance the asymptotic normality test, the Berenblutt-Webb test, Durbin-Watson *d* test, and the Breusch-Godfrey test (Gujarati, 2009, p. 453). This study used the Breusch-Godfrey LM test.

Eighthly, Hausman's test, which can be used to determine whether the random effects or fixed effects models are more appropriate. The acceptance of the null hypothesis means that the random effects model is more appropriate, while its rejection means that the fixed effects model is more appropriate in interpreting the results.

Ninthly, One way ANOVA test assumed the data are randomly sampled and independently chosen from the populations, the residuals are normally distributed, and the variances of each sample are assumed equal, this is an extension of the two independent samples t-test that compare the variances in the group means within a sample when considering one independent variable or factor (Olive, 2017).

Finally, panel data analysis, which includes a time series of cross-sectional data. It distinguishes itself from pooled analysis method in several points. For instance, it accounts for the effect of individual and time factors (individual and time-specific effects) when estimating regression equations. Compared to cross-sectional data and time series data, panel data analysis provides a greater amount of information and increases the number of study views (Bruel, 2005). Furthermore, it reduces some statistical problems such as multicollinearity, and it raises the degrees of freedom and improves the efficiency of measured coefficients and estimates. This analysis allows the study of individual dynamics and their development over a period of time, and it gives information about the time sequence of events. It also allows the researcher to analyze a number of economic issues that cannot be addressed using time series or cross-sectional data.

Firstly, panel data estimated with either the fixed effects model, which is estimated using ordinary least squares (OLS), or the random effects model, which is estimated using the general least squares (GLS) method. The fundamental difference between the fixed effects model and random effects model is whether the individual and time-specific effects are related to the independent variables.

4.8.1 Fixed Effect Model

The fixed effects model explores the relationship between the explanatory and dependent variables within a unit and controls the unobserved unique characteristics

inside the unit that can bias or affect the dependent variable (Allison, 2009). Therefore, the net effect of the independent variables is assessable because this model disregards the effect of unobserved time-invariant factors on the explanatory variables. In other words, this model assumes the constancy of individual factors, the time factor of individuals, time-specific effects, and their correlation with the independent variables.

4.8.2 Random Effect Model

The random effects model assumes the randomness of their appearance, which means that the intercept of individual units is a random drawing from a large sample with a fixed mean value. This model is appropriate when the (random) intercept of each cross-sectional unit is uncorrelated to the regressors (Gujarati, 2009).

4.8.3 Feasible Generalized Least Squares Model

This generalized least squares estimator directly takes into account cross-sectional and serial correlations and heteroskedasticity in the estimation, and so it is the best unbiased linear estimator (Bai et al., 2021). FGLS creates a new error term which meets the Gauss-Markov assumptions of homoscedasticity and no autocorrelation. It also retains β as a linear parameter vector (Rothe, 2018). In addition, it enables a representation of unique regression coefficients as the sums of total effects (direct and indirect effects), therefore permitting valid causal interpretations involving real world phenomena (Paravastu et al., 2019).

4.9 Panel Regression Model

The dataset of this research was panel data, and the study employed the fixed effects and random effects models to evaluate the relationships between the dependent variable (DV) and the independent variables (IV). The general form of panel regression model is given below:

$$Y_{it} = \beta_{0i} + \beta_1 (X_1)_{it} + \beta_2 (X_2)_{it} + \ldots + \beta_k (X_k)_{it} + U_{it} \quad (4.1)$$

where:

Y_{it}: the dependent variable

$X_1, \ldots X_k$: independent (explanatory) variables

$\beta_o, \ldots \beta_k$: regression model coefficients (parameters)

I: the number of observations or (the cross-sectional dimension of the data)

T: The number of time periods or the time or longitudinal dimensions of the data

U: random error

Three panel regression models have been developed to test the associations between the three constructs of credit risk exposures, liquidity risk exposures, and bank performance. Furthermore, three models were run using the collective data of Jordanian, Qatari, and Saudi Arabian banks. The three models were run separately, one for conventional banks and another for Islamic banks. This exercise allowed the comparison of results between the two types of banks.

The dependent variable for the three models was bank performance. The independent variables included continuous and dummy variables as proxies for three groups. The first group comprised the financial variables of credit risk exposure, the second group comprised the financial variables of liquidity risk exposures, and the

third group comprised the following control variables: bank size, bank type, board size, and gross domestic product. Model (1) tested the association between credit risk exposures and bank performance:

$$BP_{it} = \beta_{0i} + \beta_1 NPL_{it} + \beta_2 CAR_{it} + \beta_3 CLR_{it} + \beta_4 LLR_{it} + \beta_5 LGR_{it} + \beta_6 Bsize_{it} + \beta_7 Btype_{it} + \beta_8 BOZ_{it} + \beta_9 GDP_{it} + U_{it} \quad (4.2)$$

Model (1) evaluated the relationship between credit risk exposures and bank performance. The independent variables tested in the current research can be classified into two groups. The first group comprised credit risk exposures indicators: non performing loans ratio, capital adequacy ratio, cost per loan ratio, loan loss reserve, and loan growth ratio. The second group comprised the control variables, including bank type (conventional and Islamic), bank size, board size, and gross domestic product.

Model (2) tested the association between liquidity risk exposures and bank performance:

$$BP_{it} = \beta_{0it} + \beta_1 CR_{it} + \beta_2 LDR_{it} + \beta_3 LAR_{it} + \beta_4 CDR_{it} + \beta_5 LR_{it} + \beta_6 Bsize_{it} + \beta_7 Btype_{it} + \beta_8 BOZ_{it} + \beta_9 GDP_{it} + U_{it} \quad (4.3)$$

Model (2) evaluated the relationship between liquidity risk exposures and bank performance. The independent variables can be classified into two groups. The first group was the liquidity risk exposures group, containing the variables of current ratio, loan to deposit ratio, loan to asset ratio, cash to deposit ratio, and leverage ratio. The second group comprised the control variables, such as bank type (Islamic and conventional), bank size, board size, and gross domestic product.

Model (3) tested the association between the CRETY model and bank performance:

$$BP_{it} = \beta_{0i} + \beta_1 NPL_{it} + \beta_2 CAR_{it} + \beta_3 CLR_{it} + \beta_4 LLR_{it} + \beta_5 LGR_{it} + \beta_6 CR_{it} + \beta_7 LDR_{it} + \beta_8 LAR_{it} + \beta_9 CDR_{it} + \beta_{10} LR_{it} + \beta_{11} Bsize_{it} + \beta_{12} Btype_{it} + \beta_{13} BOZ_{it} + \beta_{14} GDP_{it} + U_{it} \quad (4.4)$$

Model (3) evaluated the relationship between credit and liquidity risk exposures, and bank performance. The independent variables can be classified into three groups. The first group comprised the indicators of credit risk exposures: non-performing loan ratio, capital adequacy ratio, cost per loan ratio, loan loss reserve, and loan growth ratio. The second group was the liquidity risk exposures group, containing current ratio, loan to deposit ratio, loan to asset ratio, cash to deposit ratio, and leverage ratio. The third group comprised the control variables, such as bank type (Islamic and conventional), bank size, board size, and gross domestic product.

4.10 Chapter Summary

This chapter has presented and discussed the definitions of the study variables and their measurements and linked them with previous studies that used the same variables. This study exhibited three types of variables: (1) independent variables related to credit and liquidity risk exposures; (2) dependent variables (bank performance), measured by ROA, ROE, and TQ; and (3) control variables, measured by bank size, bank type, board size, and gross domestic product.

In addition, this chapter has presented the study sample, which consisted of 15 Jordanian banks, 11 Saudi Arabia banks, and eight Qatari banks listed on Amman Stock Exchange, Saudi Stock Exchange, Qatar Stock Exchange in 2013-2017. This study used panel data regression to test the conceptual framework models. It also

added the definitions and explanations for the statistical analyses and diagnostic tests, such as normality, multicollinearity, outliers, heteroscedasticity, autocorrelation, and Hausman test.