

**IMPACT OF BASEL III LIQUIDITY REQUIREMENTS
ON ISLAMIC AND CONVENTIONAL BANKS'
PERFORMANCE IN PAKISTAN**

BY

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ABSTRACT

Since the financial crisis of 2007-2008, Basel III issued new regulations to enhance the resilience of the banking industry, including robust liquidity guidelines requiring all banks to maintain a net stable funding ratio (NSFR) and liquidity coverage ratio (LCR) of 100% or more. These regulations apply to both conventional and Islamic banks, though Islamic banks face unique challenges due to Shariah compliance requirements on liquidity product structures and mechanisms to avoid usury and highly speculative exposures. This study explores the impact of Basel III liquidity requirements on the stability, profitability, and intermediation cost of banks in Pakistan, focusing on the differences between conventional and Islamic banks. Addressing key gaps, the study examines the differential impact of the financial crisis on conventional and Islamic banks, the Basel Committee's uniform application of standards to both banking systems, and the lack of tailored regulatory standards for Islamic finance. Using a balanced panel data set from 2007-2021, comprising seventeen conventional banks and four full-fledged Islamic banks, various bank-specific and macroeconomic variables are analyzed. The Generalized Method of Moments (GMM) and Driscoll-Kraay covariance estimator are applied to conventional banks, while the Autoregressive Distributed Lag (ARDL) model is used for Islamic banks. Results indicate that for conventional banks, NSFR significantly enhances stability, has no impact on profitability, and reduces intermediation cost, while LCR significantly enhances stability but reduces both profitability and intermediation cost. For Islamic banks, NSFR shows no impact on stability and negatively affects profitability. In contrast, LCR negatively impacts stability and intermediation cost but positively affects profitability.

The findings underscore the significant influence of Basel III liquidity requirements on both banking systems, highlighting the need for differentiated regulatory approaches. Policymakers should consider the unique characteristics of Islamic banking when formulating liquidity regulations. The results suggest that while Basel III requirements positively influence stability, they may adversely affect profitability and intermediation cost. This implies that regulators should continue to enforce these regulations to ensure that banks maintain adequate liquidity buffers to withstand financial shocks. Given the distinct impact on Islamic banks, tailored liquidity requirements that better suit Islamic banking products and services are necessary. Encouraging the diversification of funding sources can enhance bank stability, as indicated by the positive impact of NSFR. Additionally, promoting best practices in liquidity risk management, such as stress testing and contingency planning, can enhance banks' resilience to financial shocks. Overall, a balanced approach by policymakers is essential to promote financial stability without compromising the provision of financial services. Moreover, the study highlights the importance of regulatory compliance and the potential benefits of differentiated treatment for Islamic banks to address their unique needs. The emphasis on stability through NSFR and LCR compliance illustrates the trade-offs faced by banks in managing liquidity risks and profitability. The policy implications drawn from this study can guide future regulatory frameworks to ensure the soundness and growth of both conventional and Islamic banking sectors in Pakistan.

ملخص البحث

منذ الأزمة المالية في عام 2007-2008، أصدر بازل الثالث لوائح جديدة لتعزيز مرونة صناعة البنوك، بما في ذلك إرشادات السيولة الصارمة التي تتطلب من جميع البنوك الحفاظ على نسبة تمويل مستقرة صافية (NSFR) ونسبة تغطية السيولة (LCR) بنسبة 100٪ أو أكثر. تنطبق هذه اللوائح على كل من البنوك التقليدية والإسلامية، على الرغم من أن البنوك الإسلامية تواجه تحديات فريدة بسبب متطلبات الامتثال للشريعة في هياكل منتجات السيولة وآليات تجنب الربا والتعرضات المضاربة العالية. تستكشف هذه الدراسة تأثير متطلبات السيولة في بازل الثالث على الاستقرار والربحية وتكلفة الوساطة للبنوك في باكستان، مع التركيز على الاختلافات بين البنوك التقليدية والإسلامية. تتناول الدراسة الثغرات الرئيسية من خلال دراسة التأثير التفاضلي للأزمة المالية على البنوك التقليدية والإسلامية، والتطبيق الموحد لمعايير لجنة بازل على كلا النظامين المصرفيين، وغياب معايير تنظيمية مصممة خصيصًا للتمويل الإسلامي. باستخدام مجموعة بيانات لوحة متوازنة من 2007-2021، تشمل سبعة عشر بنكا تقليدياً وأربعة بنوك إسلامية كاملة، يتم تحليل مختلف المتغيرات الخاصة بالبنوك والمتغيرات الاقتصادية الكلية. يتم تطبيق طريقة العزوم العامة (GMM) ومقدّر التباين دريسكول-كراي (Driscoll-Kraay) على البنوك التقليدية، بينما يتم استخدام نموذج الأوتوغراف الموزع ذاتي الرجوع (ARDL) للبنوك الإسلامية. تشير النتائج إلى أن نسبة التمويل المستقرة الصافية (NSFR) تعزز بشكل كبير الاستقرار في البنوك التقليدية، وليس لها تأثير على الربحية، وتقلل من تكلفة الوساطة، بينما تعزز نسبة تغطية السيولة (LCR) بشكل كبير الاستقرار، ولكنها تقلل من الربحية وتكلفة الوساطة. أما بالنسبة للبنوك الإسلامية، فلا يظهر أن

نسبة التمويل المستقرة الصافية (NSFR) لها تأثير على الاستقرار وتؤثر سلباً على الربحية. في المقابل، تؤثر نسبة تغطية السيولة (LCR) سلباً على الاستقرار وتكلفة الوساطة، ولكنها تؤثر إيجاباً على الربحية.

تؤكد النتائج التأثير الكبير لمتطلبات السيولة في بازل الثالث على كلا النظامين المصرفيين، مما يبرز الحاجة إلى نهج تنظيمي متميز. ينبغي على صناع السياسات مراعاة الخصائص الفريدة للمصرفية الإسلامية عند صياغة اللوائح المتعلقة بالسيولة. تشير النتائج إلى أن متطلبات بازل الثالث تؤثر إيجابياً على الاستقرار، لكنها قد تؤثر سلباً على الربحية وتكلفة الوساطة. وهذا يعني أن على الجهات التنظيمية الاستمرار في فرض هذه اللوائح لضمان احتفاظ البنوك بوسائل سيولة كافية لتحمل الصدمات المالية. بالنظر إلى التأثير المختلف على البنوك الإسلامية، فإن هناك حاجة إلى متطلبات سيولة مصممة خصيصاً لتناسب منتجات وخدمات البنوك الإسلامية. يمكن أن يعزز تنوع مصادر التمويل استقرار البنوك، كما يتضح من التأثير الإيجابي لنسبة التمويل المستقرة الصافية (NSFR) بالإضافة إلى ذلك، فإن تعزيز أفضل الممارسات في إدارة مخاطر السيولة، مثل اختبارات الضغط والتخطيط للطوارئ، يمكن أن يعزز من قدرة البنوك على تحمل الصدمات المالية. بشكل عام، يُعتبر النهج المتوازن من قبل صناع السياسات أمراً ضرورياً لتعزيز الاستقرار المالي دون الإخلال بتقديم الخدمات المالية. علاوة على ذلك، تبرز الدراسة أهمية الامتثال التنظيمي والفوائد المحتملة للمعاملة المتميزة للبنوك الإسلامية لتلبية احتياجاتها الفريدة. يؤكد التركيز على الاستقرار من خلال الامتثال لنسبة التمويل المستقرة الصافية (NSFR) ونسبة تغطية السيولة (LCR) على التوازنات التي تواجهها البنوك في إدارة مخاطر السيولة والربحية. يمكن أن توجه التبعات السياسية المستخلصة من هذه الدراسة الأطر التنظيمية المستقبلية لضمان سلامة ونمو القطاعين المصرفيين التقليدي والإسلامي في باكستان.

APPROVAL PAGE

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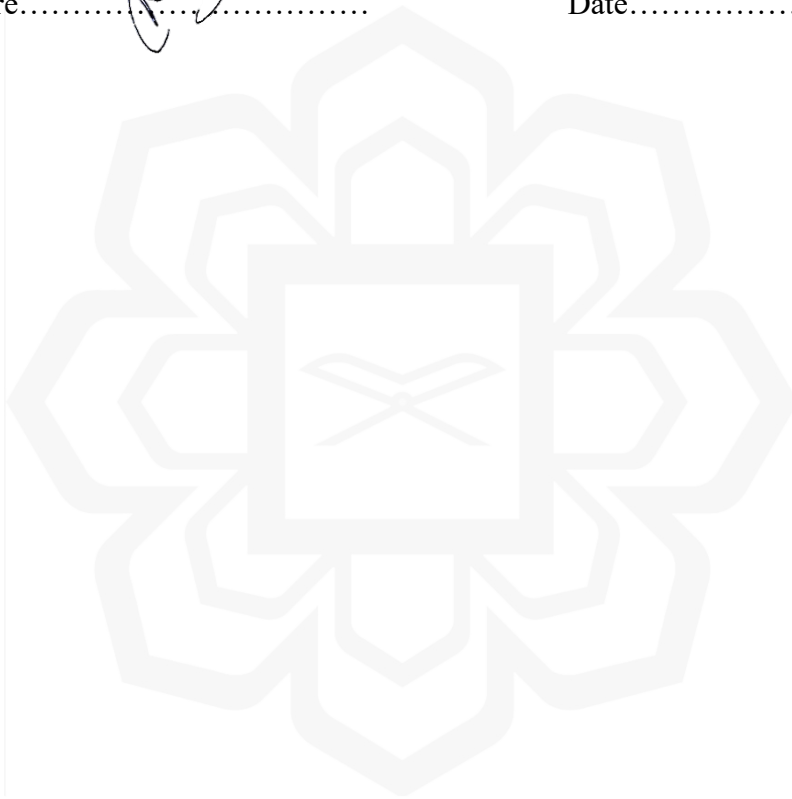
DECLARATION

I hereby declare that this thesis is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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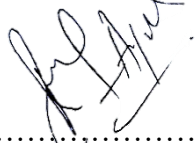
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*This thesis is dedicated to my parents for their unwavering support and love which
have shaped me into who I am today.*

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LIST OF ABBREVIATIONS

SBP	State Bank of Pakistan
BCBS	Basel Committee Banking Supervisions
BIS	Bank for International Settlement
IFSB	Islamic Financial Services Board
LCR	Liquidity Coverage Ratio
NSFR	Net Stable Funding Ratio
CB	Conventional Bank
IB	Full-Fledged Islamic Bank
IBDs	Conventional Banks with Islamic Banking Division
ROA	Return on Asset
ROE	Return on Equity
NIM	Net Interest Margin
NPM	Net Profit Margin
CAR	Capital Adequacy Ratio
GDP	Gross Domestic Product
INF	Inflation
LqIt	Loan Quality
Conc	Concentration
FEM	Fixed Effect Model
REM	Random Effect Model
OLS	Ordinary Least Square
GMM	Generalized Method of Moments
DK	Driscoll-Kraay Standard Error
ARDL	Autoregressive Distributed Lag

CHAPTER ONE

INTRODUCTION

1.1. BACKGROUND OF THE STUDY

The financial health of a country is determined by the performance of the financial sector. This sector constitutes a major part of the economic sector; hence, economic growth is directly related to the growth of the financial sector. In an economy of a country importance of the role played by the banks cannot be denied. Commercial banks in any country are the most dominant players in the financial system. They channelize savings from savers to firms and by diversifying the overtime fluctuations, banks share risks in the economy (Allen et al., 2008). Porter, (1965) established that economic growth and financial development are directly related to one another. They emphasized the efficient role of banks as an intermediary.

The growth and success of the Islamic Banking industry cannot be ignored. According to ICD and Refinitiv, (2021), the Islamic Banking industry is growing at an exponential growth rate, and it is expected that its total assets will reach \$2,439 Bn by 2022 with a compound annual growth of 7.3%. Islamic banking throughout the world is much more developed in terms of products and services for customers and one of the key issues faced by the Islamic banking industry is Liquidity Management. But Islamic financial markets; capital markets as well as money markets, are still in the infancy stage.

Several factors can influence the profitability and stability of a commercial bank: conventional or Islamic. One of the most significant factors affecting profitability and stability is liquidity management. Inefficient liquidity management can create liquidity risk. Hence, it is of utmost important for every bank to efficiently manage liquidity to remain profitable. The financial crisis of 2008 was a clear indication of inefficient liquidity management. According to Ali, (2013), situations of surplus as well as a shortage of liquidity, are critical for a bank. Islamic Banks globally have been encountering issues in liquidity management. According to Islamic Finance

Development Report, ICD and Refinitiv, (2021) Report and Multi-country report, (IMF- International Monetary Fund. Middle East and Central Asia Dept., 2017), Islamic banks are facing many issues in liquidity management. These include unavailability of developed Islamic money market as well as Islamic money market instruments, Islamic interbank benchmark rate etc (Rizkiah, 2018; Abdul Ganiyy, Ogunbado, & Ahmad, 2017; Islam & Amir, 2016; and Muttalib 2014).

The liquidity of an asset is the timely conversion into cash. Liquidity management for a banking institution is its ability to manage assets in a manner that liabilities can be met on a timely basis without incurring any substantial losses. Liquidity risk generally arises due to inefficient management of current assets and liabilities. In a banking institution, liquidity risk refers to the possibility that a bank won't be able to make payments as liabilities become due (Greuning & Bratanovic, 2020). Mismatch of maturing debt obligations and incoming cashflows of the business generate liquidity risk. In a banking institution maturity gap means difference in the maturity tenors of assets and liabilities. A high positive or low negative maturity gap in banking assets and liabilities gives a signal of the presence of liquidity issues in the bank (Ali, 2013).

Basel committee has issued a complete set of standards for banking supervision that is Basel committee banking supervisions (BCBS). The purpose of these standards is to act as standard setters in formulating prudential regulations for banks. It is meant to develop a framework for managing all types of risks in banks and to reduce the likelihood of regulatory arbitrage. Concerning the global financial liquidity crisis, of 2008, BCBS released Basel III to improve the risk management of banks. These standards are for all banks without any differentiation between Islamic and conventional banks. BCBS issued regulations on liquidity risk management in which banks are now required to maintain a Liquidity Coverage ratio (LCR) and Net Stable Funding ratio (NSFR) greater than 100% (BIS, 2013, 2014). Islamic Financial Service Board (IFSB) also issues the modified version of Basel liquidity standards for Islamic banks in 2015, in the form of published or guiding notes along with many other standards (IFSB, 2015), for the management of liquidity risk in Islamic Banking Institutions. According to (Dolgun et al., 2019) standards issued by IFSB are similar to that of BCBS. Ling et al., (2022) in their research revealed that IFSB guidelines has been adopted from BCBS

with some modifications to consider the asset-liability structure of Islamic bank. Hassan, (2023) highlighted that the only difference in the provisions for risk mitigation offered by IFSB from BCBS is the replacement of non-compliant instruments with Shariah-compliant instruments. Dolgun et al., (2019), therefore stated that there is a need to develop a suitable stress testing framework tailored for Islamic. Existing literature is scarce in identifying the impact of Basel III liquidity standards on banks in general and even scant for Islamic banks.

This research aimed at analysing the impact of Basel III regulations related to liquidity risk requirements on stability, performance and financial intermediation cost of Islamic banks and conventional banks in Pakistan for the period of 2007 to 2021.

1.2. BANKING SECTOR OF PAKISTAN

1.2.1 Overview

In 1947, Pakistan took independence from the British regime and established itself as an independent country. In the land included in Pakistan, only agricultural land was present and the sea was used for export. There was no industry present at that time. Also, after the announcement of partition, many banks moved their head offices to India (Siddiqi, 1998). At that time Pakistan faced a shortage of resources and skilled personnel. Therefore, it was recommended that the Reserve Bank of India should assist with monetary matters such as issuing coins and currency until September 30th, 1948. However, this deadline was later changed to June 30th, 1948.

State Bank of Pakistan (SBP) the central bank of Pakistan that regulates the whole banking sector of the country was founded in 1948. The banking sector of Pakistan includes public and private commercial banks, foreign banks, specialized banks and microfinance banks. According to SBP, in Pakistan, the banking industry represents more than 74% share in the assets of the whole financial sector of the country.

1.2.2 Formation of Commercial Banking System (1947 – 1973)

The State Bank of Pakistan was founded on July 1st, 1948, as a result of the Imperial Bank, which acted as an agent of the Reserve Bank of India, shutting down its branches in Pakistan. Additionally, the Indian government did not pay Pakistan its share of the cash balance, amounting to Rs. 750 million, held in the Reserve Bank of India. To address the challenges the government proclaimed the Banking Companies Ordinance of 1947 and the Banking Companies Act of 1949. Only two Muslim-owned banks existed at that time: Habib Bank Limited and Australasia Bank. The State Bank of Pakistan supported the expansion of Habib Bank Limited's network and established the National Bank of Pakistan in 1949, which assumed the agency function previously held by the Imperial Bank of India in 1952. With the assistance of the government and SBP, financial institutions in Pakistan saw rapid growth, including the establishment of the Industrial Development Finance Corporation and the Agriculture Development Bank. Economic planning began in 1956, and the United Bank Limited was founded in 1959. However, the separation of East Pakistan in 1971 had a detrimental effect on the progress of the banking sector. By December 31st, 1973, there were 14 scheduled Pakistani banks with 3,323 branches in Pakistan and 74 branches in foreign countries, as reported by Siddiqi, (1998).

1.2.3 Nationalization of Banks (1974 – 1978)

The government's decision to nationalize all banks in 1974 as part of its broader policy of taking control of all assets held by the private sector. This move was made possible by the Banks Nationalization Act 1974, which transferred ownership, management, and control of all commercial banks from the private sector to the federal government. Before nationalization, 14 Pakistani commercial banks were operating in the country. After nationalization, five major banks emerged: National Bank of Pakistan, Habib Bank Limited, United Bank Limited, Muslim Commercial Bank Limited, and Allied Bank Limited. However, the nationalization process had a negative impact on the banks' performance due to inefficient services and substandard financial products. It also sent a negative message to private investors and foreign financial institutions (Abidi et al., 2014).

1.2.4 Banking Islamization (1977-1992)

According to the State Bank of Pakistan, the first attempt at the Islamization of the economy of Pakistan was made in 1977-1978 by making the banking system, an interest-free banking system. In 1981, the concept of interest-free Islamic banking was introduced in Pakistan, and entities such as the National Investment Trust (NIT), Investment Corporation of Pakistan (ICP), and House Building Finance Corporation (HBFC) eliminated interest from their transactions. Other measures included the formation of Mudarabah companies, the launch of Participatory Term Certificates (PTC), and the proclamation of the Zakat ordinance in 1980. Nationalized banks were also required to have interest-free counters for their customers in 1981. The Usher ordinance was implemented in 1983, and amendments to the Banking and Financial Services Ordinance were introduced in 1984, integrating non-interest-based systems.

1.2.5 Privatization in Banking Sector (1992 – 2000)

After two decades of nationalization, the government realized that the intended objectives were not achieved. On the contrary, outcomes were opposed to the set goals. According to (Husain, 2011), the banks and other public enterprises in Pakistan became a financial burden on the country's resources due to overstaffing and non-performing loans. Hence, the nationalization policy was reversed in January 1991. The Privatization Commission (PC) was established on January 22, 1991, as the first step towards this goal. Although the Privatization Commission was initially intended for the industry, the banking sector was included in the privatization process by 1993. The privatization of banks took place in two phases. The first phase (1992-96) saw partial privatization of banks, while the second phase (1997-2000) led to complete denationalization of the banking sector.

1.2.6 Historical Judgement on Interest and Initiation of Islamic Banking Era (From 2000)

In 1991 Federal Shari'ah Court declared the practices of an interest-free banking system unIslamic. Many appeals were made against this ruling but remained unable to affect the decision and finally in 2001 Supreme Court of Pakistan gave a final historical judgment on this matter. In the year 2000, the Commission for Transformation of Financial System (CTFS) was established by the State Bank of Pakistan to identify the actions needed for the transformation of the conventional banking system to the Islamic financial system, and also to identify the major Shari'ah-compliant modes of financing. State banks continuously worked very hard to re-launch Islamic banking in Pakistan properly. Because of this hard work of the State Bank of Pakistan, the first Islamic bank was established in 2002 that is Meezan Bank Limited. To monitor the Islamic Banking activities in the country constantly, SBP established a separate department by the name of the Islamic Banking Department in 2003 (SBP, 2003a).

To promote Islamic Banking in Pakistan, SBP issued a strategy comprised of three approaches in 2003 (SBP, 2003b). In that strategy, all conventional banks in Pakistan were asked to opt for one of the given alternatives which is either to establish a full-fledged Islamic bank or Islamic banking subsidiary or stand-alone branches for Islamic banking.

1.2.7 Current Status of the Banking Sector in Pakistan

The banking sector of Pakistan as per the statistics given by SBP is comprised of the following banks:

Table 1.1 Statistics of scheduled banks in Pakistan

Types of Banks	Total Number
Public sector banks	5
Private sector banks	20
Foreign banks	5
Specialized banks	4
Total	34

Source: (SBP, 2021a)

In seventeen years currently among commercial banks, there are four full-fledged Islamic banks (Ibs), one Islamic Banking Subsidiary, seventeen conventional banks with Islamic banking branches and rest two private commercial banks that do not have any Islamic banking subsidiaries or division (SBP, 2021a). These are Fist Women bank limited, JS bank limited, and Samba Bank Limited. On April 28th, 2023, the Federal Shariah Court (FSC) of Pakistan issued a verdict against Riba and directed the government of Pakistan to make Pakistan interest-free in five years. The FSC ordered the conversion of the current banking system to a riba-free system by the end of 2027 (Business Recorder, 2023). Therefore, all conventional banks have started working on a full conversion.

Figure 1.1 shows the establishment of Islamic banks in Pakistan since 2003. By the end of the year 2021, twenty-two Islamic banking institutions are offering Islamic banking services in Pakistan, with 3,956 numbers of branches (SBP, 2021b).

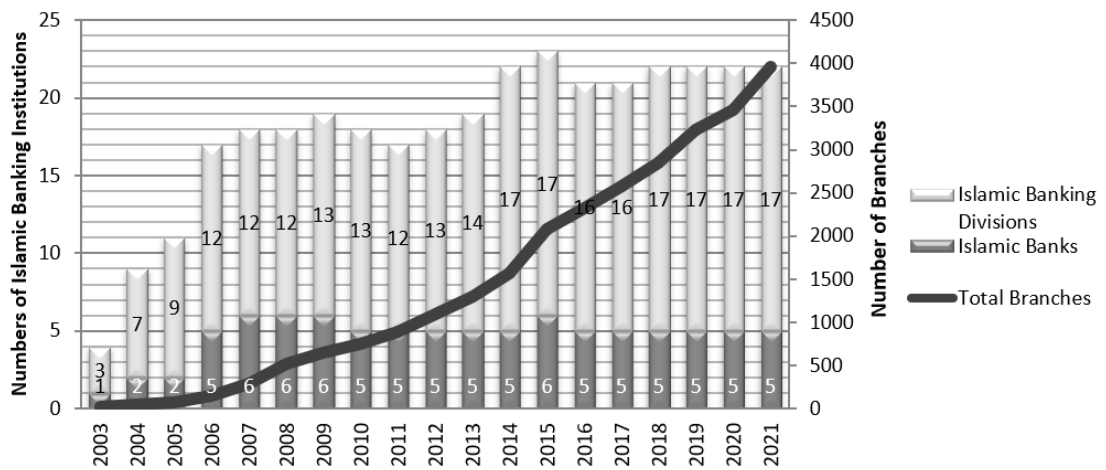


Figure 1.01 Establishment of Islamic Banks in Pakistan (2003-2021) (IBB, 2021)

1.2.8 Performance of the Islamic Banking Sector of Pakistan

In Pakistan Islamic banking is still young in comparison to the conventional banking industry, but the performance of Islamic Banks has grown at an outstanding rate. Pakistan now holds 7th rank among the top ten countries in Islamic finance (ICD & Refinitiv, 2021). Figure 1.2 presents the performance of the Islamic banking sector in Pakistan from 2003 to 2021.

The Islamic banking industry has shown remarkable growth since 2003. In terms of total assets, by the end of the year 2021, Islamic banks held an 18.6% share in the industry assets and a 23.55% share in total deposits of the industry (SBP, 2021b).

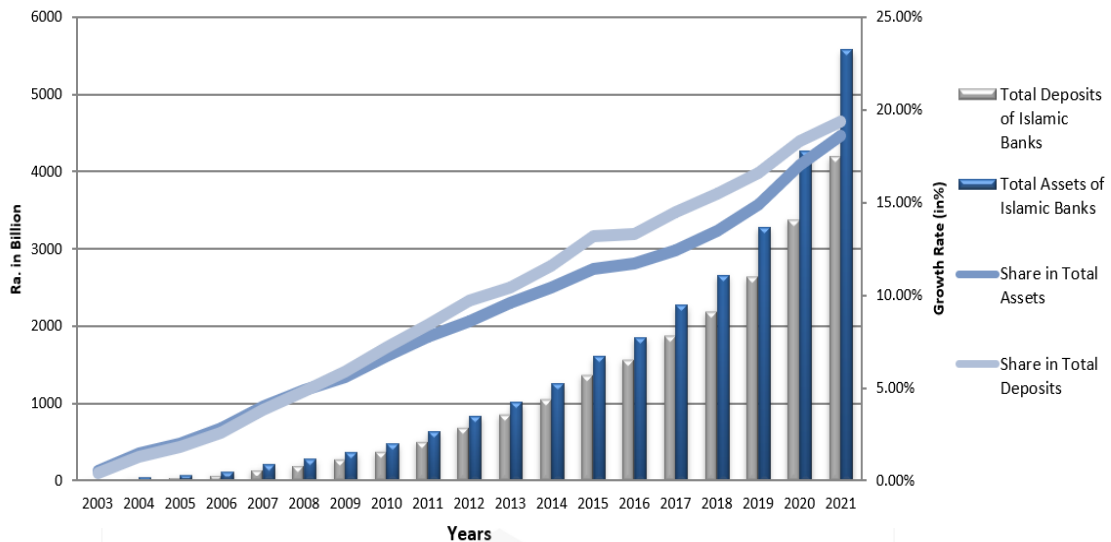


Figure 1.2 Growth in Assets and Deposits of Islamic Banking Industry of Pakistan: SBP, Islamic banking bulletin (2008-21)

Islamic banking industry (IBI) has shown a mostly increasing trend in terms of profitability as well (Figure. 1.3). ROE since 2011 is showing improved results in comparison to the overall banking industry of Pakistan. Currently, it is almost equal to the industry average. In figure 3 it can be observed that in 2011 there was a sharp increase in profitability. ROE increases from 5.2% (in 2010) to 17.3% (in 2011) and it was 4.6% behind the industry average in 2010 while 2.3% ahead in 2011. Critical changes occurred in the banking industry of Pakistan during the year 2011. RBS was acquired by Faysal Bank and Emirates Global Islamic Bank merged with Albaraka Islamic Bank. Also, SBP policies regarding KIBOR improved the situation of the banking industry. Islamic banking profitability has shown a mixed trend during 2012-15. But since then, it is showing continuously an increasing trend. Since 2018 Islamic banking industry has surpassed the overall banking industry in profitability. In 2021, the ROE of the Islamic banking industry was 32.4% in comparison to the ROE of 24% of the whole banking industry.

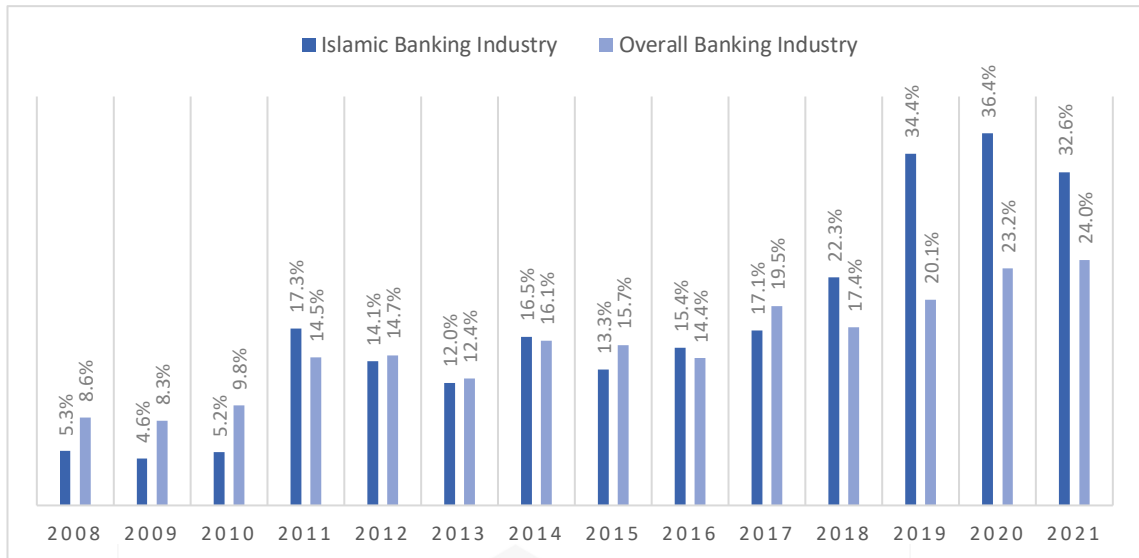


Figure 1.3 Return on Equity (ROE) of Islamic Banking Industry vs Overall Banking Industry of Pakistan (2008-2021): SBP, Islamic banking bulletin (2008-21)

1.2.9 State of Liquidity

The liquidity of the Islamic banking industry in Pakistan has been improving over time. The pandemic, however, affected the overall banking industry and hence, Islamic banking liquidity of Islamic banking industry was affected too. But overall the liquidity position again started to improve in 2020. In Pakistan there is no much difference in the liquid assets of Islamic banks except the fact that all Islamic banking assets are Shariah compliant. These includes deposits, short term investments etc.

Figure 1.4 shows that ratio of liquid assets to total assets for the Islamic banking industry is very low in comparison to the industry. Initially, in 2012, the Islamic banking sector had a relatively high ratio of 46.70%. However, this ratio showed a consistent decline in the following years, reaching a low of 20.80% in 2019. The decrease in the ratio of liquid assets to total assets in the Islamic banking industry can be attributed to the development and diversification of liquidity instruments within the sector. In the early years, options for Sukuk investments and other Sharia-compliant financial instruments were limited. As the sector evolved, more investment opportunities became available, leading to a higher allocation of assets in these instruments. Consequently,

the proportion of liquid assets relative to total assets decreased over time. Notably, in 2020 and 2021, the ratio of liquid assets to total assets in the Islamic banking industry increased to 28.70% and 33.20%, respectively. This rebound can be linked to changes in investment opportunities and strategies within the sector, which may have led to a temporary increase in liquidity.

In contrast, the total banking industry maintained a relatively stable and higher ratio of liquid assets to total assets throughout the period. This stability suggests that conventional banks had more consistent access to liquid assets compared to their Islamic counterparts.

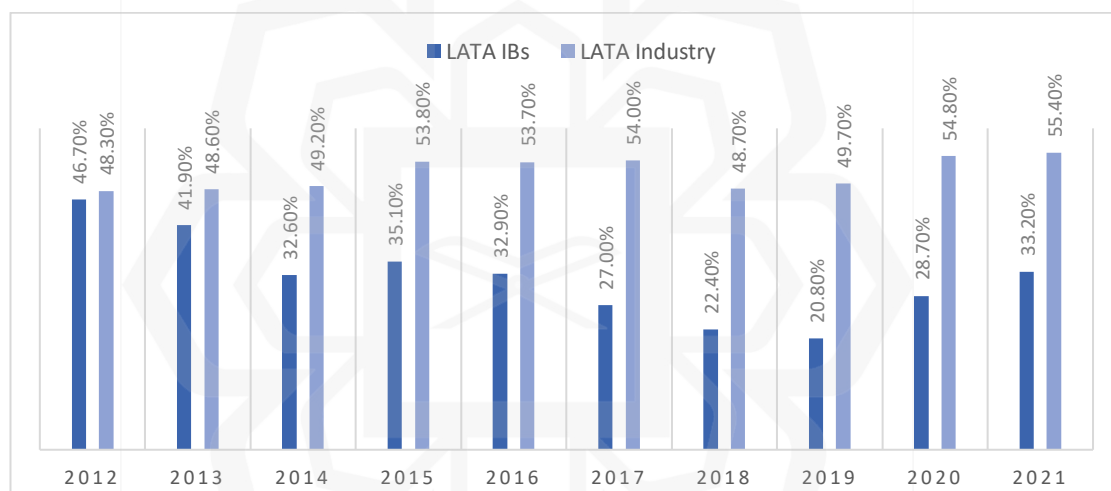


Figure 1.4 Liquid Asset to Total Asset Ratio (LATA) (2012 – 2021): SBP, Islamic banking bulletin (2012-21)

Figure 1.5 also presents the same results as Figure 1.4. Liquid asset to deposit ratio of the Islamic banking industry in comparison to the overall banking industry. Till 2019 Islamic banking industry has more than 50% lower LATD ratio in comparison to the overall industry. But since 2020, the ratio is improving.

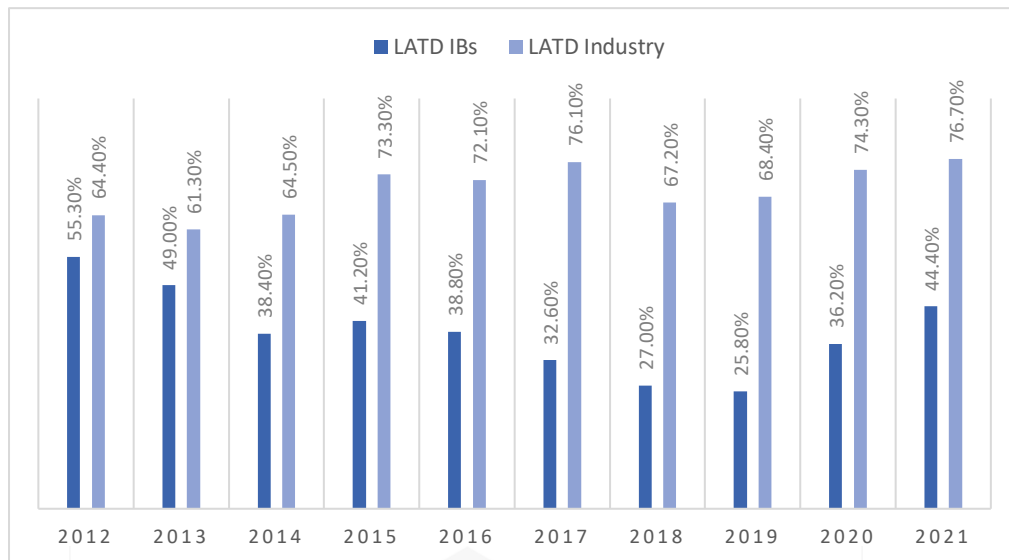


Figure 1.5 Liquid Asset to Deposit (LATD) Ratio (2012-2021) SBP, Islamic banking bulletin (2012-21)

1.3. PROBLEM STATEMENT

The Global Financial Crisis of 2008 highlighted the fragility of the banking industry. It raised fundamental questions about liquidity risk in the banking industry (Strahan, 2012). It was also observed that a difference was found in the impact of this financial crisis on the stability and profitability of conventional and Islamic banks (Bourkhis & Nabi, 2013; Čihák & Hesse, 2010; Fayed, 2013; Ouerghi, 2014; Rashid et al., 2017; Tabash & Dhankar, 2014; Trad et al., 2017). In response to the crisis and to improve the resilience of the banking system Basel Committee issued its Basel III framework that addresses the shortcomings of the previously issued framework (BIS 2010). Here it is important to consider the fact that despite the known difference in the business model of conventional and Islamic banks Basel Committee does not consider this factor while formulating the framework. It can be said that the Basel Committee does not differentiate the standards for both conventional and Islamic banks, IFSB has also issued the modified versions of Basel III for Islamic banks that remove the non-Shariah compliant elements of the standards and make it applicable for Islamic banks as well. In Pakistan like most countries including Bangladesh, Malaysia, etc., the central bank has issued a standardized version of Basel III for both Islamic and conventional banks

(SBP, 2013). It is also highlighted in the literature that a significant obstacle to the advancement and proliferation of Islamic finance is the absence of regulatory and supervisory standards that are tailored to the unique features of Islamic finance disclosures of Investment accounts and Islamic financing contracts since most of the existing standards issued by IFSB are analogous to those established by the BCBS (Dolgun et al., 2020).

In Pakistan, as per the directives of SBP, banks started reporting LCR and NSFR in 2017. Therefore, the existing literature is scarce on identifying the impact of Basel III standards on liquidity management practices of banks and it is even scant specifically for Islamic banks. Researchers suggest that Islamic banks may face constraints in meeting Basel III liquidity requirements due to the lack of Shariah-compliant liquidity instruments (Ahmed, 2015). This research aims to address this empirical gap by examining how Basel III liquidity requirements affect the stability, profitability, and intermediation cost (NIM/NPM) of Islamic banks compared to conventional banks. Moreover, the study will explore the influence of different bank-specific factors and country-specific variables on these outcomes.

This research aims to fill several gaps in the existing literature. First, there is an empirical gap in understanding how Basel III liquidity requirements impact the stability, profitability, and financial intermediation cost of Islamic banks, particularly in Pakistan. Second, a theoretical gap exists due to the lack of differentiation in Basel III standards between conventional and Islamic banks, despite their differing business models. Finally, a methodological gap is evident in the absence of studies that comprehensively analyze these impacts using appropriate econometric techniques and data.

The evaluation of bank performance from the aspects of stability, profitability, and intermediation cost is crucial for several reasons. Stability is essential to ensure the resilience of banks against financial shocks. Profitability is a key indicator of a bank's ability to generate earnings and sustain operations. Financial intermediation cost reflects the efficiency of banks in transforming deposits into loans. These aspects are critical in assessing the overall health and performance of banks, and they provide a comprehensive view of the impact of liquidity requirements. This research will also

consider bank-specific and country-specific factors that significantly influence the stability, profitability and intermediation cost of banks.

Specifically, for Model 1, which analyses stability (z-score) as the dependent variable, the independent variables are Basel III liquidity requirements (NSFR and LCR), with control variables including size, asset quality (Lq1t), GDP growth, and concentration. These control variables are chosen because they directly impact a bank's stability by affecting its risk profile and market environment. In Model 2, which evaluates profitability (ROA), the independent variables are Basel III liquidity requirements (NSFR and LCR), with control variables including size, operational efficiency (cost), GDP growth, and concentration. These factors are essential for understanding profitability as they influence a bank's ability to manage costs and capitalize on economic conditions. For Model 3, which examines financial intermediation cost (NIM), the independent variables are Basel III liquidity requirements (NSFR and LCR), with control variables including size, operational efficiency (cost), GDP growth, and inflation. These variables are selected because they affect the cost of financial intermediation through their impact on both internal efficiency and external economic pressures. The selection of these control variables is based on evidence from the literature, and detailed discussions are provided in the literature review section.

As per the researcher's knowledge, there is a dearth of literature analyzing the impact of Basel III liquidity requirements on the stability, profitability, and financial intermediation cost of Islamic banks in general, and specifically in Pakistan. Therefore, this research will contribute to the existing literature by filling these gaps and providing insights into this region. Due to the lack of liquidity instruments for Islamic banks and the need to implement Basel III requirements, the significant impact of liquidity requirements on banks' stability, profitability, and financial intermediation cost needs to be examined and assessed.

As per the researcher's knowledge, there is a dearth of literature on analysing the impact of liquidity requirements of Basel III on the stability, profitability and financial intermediation cost of Islamic banks in general and specifically in Pakistan. Therefore, this research will contribute to the existing literature by analysing this impact

in this part of the region. Due to the lack of liquidity instruments for Islamic banks and the need to implement Basle III requirements, the significant impact of liquidity requirements on banks' stability, profitability and financial intermediation cost need to be examined and assessed.

1.4. SCOPE OF THE STUDY

The research will be conducted to evaluate and compare the impact of liquidity standards on the stability, profitability and intermediation cost of both Islamic and conventional banks in Pakistan. This study encompasses all commercial banks in Pakistan; there are five public banks that are owned by government and twenty private commercial banks that are owned by various groups in Pakistan. The selected period of the study will be 2007-2021. This period has been selected because in Pakistan the substantial progression of the Islamic banking industry emerged in 2007. Therefore, in this research, the impact of LCR and NSFR on the stability, profitability and intermediation cost of Islamic and conventional banks will be analysed. The methodology includes using secondary data and applying quantitative research techniques. Specifically, the study employs fixed effects model, Driscoll-Kraay (DK) standard errors, and Generalized Method of Moments (GMM) for conventional banks, while the Autoregressive Distributed Lag (ARDL) approach is used for Islamic banks. This comprehensive approach will help in empirically identifying the impact of Basel III liquidity standards on both types of banks.

1.5. RESEARCH OBJECTIVES

The primary objective of this thesis is to enhance the understanding of the nexus of liquidity risk and profitability, liquidity risk and financial stability as well as liquidity risk and cost of intermediation of the banking sector across Basel jurisdiction with a focus on the Islamic banking sector of Pakistan. Specifically, the aims and objectives of the study are:

1. To determine the extent of impact of Basel III liquidity requirements namely liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) on the stability of all commercial banks in Pakistan.
2. To determine the extent of impact of Basel III liquidity requirements namely liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) on the profitability of all commercial banks of Pakistan.
3. To determine the extent of impact of Basel III liquidity requirements namely liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) on the intermediation cost (NIM/NPM) of all commercial banks of Pakistan.
4. To distinguish the impact of bank-specific variables namely bank size and asset quality (LqIt), and country-specific variables namely GDP and concentration (Conc) on the stability of all commercial banks of Pakistan.
5. To distinguish the impact of bank-specific variables namely bank size, and operational efficiency (Cost), and country-specific variables namely GDP, and concentration (Conc) on the profitability of all commercial banks of Pakistan.
6. To distinguish the impact of bank-specific variables namely, bank size and operational efficiency (Cost), and country-specific variables namely GDP growth and inflation (Inf) on the intermediation cost (NIM/NPM) of all commercial banks of Pakistan.

1.6. RESEARCH QUESTIONS

The purpose of this research is to examine the impact of Basel III liquidity requirements on the performance and stability of Islamic banks in comparison to conventional banks in Pakistan from 2007-2021. This study will answer the following questions:

1. To what extent there is an impact of Basel III liquidity requirements namely liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) on the stability of conventional banks of Pakistan?
2. To what extent there is an impact of Basel III liquidity requirements namely liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) on the profitability of conventional banks of Pakistan?

3. To what extent there is an impact of Basel III liquidity requirements namely liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) on the intermediation cost of conventional banks of Pakistan?
4. Is there a distinct significant impact of bank-specific variables namely bank size and asset quality (Lq1t), and country-specific variables namely GDP and concentration (Conc) on the stability of conventional banks of Pakistan?
5. Is there a distinct significant impact of bank-specific variables namely bank size, and operational efficiency (Cost), and country-specific variables namely GDP, and concentration (Conc) on the profitability of conventional banks of Pakistan?
6. Is there a distinct significant impact of bank-specific variables namely bank size and operational efficiency (Cost), and country-specific variables namely GDP growth and inflation (Inf) on the intermediation cost (NIM/NPM) of conventional banks of Pakistan?
7. To what extent there is an impact of Basel III liquidity requirements namely LCR and NSFR on the stability of all full-fledged Islamic banks (Ibs) of Pakistan?
8. To what extent there is an impact of Basel III liquidity requirements namely LCR and NSFR on the profitability of all full-fledged Islamic banks (Ibs) of Pakistan?
9. To what extent there is an impact of Basel III liquidity requirements namely LCR and NSFR on the intermediation cost (NIM/NPM) of all full-fledged Islamic banks (Ibs) of Pakistan?
10. Is there a distinct significant impact of bank-specific variables namely bank size and asset quality (Lq1t), and country-specific variables namely GDP and concentration (Conc) on the stability of all full-fledged Islamic banks of Pakistan?
11. Is there a distinct significant impact of bank-specific variables namely bank size, and operational efficiency (Cost), and country-specific variables namely GDP, and concentration (Conc) on the profitability of all full-fledged Islamic banks of Pakistan?
12. Is there a distinct significant impact of bank-specific variables namely bank size and operational efficiency (Cost), and country-specific variables namely

GDP growth and inflation (Inf) on the intermediation cost (NIM/NPM) of all full-fledged Islamic banks of Pakistan?

1.7. SIGNIFICANCE OF THE STUDY

With reference to Basel III, financial authorities have instructed banks to implement Basel III liquidity standards to improve the resilience of the banking industry. Early adopters in certain jurisdictions started implementing these standards in 2015. All banks are now required to maintain LCR and NSFR, the two liquidity ratios need to be greater than or equal to 100%. In Pakistan, these standards have been applied since 2017.

Since one of the most prominent concerns facing the Islamic banking sector is liquidity management, the research's findings will be advantageous to Islamic banks in several ways. Firstly, the study will provide empirical evidence on the impact of Basel III liquidity requirements on Islamic banks' stability, profitability, and financial intermediation costs. This is crucial because Islamic banks operate under Shariah law, which restricts the types of financial instruments they can use, potentially making it more challenging to meet Basel III liquidity standards. The findings will help Islamic banks identify specific areas where they may face difficulties and offer insights into how they can adapt their liquidity management strategies to comply with these requirements without compromising Shariah principles.

Furthermore, the results will be beneficial for policymakers and regulators. By understanding the unique challenges Islamic banks face, they can develop more tailored regulatory frameworks and liquidity management tools that accommodate the specific needs of Islamic financial institutions. This will enhance the overall stability and efficiency of the Islamic banking sector in Pakistan and potentially in other jurisdictions with similar regulatory environments.

The findings of this research will also be relevant to conventional banks. Although the primary focus is on Islamic banks, the comparative analysis will provide insights into how Basel III liquidity standards affect both types of banks. Conventional banks can use these findings to benchmark their own liquidity management practices

and identify best practices that could be adopted or adapted from the Islamic banking sector. Additionally, understanding the differential impact of these standards on Islamic and conventional banks can help conventional banks better navigate regulatory environments in markets where both types of banks operate, fostering a more robust and resilient banking industry overall.

This research analyses the impact of Basel III liquidity standards on the stability, profitability, and financial intermediation costs of banks from 2007 to 2021. The results will facilitate policymakers in enhancing liquidity management policies for both Islamic and conventional banks. For researchers, this study will help them understand the impact of these standards on the Islamic banking industry as compared to conventional banks in Pakistan, contributing to the broader body of knowledge on banking regulation and financial stability.

1.8. CONCLUSION

Chapter one has provided a brief insight into the banking industry of Pakistan. This chapter has established the basis for studying the liquidity management of Islamic banks in Pakistan by providing insight into its current position, as well as the historical synopsis. This chapter provided the reason for the conducted research. Also, the main objectives of the research are established, and key questions are formulated based on the identified problem. The study's significance is then outlined. The following chapter will give a detailed review of the literature. It will justify the methodology and scope of this research by providing theoretical references.

CHAPTER TWO

LITERATURE REVIEW

2.1. INTRODUCTION

In this chapter critical evaluation of the available literature is presented on the topic under study. In this chapter the rationale of banks acting as financial intermediaries is discussed with the help of traditional banking theories, the concept of liquidity management for banking institutions is explored with the help of traditional theories of bank liquidity, and literature on liquidity risk is critically analysed. Since the focus of this study is banking, therefore how this concept of liquidity management and liquidity risk is applied to banks is discussed in detail. The international regulations to control liquidity risk given by Basel and the modified version of Basel given by IFSB specifically designed for Islamic financial institutions are also discussed. Also, in this chapter development of hypotheses for this research is presented.

2.2. BUSINESS MODELS OF ISLAMIC VS CONVENTIONAL BANKS

Islamic banks are those in which all business activities take place as per the Shariah guidelines. Unlike conventional banks, Islamic banks cannot engage in any transaction based on interest. It is agreed unanimously that theoretically Islamic and conventional banks are different. However, some conflicting results are presented in the literature regarding the difference between both forms practically. Some argued that Islamic banks are not different from conventional banks with respect to their business orientation (Aggarwal & Yousef, 2000; Khan, 2010a). Some mentioned the reason for this similarity by arguing that as the majority of the transactions of Islamic banks are based on Murabaha which is a markup-based financing agreement, there is not much of a difference from the financing agreements of conventional banks (Miah & Suzuki, 2020; Suzuki et al., 2017). However, Beck, et al., (2013) and Hassan and Aliyu, (2018) argued differently by saying that there is a difference in the banking activities of both types of banks. Hassan and Aliyu, (2018) even found that Islamic banks are better at managing their risks in comparison to conventional banks.

Since the global financial crisis, there has been a renewed interest in the comparison of Islamic and conventional banking systems. The reason is that Islamic banks were found to be more stable than conventional banks (Čihák & Hesse, 2010; Farooq & Zaheer, 2015). According to Farooq and Zaheer, (2015), Islamic banks, being religious brands have the advantage of customers who are willing to share the losses of these banks. Also, according to their findings, Islamic banks will be able to lend money even in a period of crisis. Miah and Uddin, (2017) in their research have stated that the stability of a bank lies in the source of funding. Islamic banks rely heavily on deposit accounts while conventional banks rely on funding received from other banks or through the money market are more stable. This dependence of conventional banks on the money market makes them more fragile in comparison to Islamic banks.

It is worth noting that even though Islamic banks are found to be more stable, their profitability is lower than conventional banks (Beck, et al., 2013; Miah & Uddin, 2017; Olson & Zoubi, 2011). Islamic banks tend to hold more deposits and thus have lesser amounts available with them for investment purposes. Therefore, the profitability of Islamic banks is lower than conventional banks. However, according to Hassan and Aliyu, (2018), differences in the profitability of both types of banks may be related to the region the bank is operating. Therefore, it can be said that Islamic banks can be less, equally or more profitable in some regions of the world. It is therefore imperative to study the stability and profitability of Islamic banks in comparison to conventional banks in various parts of the world.

Furthermore, liquidity management is a critical aspect where the differences in business models of Islamic and conventional banks become evident. Islamic banks face unique challenges in liquidity management due to the prohibition of interest, limiting their access to conventional money markets and liquidity instruments. This constraint necessitates the use of alternative Shariah-compliant instruments for liquidity management. Conventional banks, on the other hand, have a broader range of liquidity management tools at their disposal, including interbank markets and interest-bearing securities. The different approaches to liquidity management are reflective of the underlying principles and constraints of each banking model, thereby influencing their stability and profitability. Understanding these distinctions is crucial for developing

effective liquidity management strategies tailored to each type of bank, particularly in the context of Basel III liquidity standards.

2.3. BANKING THEORIES

The literature on banking theories is dominated by three mutually exclusive and distinct theories. Among these, the oldest one is “the credit creation theory”, first introduced by Macleod in his book "The Theory of Credit" in 1858 (Macleod, 1855), in which he argued that banks have the power to create money by issuing loans and that the money supply can be influenced by changes in the interest rate. Next is “the fractional reserve theory”, first introduced by the economist Irving Fisher in his book "The Purchasing Power of Money" in 1911 (Fisher & Brown, 1911). Fisher argued that banks only need to hold a fraction of their deposits in reserve and can lend out the rest, thereby creating new money in the economy. Lastly, “the financial intermediation theory” has its roots in the work of the economist John Hicks, who introduced the concept of "liquidity preference" in his book "Value and Capital" in 1939 (Hicks, 1939). The theory suggests that financial intermediaries play a crucial role in the economy by pooling savings and lending them out to borrowers, thereby facilitating the flow of funds between savers and borrowers.

2.3.1. Credit Creation Theory

This theory views banks either individually or in combination. It challenges the idea that banks need to first gather deposits or reserves before they can lend. Instead, banks create credit by executing loan contracts or purchasing assets. According to Davenport (1919), banks create deposits through the extension of credit rather than lending out their existing deposits.

Islamic banks operate on the principles of profit and loss sharing, where both the bank and the customer share in the profits and losses of their investments. As such, the traditional credit creation theory, which is based on interest-bearing loans, does not apply to Islamic banking (Hasan, 2008) . In Islamic banking, credit creation occurs

through the creation of partnerships / seller-buyer relationships or lessor-lessee relationships between the bank and the customer, where the bank provides funds, and the customer provides expertise and/or labour. This takes place via different Islamic financial contracts like Mudarabah, Musharakah, Ijarah, Murabaha etc. (Hasan, 2008).

Mudarabah is a partnership in which the bank provides the funds, and the customer provides the expertise and labour. The profits and losses are shared according to a pre-agreed ratio. Musharakah is a partnership in which both the bank and the customer provide the funds, and profits and losses are shared according to a pre-agreed ratio. Ijarah is a leasing arrangement where the bank leases assets to the customer for a pre-agreed period, with the customer paying rent to the bank. At the end of the lease period, the customer may have the option to purchase the asset from the bank. Murabaha is a sale contract in which the bank sells goods/assets to customers on credit or spot (Usmani, 2002).

In all these contracts, credit creation occurs through the creation of new assets, rather than through the lending of existing funds. This means that Islamic banks can only create credit to the extent that they have profitable investment opportunities and that credit expansion is inherently limited by the availability of profitable investment opportunities (Siddique, 2022).

In summary, the credit creation theory in Islamic banking is based on profit and loss-sharing partnerships, rather than interest-bearing loans, and credit expansion is limited by the availability of profitable investment opportunities.

2.3.2. Fractional Reserve Theory

The fractional reserve theory of banking is a system where banks hold only a fraction of their deposits as reserves while lending out the remaining funds to borrowers. This system allows banks to create credit by extending loans and increasing the money supply in the economy (Fisher & Brown, 1911). According to Ravn, (2019) this theory underscores the importance of bank lending in influencing economic outcomes, highlighting how changes in bank credit can impact aggregate demand and economic

stability. However, this approach also acknowledges the risks associated with excessive credit creation, including financial instability and systemic risks (Ravn, 2019).

Islamic banks, on the other hand, operate on the principles of profit and loss sharing, where they do not hold or lend funds on an interest-bearing basis, and therefore do not operate on the fractional reserve system. Instead, Islamic banks mobilize savings and investments from customers and then use these funds to finance productive activities that comply with the principles of Shariah (Ayub & Khan, 2021).

In Islamic banking, the bank is not allowed to lend out money that it does not possess, nor can it create credit out of thin air. Instead, it must have actual funds in its possession to finance its investments, and it must share the profits and losses of those investments with its customers. The absence of interest-based lending and the prohibition on creating credit out of thin air in Islamic banking means that the risks and returns associated with the investments are more evenly distributed between the bank and its customers. This is because both parties share in the profits and losses of the investments. As such, Islamic banking is seen as a more equitable and socially responsible approach to banking and finance, compared to the fractional reserve system (Meera & Larbani, 2009).

In summary, Islamic banking and the fractional reserve theory of banking operate on different principles, with Islamic banking focusing on profit and loss sharing, while fractional reserve banking is based on interest-bearing loans and the creation of credit.

2.3.3. Theory of Financial Intermediation

In a world where market imperfection and frictions exist, investors cannot find borrowers on their own and they cannot perform efficient allocation of their funds. Therefore, there is a need for an intermediary to mediate between investors and borrowers of financial capital. Financial intermediaries could be banking or non-banking financial institutions. Gurley and Shaw, (1960) are regarded as the pioneers of the theory of financial intermediation. Also, the theory of financial intermediation has

its roots in the informational asymmetry theory and agency theory. According to Gurley and Shaw, (1960), the primary activity of these financial intermediaries is to transform financial securities issued by the firms i.e., shares and bonds, into those securities that are demanded by investors or depositors. Financial intermediaries are needed in the economy because they help investors and borrowers in risk division and transformation, which is not possible on their own because of the high transaction cost. According to Benston and Smith, (1976) transaction costs are the centre point of financial intermediation theory. Leland and Pyle, (1977) suggested that informational asymmetries could be the primary reason for the existence of intermediaries.

Santos, (2001), presented the two most notable justifications for the existence of financial intermediaries. The first is the liquidity provision and the second is the monitoring services provision. Banks serve a key role as liquidity providers because they provide liquidity insurance to depositors (Bryant, 1980; Diamond & Dybvig, 1983). Banks also provide monitoring services to investors by acting as delegated monitors and hence avoiding any duplication of monitoring costs (Diamond, 1984).

According to the currently prevailing theory of financial intermediation, banks are essentially financial intermediaries that collect deposits and disburse them, no different from other non-bank financial firms. According to contemporary authors banks borrow money with short maturities from depositors and lend it to borrowers with longer maturities (Dewatripont et al., 2010). Thus, banks create liquidity through short-term borrowing and long-term advances. Figure 2.1 shows the working of a bank as a financial intermediary. Werner, (2014) notes that among the three banking theories, the financial intermediary theory is the most widely accepted and supported by prestigious journals and authors.

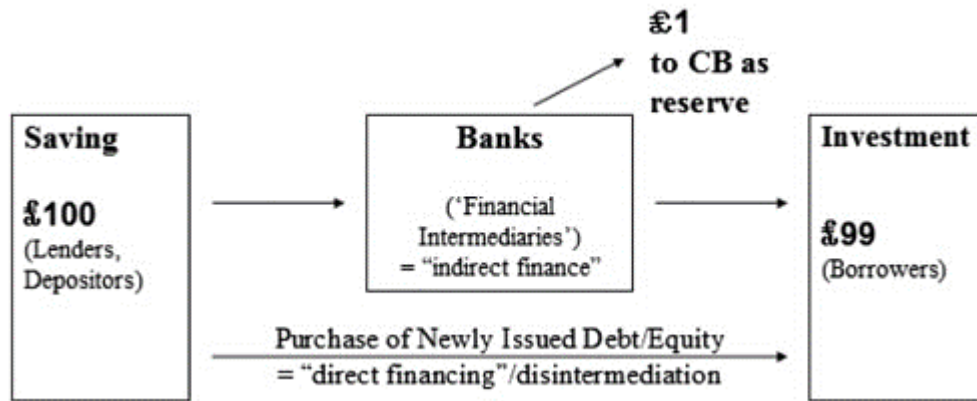


Figure 2.01 Banking theory of financial intermediation (Source: Ravn, (2019))

Financial intermediation theory is a general theory that applies to all types of banks, including Islamic banks. Islamic banks operate based on the principles of Shariah law, which prohibits interest-based transactions and requires transactions to be based on real assets and real economic activity.

An Islamic bank is a financial institution that operates according to Islamic principles and laws, also known as Shariah. These principles prohibit charging or paying interest, gambling, speculation, and financing activities that are deemed harmful to society or the environment. Instead, Islamic finance is based on profit and loss sharing, asset-based financing, and ethical investment.

In Islamic banking, financial transactions must comply with the principles of Shariah, which are derived from the Quran and the teachings of the Prophet Muhammad. Therefore, Islamic banks cannot invest in activities that are considered haram (forbidden) in Islam, such as alcohol, tobacco, or gambling. Islamic finance also promotes social justice and economic development by encouraging financing activities that are beneficial to society and the economy.

In Islamic banking, financial intermediation is carried out through profit and loss sharing (PLS) arrangements, in which the bank shares the risk and returns of the investment with the client. This is in contrast to conventional banking, which relies primarily on interest-based lending.

Islamic banks also have their own set of intermediation costs, which are different from those of conventional banks. For example, Islamic banks may incur costs related to Shariah compliance, such as hiring qualified Shariah scholars to oversee their operations and ensure that they comply with Islamic principles. They may also incur additional administrative costs related to PLS arrangements, such as monitoring the performance of investments made on behalf of clients.

However, Islamic banks may also benefit from certain advantages over conventional banks. For example, PLS arrangements may help to align the interests of the bank and the client, as both parties share in the risks and rewards of the investment. This can encourage the bank to take a more active role in managing the investment, which can result in more effective intermediation.

Overall, financial intermediation theory is relevant to Islamic banking, but the specific costs and benefits of intermediation may differ from those of conventional banking due to the unique features of the Islamic banking model.

2.4 CONCEPT OF LIQUIDITY

In the previous section, it has been discussed that according to the theories of financial intermediation, one of the key reasons for the existence of banks in an economy as an intermediary is liquidity provision (Santos, 2001). Banks provide funds to the real sector of the economy from their deposits. They generally transform short-term liability into long-term assets. In banking terms, it can be stated as they transform deposits into loans and this transformation makes them vulnerable to liquidity risk (BIS, 2008).

In finance, the concept of liquidity is studied in two dimensions. Firstly, the liquidity of financial instruments available in financial markets is their marketability and quick conversion into cash. Secondly, liquidity is related to solvency which is the payment of obligations of financial institutions like banks. The second dimension also includes the study of policies related to liquidity management, balancing assets, and liabilities, maturity transformation, etc. The focus of this research is the latter area.

It is important in managing liquidity that a bank must remain able to balance liquidity demand on the asset side with liquidity supply on the liability side. Failure in managing liquidity enhances liquidity risk for a bank. Liquidity risk is considered an expected loss for an institution that results from its failure in meeting obligations when they become due without incurring unacceptable losses.

2.5 LIQUIDITY MANAGEMENT IN COMMERCIAL BANKS

Factors affecting profitability are always clearly monitored in any organization. Liquidity management is one of the factors that significantly affect the profitability of banks (Bourke, 1989). It has been an area of interest for researchers for a very long time (Curak et al., 2012).

Past literature indicates a significant relationship between liquidity management and the profitability of banks. However, since the beginning, mixed results have been found in the direction of this relationship. Alexiou and Sofoklis, (2009) concluded that there is a positive relationship between liquidity; liquid assets to total assets, and profitability that is Return on Assets (ROA). He also commented that this finding is unexpected as liquidity holdings in a bank are an expense and generally increase in expense results in a decrease in profitability. Alshatti, (2015) also found a significant positive relationship between liquidity; represented as a loan-to-deposit ratio, and profitability as ROA.

Research conducted by Molyneaux and Thornton, (1992) presented a contrasting result that is there is a significant negative relationship between liquidity ratios and profitability. It was also stated that it is expected because liquidity act as a cost to the bank as it is imposed by authorities. Alshatti, (2015) has presented similar results in the Greek banking sector. They stated in their conclusion that other things held constant the more resources the bank tied up to meet future liquidity requirements, the lower will be the profitability of the bank.

Petria et al., (2015) evaluated the impact of liquidity management on profitability in Jordanian banks. Five variables were used to evaluate liquidity

management that are investment ratio, net credit facilities to total asset ratio, capital ratio, liquid ratio and quick ratio. ROA and ROE were used as dependent variables. It was concluded that net credit facilities to total asset ratio and liquid ratio have a negative relationship with both dependent variables. The rest of the variables have a positive relationship with ROE. Malik et al., (2016) believed that the negative relationship between liquid ratio and profitability is logical and according to the trade-off principle between liquidity and profitability. Nabeel and Hussain, (2017) also studied the profitability determinants of banks. The findings of the study show that liquidity risk calculated as loans/customer deposits has a significant negative impact on ROA as well as on ROE in 1098 banks in EU 27.

Ariffin, (2012) studied ten commercial banks in Pakistan. Liquidity of banks was measured through QR, CR, Cash ratio, ICR, and CAR while profitability was represented through ROA, ROE and EPS. The studied model has many drawbacks. Multicollinearity is present in the independent variables. Also, the model was not justified with the help of the literature. The findings of the results are very confusing, as the authors have not provided any justification for the results. QR, CR, and cash ratio were found to have an insignificant relationship with all three dependent variables. ICR has a significant positive impact on ROA, a significant negative impact on ROE and no significant impact on EPS. CAR has a significant positive impact on ROA and EPS and a significant negative impact on ROE. Also, Rahman and Banna, (2015) found an insignificant negative relationship between liquidity and profitability. They studied 24 commercial banks in Pakistan. However, no justification for this result has been provided by the authors. Mumtaz et al., (2022) in their research evaluated the impact of factors of liquidity management on the profitability of Pakistani banks as well for the period 2010 to 2019. Current and liquidity ratios were found to have a significant positive impact on ROA and ROE and the impact of quick ratio was found to be insignificant.

2.6 LIQUIDITY MANAGEMENT IN ISLAMIC BANKS

Researchers have tried to study the impact of liquidity management practices on the profitability or stability of Islamic banks as well. However, the results are similar to conventional banks.

Akhtar et al., (2011b) studied the impact of liquid asset to liabilities ratio on ROA and ROE. The findings of the study presented mixed results. In some years there was a positive relationship while in others negative. According to the authors, there is a change in the direction of the relationship due to the impact of the financial crisis. In this research, the authors have only used Person Correlation and no other statistical technique. Also, no justification or support for the statement that the financial crisis has affected the relationship between liquidity and profitability was given.

Rahman and Banna, (2015) studied variables contributing to the liquidity risk of banks in Bangladesh. Findings state that none of the studied variables; bank size, net working capital, ROE, capital adequacy ratio, and ROA, have any significant impact on liquidity risk i.e., cash to total asset on either conventional or Islamic banks in Bangladesh. The authors have not provided any support from previous literature for the results. However, these results are supported and contradicted by literature available in other countries. Dabiri et al., (2019) found exact similar results in Pakistan. Whereas, Iqbal, (2012), found a significant relationship among the same variables as studied by Rehman et al., (2018) in Pakistan, and Usman and Khan, (2012) found a significant negative relationship between the liquidity of Islamic banks and profitability.

Rafiullah et al., (2018) studied various factors of liquidity management in the Islamic banking industry of Pakistan. In this research factors of liquidity affecting liability and asset side of Islamic banks in Pakistan were studied along with factors that contribute to maintaining optimum liquidity reserves. Also, the research examined the ability of the Islamic banking sector to withstand expected and unexpected liquidity strains. The results of the study show that with respect to managing liquidity, several key variables, including returns on deposits, returns on financing, costs of banking operations, and Karachi interbank offered rate (KIBOR) were found a significant in the liability and asset models in Islamic banks in Pakistan. Also, the authors suggested that

in order to create optimal liquidity reserves, Islamic banks should consider the total amount of Islamic financing, returns on financing, and KIBOR, according to the liquidity reserves model for Islamic banking.

It is highlighted in previous research that Islamic banks are more cautious towards liquidity risk than conventional banks. This view is supported by Norhayati, (2011), and Roussakis, (1997). One of the reasons highlighted for having higher liquidity in Islamic banks is the need to cover short-term financings, which constitutes a major part of the total financing of Islamic banks (Roussakis, 1997).

2.7 TRADITIONAL THEORIES ON LIQUIDITY MANAGEMENT

Any type of organization must maintain a certain level of liquid assets to meet day-to-day requirements. For a financial institution like a commercial bank, it is of utmost importance to be able to meet the depositors' demands at any point in time. There cannot be any standard amount of liquid assets that must be held at any bank because it is a relative term. The liquidity requirements of each bank differ from other banks as the demand of customers varies from area to area or from day to day. Therefore, how much liquid assets must be held cannot be standardised. Over the period, various opinions have been held by the banks. Four prominent theories have emerged: the commercial loan theory, the shift ability theory, the anticipated income theory and the liability management theory. The first three deal with asset management, while the last one focuses on liability management (Basu, 1991).

2.7.1 The Commercial Loan Theory

This theory is also referred to as the “real bills doctrine” a concept which is said to be originated from Adam Smith’s *Wealth of Nations* in the eighteenth century. According to this theory, commercial banks should indulge in issuing short-term, self-liquidating loans to finance commercial transactions. This theory is preferred to avoid risk, as short-term payments are sure to receive. Also, if a debtor is involved in an actual commercial transaction, the closure of the transaction will result in a return of the amount to the

bank as well. These types of loans ensure continuous liquidity for the bank (Hunjra et al., 2017).

This theory had some fallacies. These types of transactions cannot assure sufficient liquidity for all banks. These are credit-based transactions in which the amount can only be paid off when goods are sold, hence it is highly dependent on market demands. It will also not remain useful if a customer is also taking a loan to buy goods. Hence, in such a scenario banking system will gain no more or less liquidity than before entering into the transaction.

It becomes difficult for banks to follow this theory since World War I, because of the large demands for government securities. This practice also diminished with the change in demand for loans. In the 1920s, mortgage lending was initiated as well as several investment banking practices came into being that involved equities and bonds (Summers, 1975). With this shifting in practices of loan and investment new theory emerged.

2.7.2 The Shiftability Theory

This theory was proposed by Prochnow, (1949). It replaced the commercial loan theory. According to this theory, commercial banks can protect themselves from sudden surges in deposit withdrawal by maintaining a liquidity reserve with another bank or most preferably the central bank. Here, shiftability means the ability of banks to shift their liquid assets to other banks which can only be done if banks have a reasonable amount of liquid assets with them.

Unlike commercial loan theory, this theory has the ability to adapt and accommodate new lending innovations in the market. The adoption of shiftability theory leads towards the biggest breakthrough in commercial lending. Due to this tradition of continuously making and renewing short-term loans started and flourished (Roussakis, 1997).

This theory had its shortcomings as well. According to Loo, (2007) Shiftability theory does not readily apply to unsecured commercial loans of banks for the reason that they cannot be sold in the secondary market or to other banks. Also, money market instruments like commercial papers or bankers' acceptance only constitute a small part of total loans it does not suffice the liquidity demand of the whole industry. This theory does not consider economic conditions and proved to be ineffective during the great depression (Prochnow, 1949). It can be said that both commercial loan theory and shiftability theory considers the liquidity of individual bank but does not assure the liquidity of the whole banking industry (Roussakis, 1997).

2.7.3 The Anticipated Income Theory

After the great depression and World War II, there was a drastic rise in the demand for loans. Hence, banks were required to expand their loan portfolios which will lead to higher earnings. The portfolio of loans of commercial banks after the war was mostly comprised of medium to long-term loans that does not qualify under the traditional definition of liquid assets. However, it does meet the criteria of liquid assets under the Anticipated-Income theory that was presented by Prochnow, (1949). According to this theory, liquidity can be retained by a bank when repayments of a loan are scheduled based on the anticipated income of the debtor. It can be said that the future cash flows of the debtor assure the self-liquidating characteristic of the loan as future payments will make sure timely repayment of loan and interest.

2.7.4 The Liability-Management Theory

This theory emerged in the 1960s from New York City banks. It originated due to strong economic pressure. The economy at that time was recovering from the recession and experiencing insufficient growth in deposits. According to this theory, traditional liquidity standards are not essentially required if a bank can bid for funds in the market at the time of need. Thus, a bank can meet its liquidity requirements by generating more liability. Banks have been meeting their liquidity requirements by using certificates of

deposits, short-term notes, purchasing federal funds, borrowing from Eurodollar markets, or at Federal reserves (Greenbaum et al., 2019).

Liability management is considered to be a significant innovation in banking practices. It has evolved over the period. From liability management to managing liquidity in the banks it has been transformed into “Asset-Liability management” to manage liquidity as well as interest rate risk (Ali, 2013; Asutay, 2015; Khan, 2010). There are no such things as traditional liquidity loans, now asset/liability management is one of the main approaches to managing liquidity.

The asset/liability management theory of liquidity management can also be applied to Islamic banks. Islamic banks follow the principles of Shari'ah law, which prohibits the payment or receipt of interest. As a result, the funding sources and liabilities of Islamic banks differ from conventional banks. However, the basic principles of this theory can still be applied.

Like a conventional bank, the asset/liability management theory has the same application in an Islamic bank. The main reason is that deposits constitute the major portion of the liability side of an Islamic bank as well. But the difference lies in the contract of depositors with the bank. Unlike conventional banks, the deposit accounts in Islamic banks are based on the Mudarba agreement which is a partnership agreement in which the depositor is the Rabb-ul-maal (investor) and the bank is the Mudarib (manager), and both partners share profit on the agreed ratio. On the asset side, Islamic banks use sales-based contracts like Murabaha, Salam, and Istisna contracts, leasing contracts; Ijarah and partnership-based financing facilities; Musharakah or Diminishing Musharakah to provide financing to their customers.

To manage their liquidity, Islamic banks need to ensure that they have sufficient funds available to meet their obligations, particularly during times of financial stress. They can do this by carefully managing their liabilities and balancing the mix of funding sources. Islamic banks can also use various liquidity instruments, such as commodity Murabaha, tawarruq and hedging contracts, to manage their liquidity risk (Schoon Natalie, 2016). For example, they can use commodity murabaha to buy and sell

commodities, which allows them to generate cash quickly and meet their short-term liquidity needs.

Overall, the liability management theory of liquidity management is equally applicable to Islamic banks, and it provides a framework for managing their liquidity risk. By carefully managing their liabilities and balancing their funding sources, Islamic banks can ensure that they have sufficient funds available to meet their obligations while complying with the principles of Shari'ah law.

2.8 LIQUIDITY RISK IN BANKING INSTITUTIONS

In finance, the concept of liquidity is studied in two dimensions: Firstly, liquidity of financial instruments that are traded in financial markets. The Instrument with the highest marketability, less risk and limited or no financial barrier is the most liquid instrument. Secondly, liquidity is related to the solvency of an organization which is the obligation to meet short-term payments (Fiedler, 2000). The latter deals with formulating policies related to liquidity management, liquidity reserves managing assets and liability etc. This thesis focuses on the second aspect of liquidity for the banking sector.

Liquidity risk management deals with the balancing of demand and supply of liquidity on both the asset and liability side of the balance sheet. It can be defined as the risk of being unable either to meet the demand liabilities that are the obligations of banks towards their depositors or to fund increases in assets as they fall due without incurring unacceptable costs or losses (Ismal, 2010). Issues of liquidity risk management in banks arise when banks fail to balance their asset and liability sides, when internal liquidity reserves of banks are insufficient, or banks remain unable to acquire external funds.

In financial terms, risk can be defined as the probability of difference in return (Howells & Bain, 2008). Three broad categories of risks are present in a financial system, that are: Financial risk, Business risk, and Operational risk.

Risks that are generated from financial transactions or business affairs of banks are financial risks. It includes liquidity, credit and market risks as well. Business and operational risks are linked to the internal activities of banks. Even though risks are categorized separately the impact of one type of risk on another cannot be studied in an isolated manner. It exists under a causal and interactive system. All types of risks have a significant correlation with others. For example, liquidity risk can be caused by market or credit risks or vice versa (Ahamed, 2021; Ismal, 2010). Liquidity risk in banks arises due to maturity mismatch or imbalanced asset liability. The Banking mechanism must be efficient to be able to forecast the factors that cause all three types of risks that can lead to liquidity risk. Kashyap et al., (2002) emphasize the distinctions between deposit and credit, both of which are impacted by shocks. They argue that as long as the drawdowns of credit lines and withdrawals of deposits are not completely correlated, all products should maintain costly liquidity buffers to manage the situation.

In the present scenario, it has become more challenging to manage liquidity risk in the financial market. The reasons behind it are major financial innovations and also the nature of liquidity risk that has been transformed by the global market developments (BIS, 2008a). Banks have been relying more on capital and international/global financial markets rather than on bank deposits. This scenario has made banks vulnerable to the issues of financial markets. In past, this reliance has resulted in excessive loans that ultimately led to deep currency devaluation that resulted in the Asian economic crisis (1997-1998). Also, issues of financial markets that have affected the banks are related to sub-prime mortgages that resulted in the Global Financial Crisis (2008-2009). The liquidity risk problem of a single bank cannot be viewed in seclusion as liquidity problems of a single bank can affect the entire industry which will ultimately affect the financial system of the whole economy (Khan et al., 2017).

Sound liquidity risk management is mandatory for all banks to survive in this market. For this reason, it is essential to have cooperation and collaboration among bank management, regulators, and all other stakeholders including the general public. The global financial crisis (2008) has elaborated the significance of a sound liquidity risk management system to deal with unsecured derivatives markets, enhance market discipline, and deal with unsecured derivative markets prudently (Antonio, 1999).

According to Chen et al., (2021), inefficient liquidity risk management leads to bank failures.

The impact of the unfavorable condition of the economy on banks can be prevented by an effective liquidity risk management program. A sound liquidity management program can also support the balancing of asset and liability sides of banks and it can help in avoiding a bank rush and diminish the chances of government bailouts that occur in case of banks default.

Bank as an intermediary institution holds a large number of short-term liabilities to finance its long-term assets. Due to the short-term nature of the contract, depositors have the right to withdraw their funds at any point in time. As a result, liquidity risk arises on the liability side of the bank when a large number of account holders, at the same time decide to make a withdrawal of more than available funds from a bank (Boudt et al., 2017). In other words, liquidity risk occurs in two cases. Firstly, it arises when a bank terminates the loan of the debtor (borrower) but the debtor does not have the capacity to pay it off. Secondly, when account holders wish to withdraw their amount, but the bank does not have the capacity to pay it (Hassan, 2020)

Practically, imbalances or gaps are regularly found on the asset and liability side of a bank that needs equalization. This occurs because liquid liabilities are accepted by banks, but the investment is made in long-term/illiquid assets (Zhu, 2005). Liquidity risk occurs when banks remain unable to balance these gaps and as a result, insolvency risk, reputational risk and government bailout risk can arise. Liquidity management practices of a bank could fail because of many reasons, such as the robustness of liquidity pressure on the bank, the state of the bank at that time, and failure in identifying external or internal liquid funding sources. Table 2.1 contains some other internal and external factors that can create liquidity risk issues in banks.

Table 2.1 Factors that Can Lead to Liquidity Risk Issue

Internal factors	External Factors
Heavy reliance on corporate deposits	Sensitive and volatile financial markets
Maturity gap in assets and liabilities	Economic shocks
Elevated off-balance sheet items	Weak economy
Less investment in government securities	A sudden surge in withdrawals by depositors
Lesser long-term deposits	Non-economic factors
High short-term deposits	Unavailability of liquidity instruments

Source: Adapted and modified from Islam & Amir, (2016) Ismal (2010), Mirakhor and Iqbal (2007), and Antonio (1999).

2.9 LIQUIDITY RISK MANAGEMENT IN ISLAMIC BANKS

In the 1970s, Islamic banking emerged as an alternative banking practice in response to the demand for Shariah-based banking solutions for Muslims (Asutay, 2015; Khediri et al., 2015). The Islamic banking industry has been growing at a progressive rate for the last three decades. The total assets of the global Islamic banking industry in 2018 were approximately USD 1.57 trillion which constitutes a 71.7% share in the overall Islamic financial services industry (IFSB, 2019).

Islamic banks are similar to any other commercial bank in terms of their function in an economy. They also serve the purpose of financial intermediation by converting the savings of the general public into real projects. This transformation is carried out by channelling those funds from depositors to entrepreneurs to finance real projects. This whole process of funds channelization is carried out by strictly adhering to *Shari'ah* rulings. According to Islamic ruling, each financial contract of an Islamic bank must be based on a physical, identifiable underlying asset (Cox, 2005).

Theoretically, Islamic banks are considered to be a vital contributor to the economic growth of the country because of the distinctive nature of their products and operations (Kahf, 2000a). The Islamic banking products are novel because they are based on Shariah principles. Islamic banks are expected to be a constructive economic contributor to economic growth because they can contribute by creating jobs, promoting societal well-being, and financing economic activities (Hassan, 2009). Furthermore, in order to achieve the true objective of the Islamic financial system, the majority of Islamic banks' financing products are expected to be equity-oriented or risk-sharing based products like Mudaraba or Musaharakah rather than liability-oriented products like Muarabaha, Muswamah, Salam or Istisna (Khalil & Hussain, 2022; Yusof et al., 2009). Because of this novelty in features and complex management in asset-liabilities management, Islamic banks are expected to experience a larger gap in financing that will lead to greater exposure to liquidity risk in comparison to conventional banks. It is also important to consider the fact that the management of liquidity risk is also an issue for Islamic banks because of the unavailability or further restrictions of liquidity management instruments. Hence, considering liquidity risk management an integral part of the activities and operations of a financial institution, there is a difference in its implications for Islamic banks in comparison to conventional or hybrid banks.

2.9.1 Features of Islamic Banks Encountering Liquidity Risk

Primarily, Islamic banks should incorporate real business transactions to establish a sound and effective liquidity management system (Ismail, 2010). This is because Islamic banking operations are based on asset-based contracts with tangible underlying assets. These contracts combine business operations with support and collaboration among partners as well as safeguard the rights of stakeholders. Therefore, any liquidity risk management issue will lead to discord among partners or deteriorate the business conditions.

Secondly, because of such distinguishing features, liquidity risk is minimized by Islamic banks from internal as well as external outlooks. The Islamic banking industry is based on principles and values derived from Shariah, considering management and all stakeholders as trusted partners in business. Because of this, a

system of mutual aid, symmetric information, and transparency in funds allocation is created (Ahmed, 2011; Ali, 2013). Furthermore, since any Islamic financial market contract has to be based on a real underlying asset, liquidity risk issues are managed externally by the mechanism of the Islamic financial market that deals only with real business activities. In the Islamic financial sector, there is no contrast between the real and financial sectors (Ahmed, 2011; Ali, 2013).

Thirdly, there is no concept of interest (riba), speculation (maiser), or excessive uncertainty (Gharar) in Islamic banking contracts. Instead, Islamic teachings promote the concept of cooperation and equitable risk sharing and forbid taking advantage of each other. In Islamic finance, a social commitment exists between business partners that is clients and Islamic banks. Because of this supporters of the Islamic banking system argue that a crisis like the global financial crisis (2008) cannot occur in the Islamic banking industry (Ahmed, 2011; Ali, 2013).

Fourthly, Islamic banking is based on the concept of PLS which is profit and loss sharing. This concept supports the maintenance of asset and liabilities equality in a simultaneous manner as it requires a complete understanding of all parties in the business. hence it diminishes the liquidity risk. Nonetheless, an uncertainty in deposit return is present with PLS that implies that if actual returns are less than expected returns, rational depositors may withdraw their deposits (Khediri et al., 2015; Zulkhibri, 2018).

Lastly, asset-liability imbalances may arise in Islamic banks because of the nature of the contract. Islamic banking operations are based on real business transactions, hence Islamic banks encounter various market risks such as default risk, price fluctuation risk, amortization risk, and economic downturn risk.

Even though liquidity risk management is one of the key issues in the Islamic banking industry, there is a lack of existing literature on this issue. Some of the research has highlighted numerous potential sources of liquidity risk in the context of the Islamic banking industry. According to IFSB, (2018), the limited availability of Shariah-compliant money market and financial instruments are some of the basic reasons for liquidity risk in Islamic banks. Because of these reasons, Islamic banks remain unable

to raise external funds. Also, it has been argued that Islamic banks should start focusing on PLS-based financing products rather than replicating conventional banking products that are mainly based on debt-based contracts (Ahmed, 2011). Such contracts include murābaḥah, commodity murābaḥah, and al-bay‘ bi al-Thaman al-ājil. Approximately 66.1% of global Islamic banking assets are based on debt-based contracts (Iqbal & Mirakhor, 2011). According to Iqbal and Mirakhor, (2011), such existence of debt-based assets enhances liquidity risk as Shariah prohibits the sale of debt, hence Islamic banks cannot easily liquidate such assets when needed. Additional liquidity risk exposure in Islamic banks is due to some characteristics of Islamic financial instruments. For example, there is a cancellation risk in Murabahah transactions or trading of Murabaha or bai’ Al-Salam-based contracts is not permissible (Mohammad et al., 2020).

Also, a considerable amount of funds in Islamic banks are present in current accounts that are demand deposits, hence, the withdrawal is subject to the demand. Therefore, Islamic banks have to maintain high liquidity in the form of idle cash to deal with liquidity risk (Beck, De Jonghe, et al., 2013). In comparison to conventional banks, Islamic banks can also have other sources of liquidity risk because of the difference in interpretation and application of Shariah teaching in a particular country. For example, bai’ Al-Dayn (sale of debt) is a commonly used financial instrument in Malaysia but is not allowed in Pakistan or other countries as well (BIS, 2013). Also, the riskiness of Islamic banks increases because of the restrictions on certain classes of assets, limited availability of high-quality liquid assets (HQLA), or restricted use of hedging instruments (Hsiao, 2014).

2.9.2 Issues and Challenges of Liquidity Management in Islamic Banks

It has already been established that the Liquidity risk of Islamic banks differs from conventional banks because of adherence to *Shari’ah* requirements. Because of the unique nature of contracts, Islamic banks have and still, are facing more issues in managing liquidity risk than their counterparts. Islamic banks like any other commercial bank are affected by the factors discussed in Table 2.1 but also experience some other issues and challenges of unique nature.

Bank Negara Malaysia's Liquidity Framework provides a comprehensive approach to managing liquidity risk, focusing on effective risk management practices and compliance with legal provisions. For Islamic banks, the framework underscores the importance of adherence to Shariah principles, which complicates liquidity management due to the prohibition of interest-based instruments. This framework highlights the scarcity of Shariah-compliant liquidity instruments and the challenges in developing a robust Islamic money market. Additionally, the framework addresses specific issues such as securitisation transactions, which require careful consideration to align with Shariah requirements. Consequently, Islamic banks face a unique set of challenges that are further compounded by these regulatory frameworks.

Table 2.2 provides a summary of the issues and challenges faced by Islamic banks. As compliance with Shariah is mandatory for all Islamic banks, conventional liquidity instruments are unacceptable for Islamic banks because those are based on interest. For this reason, there is a shortage of liquidity or money market instruments in the global Islamic banking industry. Also, the Islamic money market is not yet developed in all countries because of the lesser number of participants in the Islamic money market and the availability of few money market instruments (Muttalib, 2014) . Table 2.2 highlights the Islamic banking liquidity instruments across the globe.

Table 2.2 Islamic Liquidity Management Instrument / Money Markets Across Countries

Country	Instruments Available
Malaysia	Islamic Interbank Money Market (IIMM), Government Investment Issues (GII), Islamic Commercial Papers, Bank Negara Malaysia Negotiable Notes (BNNN), Bursa Suq Al-Sila' (Commodity Murabahah)
Indonesia	Pasar Uang Antar Bank (Mudhārabah Interbank Investment), Fasilitas Pendanaan Jangka Panjang Syariah (Long-term Sharia Financing by Central Bank)

Bahrain	Sukuk Ijarah and Sukuk Al-Salam by Central Bank, Reliance on non-interest-bearing excess reserve in central bank
UAE	Global Commodity Finance (electronic Islamic interbank money market),
Pakistan, Brunei, Singapore	Islamic Certificates of Deposit based on commodity murabahah , Short term Sukuk Ijarah
Rest of the world	Early stage with no liquidity instrument available

Source: Rizkiah, (2018)

It is also important to consider the difference in opinion of the Shariah advisors. In a particular country, one instrument could be acceptable while the same is unacceptable in another country on Shariah grounds. The most known example in this regard is contracts based on “Bai’ Inah, Tawarruq and Commodity Murabaha”. These are the most controversial instruments in the global Islamic banking industry. Many Shariah scholars do not allow trading based on these contracts. While in some countries these are widely accepted and used liquidity management instruments (Muneeza, 2020). The most acceptable and preferred liquidity instrument in the majority of Islamic banking institutions is Sukuk. These are issued by the central bank to facilitate the liquidity transactions of Islamic banks. Also, Islamic banks do not have the facility to deal with day-to-day liquidity management issues (Kahf, 2000; Rizkiah, 2018).

Liquidity management issues and challenges of Islamic banks as highlighted in the literature (Abdul Ganiyy et al., 2017; A. Islam & Amir, 2016; Rizkiah, 2018) is presented below:

- Scarcity of Islamic money market instruments.
- Unavailability of international Islamic interbank money market.
- Underdeveloped Islamic interbank money market (IIMM).
- Commodity Murabaha / Tawarruq is not tradeable in the secondary market.
- Islamic interbank benchmark is not yet present.
- Sukuk supply is low in comparison to demand.

- Unavailability of Shariah-compliant Lender of Last Resort (SLOLR) facility.

2.10 NEED FOR BANKING REGULATIONS

Banks are an integral part of our economy that involves interaction with the general public as depositors as well as the corporate sector of the country. Hence, the banking sector is required to be regulated and supervised in the utmost manner to especially safeguard the interest of the general public. Numerous reasons have been presented by different researchers. Sahajwala and Bergh, (2000) presented that deregulation, innovation, and globalization have made banking a complex and riskier business and because of this fact, it has become a challenge for banking supervisors to structure their supervision processes that can accommodate the changes. According to Saidenberg and Schuermann, (2003), there are two major reasons for the financial regulations of banks. First is the protection of depositors and second is systematic risk. According to them as banks play a central role in the payment system as well as in the distribution of financial resources, they are often considered to be a cause of systematic risk. Also, a bank is a special financial institution that is highly leveraged with huge short-term liabilities as deposits, and relatively illiquid assets as loans or financings. Because of this special nature, they are under special regulatory oversight (Saidenberg & Schuermann, 2003).

Ping, (2014) states that the importance of banks in the economy is due to the fact that they are the largest supplier of credit supply in the country because of the depositors. Any disruption in credit supply in the country can affect economic growth adversely and it can lead to a crisis such as the American Banking Crisis of 1933. According to Ping, (2014), banks can create a monetary disturbance or a banking panic because banks are highly linked with each other through interbank markets, and they have dominance on payment systems in the country. Koch and MacDonald, (2015) have highlighted five main reasons for the regulations of the depository institutions like banks:

1. To safeguard the solvency of the institution as well as the soundness of financial instruments it is offering.

2. To provide a competitive and effective financial system
3. To provide stability in the monetary system
4. To preserve the reliability of the payment systems of the nation
5. To safeguard general consumers from abuse and manipulations of credit-granting institutions

Banks are special entities with public funds; hence, they need special supervision. Prominent and significant changes in the regulations began in the 1970s after the increasing number of the banking crisis (Valencia & Laevan, 2008).

2.11 BASEL ACCORD: AN OVERVIEW

Banking supervisory authorities are working continuously to develop and improve the monitoring mechanisms for banks. The task is to take pre-emptive measures in order to stabilize the banking industry and give support to the economy. Till the 1970s, each country had its banking regulations applied to banks operating within its border. In 1974, to deal with the issues in banking markets, international currency, and the failure of Herstatt Bank, West Germany, Governors of the group of ten largest economies of the world established the Basel Committee. It was initially named as Committee on Banking Regulations and Supervisory Practices. This committee aimed at enhancing the financial stability of banks by upgrading banking supervision practices all over the world. Also, to provide a platform for member countries for continuous cooperation on banking supervision issues. Currently, members of the Basel Committee have reached 10 to 45 institutions from 28 jurisdictions (BIS, n.d.).

The Committee first issued the Concordat which was revised and re-issued as Principles for the supervision of banks' foreign establishments. It aimed at improving the regulatory practices for foreign branches of the banks. the document is still updated and incorporating any needful regulations. Later in the early 1980s, the debt crisis increases in Latin America which calls for regulatory action. In response to that crisis, the committee members issued the Basel Capital Accord or Basel I in 1988. The most important contribution of Basel I was the agreement on the definition of bank capital. For different classes of assets, it also assigned the weighted risks. for this assignment

of risk, Basel I classified the four risk buckets. It initially focused on Credit risk only. There were some deficiencies in Basel I. According to Ong, (2007), the Accord presented a “one size fits all” approach to risk management that was not effective. Also, it does not consider other types of risks as well. There was a deficiency in the criteria of risk weightiness. Makwiramiti, (2008) further highlighted that Basel I did not encourage banks to improve procedures for risk management. Also, with the introduction of complicated financial products, there was a lack of accounting.

In 2004, Basel II was issued, which was based on three pillars i.e. minimum capital requirement, mandatory supervisory assessment of capital adequacy and internal assessment process of a bank, and lastly, to improve market discipline and to promote sound and transparent banking practices disclosures were used as a lever. Basel II had a very short life in comparison to Basel I because it remained unable to meet the requirements of regulators and participating banks. Also, it was introduced at the time when the financial crisis of 2008 was cultivating. Following are some of the deficiencies that were highlighted by Daniela and Raluca -Dorina, (2009) and Shah, (2012):

- Implementation of Basel II proved to be very costly for less developing countries because of high training and information technology costs.
- The size of the bank was not considered as a factor while formulating Basel II regulation.
- Less attention was paid to leverage.
- It does not discuss the systematic risks of banks.

Prior to the collapse of Lehman Brothers, it became apparent to the Basel committee that there is a need to further strengthen the Basel II. In 2010 Basel III was set out by the committee. It was also revised in later years as well. It encompasses the following changes:

- It reinforces the primary role of common equity in banks
- It added an extra common equity layer that is the capital conservation buffer for banks.
- A new leverage ratio was introduced that was regardless of risk-weighting

- Liquidity requirements were also introduced. Two new ratios were implemented that is Liquidity Coverage Ratio (LCR) for a funding period of 30 days and Net Stable Funding Ratio, a longer-term ratio to take care of maturity mismatches in the balance sheet.

Basel III has been recently implemented in various countries. Hence, research is needed in identifying the pros and cons of the regulations. The focus of this research is to analyze the impact of the liquidity requirements given by Basel III on the stability and performance of conventional as well as Islamic banks in Pakistan.

2.12 BASEL III GUIDANCE ON LIQUIDITY MANAGEMENT OF BANK CAPITAL

After the financial crisis of 2008, a comprehensive international framework for liquidity risk measurement, standards, and monitoring (2010) was issued by Basel Committee on Banking Supervision (BCBS) that was revised and re-issued as Basel III: The Liquidity Coverage Ratio and Liquidity risk monitoring tools (2013) and Basel III: the net stable funding ratio (2014). In these standards, banks are required to maintain a liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) of more than 100% each. The objective of LCR implementation is explained below from the excerpt of the Basel III (BIS, 2014):

“This standard aims to ensure that a bank has an adequate stock of unencumbered HQLA that consists of cash or assets that can be converted into cash at little or no loss of value in private markets, to meet its liquidity needs for a 30 calendar day liquidity stress scenario. At a minimum, the stock of unencumbered HQLA should enable the bank to survive until Day 30 of the stress scenario, by which time it is assumed that appropriate corrective actions can be taken by management and supervisors, or that the bank can be resolved in an orderly way. Furthermore, it gives the central bank additional time to take appropriate measures, should they be regarded as necessary. As noted in the Sound Principles, given the uncertain timing of outflows and inflows, banks are also expected to be aware of any potential mismatches within the 30-day

period and ensure that sufficient HQLA are available to meet any cash flow gaps throughout the period. The LCR builds on traditional liquidity “coverage ratio” methodologies used internally by banks to assess exposure to contingent liquidity events. The total net cash outflows for the scenario are to be calculated for 30 calendar days into the future. The standard requires that, absent a situation of financial stress, the value of the ratio be no lower than 100% (i.e. the stock of HQLA should at least equal total net cash outflows) on an ongoing basis because the stock of unencumbered HQLA is intended to serve as a defence against the potential onset of liquidity stress. During a period of financial stress, however, banks may use their stock of HQLA, thereby falling below 100%, as maintaining the LCR at 100% under such circumstances could produce undue negative effects on the bank and other market participants. Supervisors will subsequently assess this situation and will adjust their response flexibly according to the circumstances”.

The standard further explained that LCR has two components; Value of the stock of HQLA in stressed conditions; and Total net cash outflows (BIS, 2013).

$$LCR = \frac{\text{Stock of HQLA}}{\text{Total net cash outflows over the next 30 calendar days}} \geq 100\%$$

Also, NSFR has been introduced to strengthen the funding ability of banks (BIS, 2014). According to Basel III:

“The NSFR will require banks to maintain a stable funding profile in relation to the composition of their assets and off-balance sheet activities. A sustainable funding structure is intended to reduce the likelihood that disruptions to a bank’s regular sources of funding will erode its liquidity position in a way that would increase the risk of its failure and potentially lead to broader systemic stress. The NSFR limits overreliance on short-term wholesale funding, encourages better assessment of funding risk across all on- and off-balance sheet items, and promotes funding stability. This document sets out the NSFR standard and timeline for its implementation. Maturity transformation performed by banks is a crucial

part of financial intermediation that contributes to efficient resource allocation and credit creation. However, private incentives to limit excessive reliance on unstable funding of core (often illiquid) assets are weak. Just as banks may have private incentives to increase leverage, incentives arise for banks to expand their balance sheets, often very quickly, relying on relatively cheap and abundant short-term wholesale funding. Rapid balance sheet growth can weaken the ability of individual banks to respond to liquidity (and solvency) shocks when they occur, and can have systemic implications when banks fail to internalise the costs associated with large funding gaps. A highly interconnected financial system tends to exacerbate these spillovers. During the early liquidity phase of the financial crisis starting in 2007, many banks – despite meeting the existing capital requirements – experienced difficulties because they did not prudently manage their liquidity. The crisis drove home the importance of liquidity to the proper functioning of financial markets and the banking sector. Prior to the crisis, asset markets were buoyant and funding was readily and cheaply available. The rapid reversal in market conditions showed how quickly liquidity can dry up and also how long it can take to come back. The banking system came under severe stress, which forced central banks to take action in support of both the functioning of money markets and, in some cases, individual institutions. The difficulties experienced by some banks arose from failures to observe the basic principles of liquidity risk management. In response, the Committee in 2008 published Principles for Sound Liquidity Risk Management and Supervision (“Sound Principles”) as the foundation of its liquidity framework.¹ The Sound Principles offer detailed guidance on the risk management and supervision of funding liquidity risk and should help promote better risk management in this critical area, provided that they are fully implemented by banks and supervisors. The Committee will accordingly continue to monitor the implementation of these fundamental principles by supervisors to ensure that banks in their jurisdictions adhere to them. The Committee has further strengthened its liquidity framework by developing two minimum standards for funding and liquidity. These standards are designed to

achieve two separate but complementary objectives. The first is to promote the short-term resilience of a bank's liquidity risk profile by ensuring that it has sufficient high-quality liquid assets (HQLA) to survive a significant stress scenario lasting for 30 days. To that end, the Committee has developed the liquidity coverage ratio (LCR).² The second objective is to reduce funding risk over a longer time horizon by requiring banks to fund their activities with sufficiently stable sources of funding in order to mitigate the risk of future funding stress. To meet this second objective, the Committee has developed the NSFR.

Basel III defines NSFR as:

“The NSFR is defined as the amount of available stable funding relative to the amount of required stable funding. This ratio should be equal to at least 100% on an ongoing basis. “Available stable funding” is defined as the portion of capital and liabilities expected to be reliable over the time horizon considered by the NSFR, which extends to one year. The amount of such stable funding required (“Required stable funding”) of a specific institution is a function of the liquidity characteristics and residual maturities of the various assets held by that institution as well as those of its off-balance sheet (OBS) exposures”.

2.13 ISLAMIC FINANCIAL SERVICES BOARD: AN OVERVIEW

A credible and effective process of risk assessment is an integral part of a robust liquidity management program (Alsayed, 2007). IFSB; is an international standard-setting body of regulatory and supervisory agencies that has devoted its efforts to ensuring a sound and stable Islamic financial industry. It was formally established in 2002. It is working as an international standard-setting body to ensure the stability and soundness of the Islamic Finance Industry that encompass banks, the capital market, and insurance. It aims at promoting the formation of a transparent Islamic financial services industry by issuing new or modifying existing international standards complying with Shariah principles. By the end of 2020, IFSB had 188 members (IFSB, n.d.).

2.14 IFSB GUIDELINES ON LIQUIDITY MANAGEMENT OF ISLAMIC BANKS

To achieve the stated objectives, IFSB has issued published standards, Technical Notes, and Guidance notes that also complement standards given by Basel Committee. For liquidity risk management IFB has issued Guiding Principles on Liquidity Risk Management for Institutions offering Islamic Financial Services (IFSB-12) (March 2012), Technical note on issues in Strengthening Liquidity Management of Institutions Offering Islamic Financial Services: The Development of Islamic Money Markets (March 2008), and Guidance Note on Quantitative Measures for Liquidity Risk Management in Institutions Offering Islamic Financial Services (GN-6) (April 2015). These notes by IFSB complement the risk management principles given by Basel Committee on Banking Supervision (BCBS) and other international standard-setting bodies.

These guiding principles are considered to be the core reference for Islamic banks. All Islamic financial institutions are allowed to make adjustments according to their respective business operation and country environment. IFSB-12 has given the guiding principles on the Role of the Board of Directors, governance structure and the role of senior management in the identification of liquidity risk, identification of liquidity risk, interactions of liquidity risk and implications of Islamic financing contracts, measurement of liquidity risk, control and mitigation of liquidity risk, foreign exchange liquidity risk, reporting and disclosure of liquidity risk and guiding principles for supervisory authorities.

Regarding liquidity risk management IFSB has issued a Guidance note on quantitative measures for liquidity risk management (GN-6) (IFSB, 2015). This was issued in response to Basel III requirements. It has been issued as complementary guidelines to IFSB-12. IFSB guidelines and principles guide preparing a strong liquidity management program as well as in designing and developing the Islamic financial markets that can support the process of liquidity management. The scope of this guidance note includes:

“This GN establishes a minimum level of liquidity for IIFS, including full-fledged IIFS, Islamic windows of conventional banks and Islamic

banking subsidiaries of conventional banks on an individual and a consolidated basis. Supervisory authorities can extend the application of this GN to Islamic investment banks and other financial institutions at their discretion. The parameters of LCR and NSFR in this document are built upon BCBS proposals, with a number of additions and adjustments to meet the specificities of IIFS. The LCR and the NSFR should be applied consistently across the jurisdiction for the IIFS sector. However, supervisory authorities may modify or exclude certain components of the LCR and the NSFR, taking account of specific economic conditions and the business model of IIFS. Discretion has been provided to supervisory authorities on a number of parameters, especially run-off rates, which require a careful calibration and study of the funding profile, business model, and characteristics of the various interbank and consumer products available to or offered by IIFS. In addition, supervisory authorities should consider market conditions, including the application of LCR in stress conditions. Supervisory authorities are expected to provide transparency and appropriate public disclosures in order to provide clarity to the IIFS and other stakeholders in applying these requirements. While the LCR and the NSFR are initially intended for application by internationally active banks, supervisory authorities are likely to apply them more broadly, but should pay due attention to the market conditions and potential difficulties for smaller IIFS, if these liquidity requirements – in particular, the associated onerous reporting requirements – are applied to such institutions”.

2.14.1 Basel III Liquidity Regulations and Asset/Liability Management Theory

Basel III is a global regulatory framework for banks that was introduced in response to the 2008 financial crisis. It seeks to improve the resilience of the banking sector by strengthening the capital and liquidity requirements of banks. The asset/liability management theory of liquidity management is closely related to the liquidity requirements set out in Basel III. Banks are now required to maintain a net stable

funding ratio (NSFR) and liquidity coverage ratio (LCR) greater than or equal to 100% (BIS, 2013, 2014).

Under Basel III liquidity management policies, banks are required to maintain a minimum level of high-quality liquid assets (HQLA) that can be easily converted into cash to meet their liquidity needs in times of stress. The HQLA include cash, central bank reserves, and certain types of highly rated government and corporate debt securities. The asset/liability management theory of liquidity management can help banks to meet the liquidity requirements of Basel III by managing their liabilities in such a way that they have sufficient HQLA available to meet their obligations. Banks can achieve this by maintaining a balance between their funding sources, such as deposits and other forms of borrowing, and the maturity structure of their liabilities. By doing so, they can ensure that they have sufficient funds available to meet their obligations, even in times of stress (BIS, 2013, 2014).

Basel III also requires banks to conduct regular stress tests to assess their ability to withstand adverse market conditions. The asset/liability management theory of liquidity management can help banks to prepare for these stress tests by identifying potential liquidity gaps and ensuring that they have sufficient HQLA available to meet their obligations under adverse scenarios.

Overall, the asset/liability management (ALM) theory of liquidity management is closely related to the liquidity requirements of Basel III, and it provides a framework for banks to manage their liquidity risk in a way that meets the regulatory requirements while also ensuring their financial stability.

2.15 EMPIRICAL STUDIES ON THE IMPACT OF BASEL III LIQUIDITY STANDARDS ON THE STABILITY OF BANKS

Vazquez and Federico, (2015) in their paper analyzed funding structures and their implications on the financial stability of U.S. and European banks from 2001 to 2009. Their findings support Basel III's initiatives on structural liquidity and leverage. Banks

with weaker structural liquidity and a high amount of debt before the financial crisis of 2008 were more exposed to failure.

Hossain et al., (2018) investigated how Basel III liquidity and capital requirements improve bank stability in the BRICS economies. The data comprised fifty-seven banks in the BRICS economies for the period 2007 to 2015. The main independent variables were the capital adequacy ratio, Tier 1 capital ratio, leverage ratio, LCR, and NSFR. The findings show that all the main independent variables are effective in increasing the resilience or stability of banks. Financial risk was also found to have no impact on bank stability in BRICS economies.

L'Huillier et al., (2018) evaluated the impact of the NSFR on enhancing the stability of banks located in forty-seven countries. The study period was from 2003 to 2013. A significant positive impact of NSFR requirements was found on the stability of banks, but with an increase in the size of the bank, there is a decrease in the marginal contribution of the NSFR to the stability of the bank. Therefore, policymakers should consider factors such as bank size while setting up the minimum NSFR requirement for banks.

Mutarindwa et al., (2020) analyzed the impact of the NSFR and risk-weighted total capital ratio on the lending and stability of African banks. A total of 606 banks from 53 African countries were selected. The study period was from 2005 to 2015. Banks complying with the threshold of the total capital ratio tend to provide more loans, and banks that conform to the NSFR threshold lend less. It was also found that the positive effect of NSFR compliance was found in the low-stability class of banks, while no impact was found in the high-stability class.

Polizzi et al., (2020) examined the extent to which capital requirements and liquidity standards affect banks' stability. A total of 2054 commercial banks from 117 countries were selected for the period 2000 to 2016. The main independent variables of the study were the Tier 1 capital ratio to approximate the Basel III capital requirement and the LCR and NSFR for liquidity standards. The authors combined the two-stage ordinary least squares procedure with panel data estimators to evaluate their model. The

authors find a negative direct impact of capital and liquidity requirements on bank stability.

Gupta and Kashiramka, (2020) analyzed the impact of liquidity creation on the financial stability of Indian banks. 1046 firms and year observations were employed for a period of 12 years, from 2007 to 2019. A dynamic panel estimation technique was employed. The author first uses the proxies for liquidity creation given by Berger and Bouwman, (2009) to evaluate the impact on financial stability calculated by the Z-score using ROA. For robustness, two other proxies were used for liquidity creation: NSFR and LCR using the estimation given by, Chiaramonte and Casu, (2017) and Z-score using ROE. A positive relationship was found between the NSFR and LCR and financial stability, implying that liquidity creation has a significant positive impact on the financial stability of Indian banks. The robustness test validates the findings of the initial tests.

2.16 HYPOTHESIS DEVELOPMENT FOR STABILITY AND BASEL III LIQUIDITY REGULATIONS

As highlighted in section 2.11, the ALM theory of liquidity management is closely related to the liquidity requirements given by Basel III. The specific NSFR and LCR ratios are imposed by the regulators to enhance the stability and risk management practices of banks by providing liquidity buffers to withstand potential shocks. Based on the ALM theory and the given empirical studies provided in section 2.12, it can be hypothesized that the stability of the bank can improve with the increase in the NSFR ratio as a higher NSFR ratio suggests that the bank has a greater proportion of stable funding to support its long-term assets and operations. Alternatively, lower NSFR can be translated into higher instability and potential vulnerability. Additionally, the ALM theory highlights the significance of having adequate liquidity. A higher LCR shows the presence of more HQLAs with banks in comparison to anticipated net cash withdrawals during a stress event. Due to its strong liquidity position, the bank can cover short-term funding needs, lowering the possibility of a liquidity crisis and boosting stability. Thus, a positive impact of LCR on the stability of commercial banks can also be predicted.

However, it is crucial to differentiate between conventional and Islamic banks when developing these hypotheses, as the supporting theories and operational principles vary between the two banking systems. Conventional banks operate primarily on interest-based transactions and are guided by the ALM theory in a traditional sense. The ALM theory in conventional banking focuses on matching the maturities and interest rates of assets and liabilities to manage liquidity risk and ensure stability (Asutay, 2015). The imposition of NSFR and LCR ratios under Basel III aligns with these principles, aiming to enhance the bank's ability to manage its liquidity and funding risks effectively.

Islamic banks, on the other hand, operate under Shariah principles, which prohibit interest (riba) and promote risk-sharing, asset-backed financing, and ethical investments. The ALM theory for Islamic banks incorporates these unique principles, requiring different liquidity management practices. Islamic banks primarily use profit-sharing and leasing arrangements, which impact their liquidity profiles differently compared to conventional banks (Iqbal, 2012). The application of NSFR and LCR in Islamic banks must account for these differences, as their liquidity management strategies are constrained by Shariah compliance.

Given these differences, it is essential to hypothesize the impact of Basel III liquidity standards separately for conventional and Islamic banks:

H₁: There is a significant impact of NSFR and LCR on the stability of all commercial banks of Pakistan.

H_{1A}: There is a significant impact of NSFR and LCR on the stability of all conventional banks of Pakistan.

H_{1B}: There is a significant impact of NSFR and LCR on the stability of all full-fledged Islamic banks of Pakistan.

2.17 EMPIRICAL STUDIES ON THE IMPACT OF BASEL III LIQUIDITY STANDARDS ON THE PROFITABILITY OF BANKS

King, (2013) studied the NSFR to suggest changes that can be implemented by banks in their respective balance sheets to meet the NSFR requirement. A total of 459 banks in 15 countries were studied. The author adopted a stylized balance sheet approach and used the first version issued by Basel III to calculate the NSFR. It was highlighted that there is a trade-off between the Basel III liquidity regulations, profitability, and risk. Strategies suggested by the author to improve the NSFR include decreasing net interest margins, shrinking the balance sheet, changing the maturity of loans, or changing investment composition.

Dietrich et al., (2014) studied the characteristics and factors affecting the NSFR in Western European banks from 1996 to 2010 using a generalized method of moments (GMM) estimations. According to the results, banks have historically not maintained minimum NSFR requirements. Most banks began increasing their NSFR after the 2008 financial crisis. According to the authors, it was found that in the past, no significant impact of NSFR on the profitability of banks has been found, but when all banks are required to have a similar balance sheet structure, that is, after the complete implementation of Basel III, earnings scenarios for the banking industry will change.

Said, (2018) analyzed the impact of the Basel III NSFR on the performance of eight local commercial banks in Malaysia. The study period was from 2005 to 2011. This study considers ROA, ROE, and net interest margin (NIM) as indicators of profitability. The findings of this study indicate that a positive relationship exists between the NSFR and all indicators of profitability. It is also highlighted that shifting from low- or medium-quality assets to high-quality assets may have decreased NIM, but banks remained able to remain profitable.

Le et al., (2020) studied the impact of the Basel III NSFR on the profit efficiency of U.S. commercial banks from 2000 to 2015. The results show that a slight strengthening in liquidity helps reduce banks' profit inefficiency. In addition, if banks hold too many liquid assets or if they become dependent on imprudent long-term funding, they will experience high funding costs or lower earnings.

Papadamou et al., (2021) studied the efficacy and prudential role of banking regulations in the European Union from 2000 to 2014. This study was conducted by evaluating the impact of NSFR and tier 1 capital on financial stability, which is depicted by the profitability of banks. The authors used ROA, risk-adjusted ROA, and the return of risk-adjusted ROA as the dependent variables. The findings of the study show that the NSFR has a significant impact on the profitability of banks; thus, the NSFR provides ways to enhance the performance of banks and improve the stability of the banking sector.

2.18 HYPOTHESIS DEVELOPMENT FOR PROFITABILITY AND BASEL III LIQUIDITY REGULATIONS

As discussed earlier, banks serve as the intermediary between savers and borrowers. According to the traditional theory of financial intermediation need for intermediaries arises because of high transactional costs and asymmetrical information. But now as highlighted by Allen and Santomero, (1997) over the period there has been a decrease in transactional costs and information is now available with ease to the investor. With such changes, the function of intermediation has not decreased but has increased due to the development of new financial markets. The theory of financial intermediation also put a lot of weight on risk management activities being performed by the financial intermediary. Allen and Santomero, (1997) argued that risk management is the area that has seen a drastic emphasis over a period of time.

In the context of the banking industry, Basel regulations have been implemented to improve the risk management of banks. Also, studies discussed in the previous section highlight the impact of Basel III liquidity regulations on the profitability of commercial banks. Based on previous studies, we can suggest that NSFR has a negative impact on the profitability of banks because, with the introduction of NSFR requirement banks are now required to hold more stable funding due to which there is a possibility of a decrease in investment income of banks, that ultimately can decrease the profitability of banks. However, LCR requirements encourage banks to hold higher portions of HQLAs. This can improve the liquidity management of banks as now banks have sufficient funds to meet short-term obligations and deposit withdrawals and

therefore there is no need to resort to costly emergency funding sources. Banks can improve their capacity to grasp lucrative investment opportunities, extend credit to customers, and produce higher returns on assets by keeping a strong liquidity position. Therefore, a positive impact of LCR is hypothesized on the profitability of commercial banks.

In conventional banks, profitability is driven by interest-based income and traditional financial intermediation. The application of Basel III liquidity requirements, such as NSFR and LCR, affects the asset-liability management practices of these banks. Holding more stable funding (NSFR) and higher portions of HQLAs (LCR) can influence their interest margins and investment strategies, ultimately impacting their profitability. The traditional financial intermediation theory supports this by highlighting the balance between risk management and profitability in conventional banks.

Islamic banks operate under Shariah principles, which prohibit interest (riba) and emphasize profit-sharing, asset-backed financing, and ethical investments. Their profitability is derived from fee-based income, profit-sharing arrangements, and trade-based activities. The impact of Basel III liquidity requirements on Islamic banks may differ due to their unique financial structures and compliance with Shariah principles. The theory of financial intermediation in Islamic banking emphasizes risk-sharing and asset-backed transactions, which affect how these banks manage liquidity and profitability. Islamic banks may face different challenges and opportunities in maintaining stable funding and HQLAs compared to conventional banks.

Given these differences, it is essential to hypothesize the impact of Basel III liquidity standards on the profitability of conventional and Islamic banks separately. In this research, ROA is used as the indicator of profitability. The hypothesis for the study is:

H₂: There is a significant impact of Basel III liquidity requirements NSFR and LCR on the profitability (ROA) of all commercial banks of Pakistan.

H_{2A}: There is a significant impact of NSFR and LCR on the profitability of conventional banks in Pakistan.

H_{2B}: There is a significant impact of Basel III liquidity requirements NSFR and LCR on the profitability (ROA) of all full-fledged Islamic banks (IBs) of Pakistan.

2.19 HYPOTHESIS DEVELOPMENT FOR COST OF FINANCIAL INTERMEDIATION AND BASEL III LIQUIDITY REGULATIONS

The process of bank financial intermediation, which involves transferring funds from surplus units to deficit units, plays a significant role in promoting sustainable and inclusive growth. Research has shown that the level of banking intermediation in an economy is strongly linked to its economic growth (Galbis, 1977; Odedokun, 1998).

The expenses involved in financial intermediation play a crucial role in determining the scope and reach of the banking system. The interest spread, which is the disparity between lending and deposit rates, calculated via net interest margin (NIM), is a widely recognized metric for assessing the cost of financial intermediation in a society (Barik & Raje, 2019; Calice & Zhou, 2018; Das Gupta et al., 2021). The dealership model was originally developed by Ho and Saunders, (1981) and later over the period, the work on it has been expanded (Allen, 1988; Angbazo, 1997; Maudos & de Guevara, 2011). According to the modified model, NIM is determined by various factors such as market structure, transaction size, risk aversion, interest rate uncertainty, regulations, bank ownership etc. Beck and Hesse, (2009) formulated a risk-based view of financial intermediation by categorizing these factors.

According to this view, financial intermediation involves the transfer of funds from savers to borrowers, which is subject to several risks, including market risk, credit risk, operational risk, and liquidity risk, among others. Hence, to comprehend the potential risks and their effects on the financial system, it is essential to adopt a risk-based approach to financial intermediation.

The risk-based approach to financial intermediation involves the identification and mitigation of risks associated with financial intermediation activities. This approach entails evaluating the risks associated with different financial intermediation activities

and adopting appropriate risk management strategies to address them. For instance, financial intermediaries manage credit risk by assessing the creditworthiness of borrowers and setting lending rates based on the risk level. They also use credit derivatives to hedge against credit risk. In managing market risk, financial intermediaries diversify their investment portfolios, hedge against interest rate risk, and employ derivatives to mitigate exposure to market volatility. To manage liquidity risk, they maintain adequate buffers of liquidity and manage asset-liability mismatches. The management of operational risk involves the establishment of strong internal controls, systems, and processes aimed at preventing operational failures, fraud, and errors. Hence, it can be said that a risk-based approach to financial intermediation promotes the safety and soundness of financial intermediaries and contributes to maintaining the stability of the financial system as a whole.

Basel III is a collection of international regulatory guidelines created by the Basel Committee on Banking Supervision (BCBS) to enhance the banking system's resilience and bolster risk management practices. Liquidity risk management is one of Basel III's primary areas of attention, and the regulations offer a risk-based framework for financial intermediaries to manage and control liquidity risk. To limit the spread of systemic risks and ensure that financial intermediaries have enough liquidity to survive liquidity stress events, BCBS issued the liquidity framework for banking institutions. The two liquidity measures are established by BCBS, the Liquidity Coverage Ratio (LCR) and the Net Stable Financing Ratio (NSFR). To meet liquidity demand, financial intermediaries are now required to maintain an adequate level of high-quality liquid assets (HQLA) and firm funding sources. Basel III also mandates that financial intermediaries implement a strong framework for managing liquidity risk, including creating a solid policy, putting in place efficient procedures for monitoring and reporting liquidity risk, and regularly performing stress tests to gauge their resilience for liquidity.

The Basel III liquidity recommendations also stress the significance of a risk-based approach to managing liquidity risk, which entails adjusting liquidity risk management procedures to the unique risks that each financial intermediary faces. With this strategy, financial intermediaries must evaluate their liquidity risk profile, including

their funding arrangements, market access, and cash flow forecasts, to ascertain their appetite for liquidity risk and create the most effective risk management plans.

In general, the liquidity guidelines of Basel III give financial intermediaries a framework for managing liquidity risk in a risk-based way, ensuring that they maintain sufficient liquidity levels to withstand liquidity stress events and prevent systemic hazards. Financial intermediaries can increase their financial stability and contribute to the broader stability of the financial system by adopting a risk-based strategy to manage liquidity risk.

After the global financial crisis, there has been renewed interest in NIMs, as evidenced by studies conducted by Afrin et al., (2022) and Jarmuzek & Lybek, (2020). As mentioned earlier NIM is often used as an indicator of financial intermediation costs and efficiency, both of which are crucial for promoting economic growth, as pointed out by (Levine, 1997, 2005). This is because high NIMs may impede growth by raising lending rates, which can discourage investment, and lowering deposit rates, which can decrease savings. Such effects can directly impact the liquidity of banks. Therefore, in this research, NIM has been used as a proxy for the cost of financial intermediation for conventional banks and net profit margin (NPM) is used as a proxy for cost of financial intermediation for Islamic banks.

Conventional banks operate primarily on interest-based income from the spread between lending and deposit rates. The dealership model and the risk-based approach highlight how regulatory requirements, such as NSFR and LCR, impact the net interest margin (NIM) by influencing the cost and availability of funds. These regulations can increase the cost of financial intermediation by requiring banks to hold more stable funding and high-quality liquid assets, thus potentially reducing their profitability from traditional lending activities.

Islamic banks, on the other hand, operate under Shariah principles, which prohibit interest (riba) and focus on profit-sharing, asset-backed financing, and ethical investments. Their financial intermediation costs are measured by the net profit margin (NPM), which reflects the profitability of their investment and financing activities. The impact of NSFR and LCR on Islamic banks may differ due to their unique funding

structures and adherence to Shariah compliance. The risk-based approach in Islamic banking involves managing liquidity through Shariah-compliant instruments and maintaining sufficient liquidity buffers without compromising Shariah principles.

Given these differences, it is essential to hypothesize the impact of Basel III liquidity standards on the cost of financial intermediation for conventional and Islamic banks separately. The following hypothesis will be tested:

H₃: There is a significant impact of NSFR and LCR on the intermediation cost of all commercial banks of Pakistan.

H_{3A}: There is a significant impact of NSFR and LCR on the intermediation cost of all conventional banks of Pakistan.

H_{3B}: There is a significant impact of NSFR and LCR on the intermediation cost of all full-fledged Islamic banks of Pakistan.

2.20 Studies on Basel III Liquidity Standards and Islamic Banks

Ahmed, (2015) examined the implications of the Basel III liquidity ratios (LCR and NSFR) on the Islamic banking industry. This is a theoretical analysis in which the author states that among the most challenging tasks for Islamic banks is liquidity risk management. Islamic banks face constraints in fulfilling the liquidity requirements of Basel III. Only a robust liquidity system facilitates this implementation. Islamic banks need new instruments to implement these requirements conveniently.

Ashraf et al., (2016) studied the potential impact of the NSFR requirements on the stability of Islamic banks. The authors calculated a modified NSFR based on guidelines provided by the IFSB standards for 133 Islamic banks from 30 jurisdictions between 2000 and 2013. The results suggest that the NSFR can improve the resilience of Islamic banks, as it helps to minimize the asset-liabilities maturity mismatch that will ultimately result in improved financial stability. The results of the study also highlight that there is no uniformity in the impact of stability on all selected banks, which suggests a prudent approach when using the NSFR as a means to enhance and support the resilience of Islamic banks.

Rashid et al., (2018) suggested best practices for liquidity risk management in Islamic banks in Malaysia by determining the strengths and weaknesses of all bank regulations for liquidity management. These include regulations by the BCBS, IFSB, and Bank Negara Malaysia (BNM). The comparative content analysis method was adopted in this study to determine strengths and weaknesses, as well as to propose the best practice among all three regulatory frameworks. The regulatory frameworks for liquidity risk management given by the IFSB and BNM are based on the framework provided by the BCBS. The best practice for liquidity risk management in Islamic banks is the regulatory framework given by the IFSB, as it is Shariah compliant. According to the authors, the unique feature of the framework given by the IFSB is that it makes the Shariah committee part of the governance system.

Abdul-Rahman et al., (2018) evaluated the impact of financing structure on the liquidity risk of twenty-seven conventional and Islamic banks in Malaysia from 1994–2014. Financing structure was measured using real estate financing, financing concentration, short-term financing structure stability, and medium-term financing structure stability. Liquidity risk was measured by the LCR and NSFR according to the Basel III standards. An unbalanced static panel regression model is applied. It was identified that some differences exist in the liquidity risk behavior of both types of banks. An increase in the real estate and short-term financing structure stability of Islamic banks may result in increased short- and long-term liquidity risks. It was also found that although real estate financing does not affect the liquidity risk of conventional banks, an increase in short-term financing structure stability and financing specialization can result in the long-term liquidity risk behavior of conventional banks. The authors recommend that different risk management frameworks be developed by regulatory bodies for Islamic and conventional banks.

Dolgun et al., (2019) studied the factors influencing the liquidity risk management of Islamic banks and presented an alternative LCR estimation method for Islamic banks by considering their unique nature. According to the authors, the lack of regulatory and supervisory standards, particularly for Islamic banks, is a key challenge to the expansion of the Islamic banking industry. IFSB standards are designed while considering the unique nature of Islamic financial institutions, but the authors argue that there is a high similarity between these standards and the standards of the conventional

financial system. Therefore, the authors calibrated a new LCR mechanism specifically designed for Islamic banking institutions.

Dolgun et al., (2020) highlight the impact of liquidity regulations on Islamic banks in Turkey. In this research, the authors also propose an alternative mechanism for the mitigation of certain risks faced by Islamic banks in fulfilling liquidity requirements. This mechanism is based on capital market standards. According to the authors, one of the key issues Islamic banks face in liquidity management is the scarcity of high-quality liquid instruments. Islamic banks have more cash in their assets than required due to regulatory constraints, as well as a shortage of high-quality liquid assets. It was suggested that a cap should be applied to LCR for Islamic banks to encourage them to manage assets with greater effectiveness, which will ultimately enhance financial intermediation in the real sector.

Limited literature has been found on evaluating the impact of Basel III liquidity standards on stability, profitability or cost of intermediation of Islamic banks and literature related to the Islamic banking industry of Pakistan is even scarce. Therefore, this research will highlight this impact.

2.21 General Empirical Studies on Basel III Liquidity Standards

This section provides a summary of empirical studies on the impact of Basel III on financial distress and bank failure. Yan et al., (2012) studied the influence of Basel III liquidity on the stability of banks and the UK economy. Their analysis suggests that these requirements increase financial stability in UK banks and hence decrease the likelihood of crises that promote lending and increase GDP. They also believed that the net impact of these requirements would be of a much larger magnitude than anticipated by the BCBS itself.

King, (2013) states that there is a trade-off between liquidity regulation, bank risk, and profitability. As banks are not experienced in applying such regulations, there is a passivity of some negative consequences. In this study, the NSFR ratio of 15 countries was estimated, and stylized facts were applied to the balance sheet and net

interest margins, a proxy of profitability. It was highlighted that banks that are already meeting the NSFR ratio will not have any impact on the net interest margin ratio; however, banks that are required to fulfil the criteria will experience a decline. It was also found that in 2009, countries that relied more on less stable funding experienced a large absolute decline in the estimated value of NSFR.

Distinguin et al., (2013) studied the association between bank regulatory capital and bank liquidity measured from on-balance sheet positions for European and US publicly traded commercial banks. They found that when there is high illiquidity in small banks, their solvency standards improve. Their findings support the guidelines given by the Basel Committee that an association between the minimum liquidity ratio and capital ratios is required. However, such a scenario might be more appropriate for large banks than for small banks, as large banks can manage liquidity differently by using more off-balance sheet instruments.

Hong et al., (2014) calculated the Basel III LCR and NSFR of US commercial banks between 2001 and 2011 using approximated measures. They examine the possible link between liquidity requirements and bank failures. According to their findings, liquidity risk measures have a minimum or no impact on bank failure. Banks are inclined to increase LCR if financial distress is expected if banks are experiencing high solvency risk, or if the economic conditions are deteriorating.

DeYoung and Jang, (2016) analyzed the liquidity positions of U.S. commercial banks before the implementation of Basel III liquidity requirements between the period of 1992-2012. According to the results, commercial banks in the United States actively managed their balance sheet liquidity during the study period. According to the authors, after the implementation of the NSFR requirement of Basel III, there will be a significant impact on banks' liquidity management. There might not be a fundamental change in the manner in which small- and mid-sized banks manage their liquidity, but it will limit the formation of illiquidity in the balance sheet that naturally forms during later stages of economic expansion.

Chiaramonte and Casu, (2017) studied the factors that contribute to bank distress in twenty-eight European Union member states for 513 banks using a pooled logistic

regression model. The dependent variable in the study was a dummy variable for failed and distressed banks, and the main independent variables include ratios of equity, tier one, tier two capital with assets, and NSFR ratio, according to the 2010 and 2013 guidelines. The results show that banks with a buffer of higher liquidity have a low probability of bank distress.

Another study was conducted by Ly et al., (2017) to ascertain the influence of the pace of U.S. banks in adjusting to the new regime of the NSFR to systemic risks. The results suggest that there is an inverse relationship between these factors; hence, systemic risks decrease with the rapid response of banks to a new regime and increasing NSFR.

Adesina, (2019) evaluated the influence of Basel III liquidity requirements on the loan growth rate of African banks. Thirty-eight banks were selected between 2005 and 2015. The NSFR and LCR were found to have a significant positive impact on bank loan growth rates. It was also found that the NSFR diminishes the adverse effect of poorly performed portfolios of loans on the bank loan growth rate. Hence, the author expects a favorable impact in Africa after the application of Basel III liquidity standards.

2.22 ANALYTICAL APPROACHES USED IN THE CONTEXT OF BASEL III OR IFSB LIQUIDITY STANDARDS.

This section provides a summary of the statistical techniques used in previous studies. Table 2.3 provides a summary of the general and contemporary quantitative techniques used by the researchers. Various statistical models have been used to estimate this model. Table 2.4 provides a summary of the qualitative technique-based articles. Very few research articles are available on Basel III or the IFSB liquidity standards that employ a qualitative approach.

Table 2.3 Quantitative approaches used in the context of Basel III or IFSB liquidity standards

S.No.	Authors	Independent Variable(s)	Dependent Variable(s)	Control Variables	Analytical Approach	Findings
The empirical literature on the impact of Basel III on the stability of banks						
1	Francisco Vazquez, Pablo Federico (2015)	NSFR, Equity ratio	Dummy crisis	<i>Bank-specific:</i> Asset growth, Trading revenues, non-interest income, off-balance sheet items. <i>Country-specific:</i> GDP growth rate, money-market rates, stock market volatility index	Probit regression model	Banks with weaker structural liquidity and higher leverage in the pre-crisis period were more likely to fail. A 3.5 percentage point increase in pre-crisis capital buffers would have significantly reduced the probability of failure for Global banks. Supports Basel III regulations, emphasizing leverage.
2	Md Zakir Hossain, Md Atiqur Rahman Khan and M. Shibley Sadique (2018)	BASEL III ratios: Model 1: CAR, LCR and NSFR Model 2: TRA (Tier1 capital ratio), LEV (leverage ratio), LCR and NSFR	Stability (Log Z-Score)	Banks-specific: ROA, LTA, LDR, LLP Country characteristics: LGDP, GDPPC, LER, INF A dummy crisis variable was added in Model 2	Panel Regression model (Fixed effect)	An increase in CAR, Tier 1 capital ratio, and leverage ratio enhances the resilience (Z-Score) of banks in BRICS economies. LCR and LEV are effective in increasing resilience if implemented together. Economic development stage does not significantly impact policy formulation for these economies.
3	Barbara L’Huillier,	NSFR, LTL (log of total gross loans)	Stability (Z-Score)	<i>Bank-specific:</i> Size, NPL, NONI, OPER,	Two-step Least square estimation,	The NSFR requirement under Basel III would

	Muhammad Suhail Rizwan, Dawood Ashraf (2018)		(Covariate estimation was applied)	TRCR, <i>Country-specific</i> : GDP growth, SPRD, INF, CONS, GFC		have enhanced financial stability but would have also caused loan portfolio shrinkage and potential sub-optimal loan portfolio selection.
4	Samuel Mutarindwa, Dorothea Schäfer, Andreas Stephan (2020)	Basel III liquidity requirement (NSFR), Total capital ratio, Ownership concentration (dummy variable), Bank's Institutional environment proxies (legal origin, Regulatory quality, Supervisory power index, the Supervisory independence index, the Private monitoring index and the Overall capital stringency index)	Stability (Z-Score), NPL ratio	Bank-specific: size <i>Country-specific</i> : GDP growth rate, Inflation	DiD (difference-in-difference) method: A quasi-experimental method; a version of fixed-effect estimation using aggregate data.	African banks complying with the capital threshold TCR lend more and improve stability (Z-score, NPL ratio) if they already have above-median stability levels. The NSFR threshold leads to reduced lending. Compliance likelihood depends on regulatory institution strength and legal origin.
5	Juhi Gupta, Smita Kashiramka (2020)	Liquidity creation (LC) In the robustness tests, NSFR and LCR were used as a proxy for LC	Stability Log Z-score (ROA) Log Z-score (ROE)	<i>Bank-specific</i> : CAR, NPA, Cost to income, ROA, deposit growth, macroeconomic factors: GDP growth, wt. repo rate <i>regulatory and institutional controls</i> : stock market capitalization and domestic credit, Herfindahl-Hirschman Index, Governance quality, Bank	Two-step system GMM estimation	Liquidity creation (LC) enhances bank financial stability, but the impact varies with bank size. Private sector banks are more stable than public sector banks. The study suggests that 'one-size-fits-all' liquidity regulations are not optimal for bank stability.

				ownership dummy variable		
6	Salvatore Polizzi, Enzo Scannella, Nuria Suarez (2020)	TIER1 capital ratio, LCR (liquid assets-to-total assets), NSFR (total equity plus customer deposits over total assets)	Bank stability (log of Z-score), loan growth	<i>Bank-specific:</i> Size, non-interest income-to-total revenue ratio, Overhead costs <i>Country-specific:</i> GDP growth, inflation, Lerner index for market power, KKZ index for institutional quality	two-stage least squares with panel data estimator	Capital and liquidity requirements have a negative direct impact on bank stability but a positive indirect impact through increased lending. The relationships are more pronounced in countries with higher creditor rights protection and lower non-traditional banking activity restrictions.
The empirical literature on the impact of Basel III on profitability and cost of intermediation of banks						
1	Michael R. King (2013)	NSFR is estimated and it was analyzed how these changes can affect net interest margin. The most cost-effective strategy was identified			Stylized facts on bank balance sheets and net interest margins	The NSFR reduces net interest margins by 70–88 basis points on average. Universal banks with diversified funding sources and high trading assets are penalized most by the NSFR.
2	Andreas Dietrich, Kurt Hess, Gabrielle Wanzelried (2014)	<i>Model 1:</i> Capital Ratio, Growth Net loans, Bank Size, Non-Interest Share, dummy variable for ownership, Dummy crisis, Yield curve, GDP Growth <i>Model 2:</i> NSFR, loan loss ratio, capital ratio, OH/TA, size, Non-Interest Share, GDP growth, Dummy crisis	Model 1: NSFR Model 2: ROA, ROE, NIM		One-step GMM Model	Larger and faster-growing institutions and banks active in asset management and investment banking historically did not fulfil NSFR requirements. Potential funding cost advantages for low NSFR banks do not translate into higher profitability and

						their results are more volatile.
3	Rasidah Mohamad Said (2018)	NSFR	NIM, ROA, ROE	<i>Bank-specific:</i> loan loss ratio, capital ratio, asset quality, size <i>Macro-economic:</i> GDP growth, inflation	Panel Regression model (Fixed Effect)	The NSFR is an important factor affecting the profitability of Malaysian commercial banks. Effective management of funding stability and asset liquidity translates into higher profitability.
4	Minh Le, Viet-Ngu Hoang, Clevo Wilson, Shunsuke Managi (2020)	Variables in the frontier function EBT, NII to net loans, non-interest income to other earning assets, interest expenses to total deposits, personnel expenses to TA, OH Exp (net of personnel expenses) to FA, capital ratio, Dummy size Variables in the inefficiency term-base model NSFR, The ratio of core deposits to loans, Asset diversification, Funding diversification, Size, Period of non-performing loans over total loans, Dummy variable for the crisis.	Profit efficiency using SFA		Regression Analysis	Efficiency, concentration, and market power influence shareholder value in Australian banks. Technical efficiency positively impacts returns on equity, while scale efficiency positively influences market value but negatively impacts interest and returns on equity.
5	Stephanos Papadamou, Dimitrios	NSFR, Tier 1 capital	ROA, the risk-adjusted ROA		Dynamic GMM, Panel vector autoregressive	NSFR plays a prudential and forecasting role, improving bank

	Sogiakas, Vasilios Sogiakas, Kanellos Toudas (2021)		(RAROA), the return of risk-adjusted capital (RORAC,		(PVAR), Dynamic panel VAR model with the Composite Indicator of Systemic Stress (CISS)	performance and stability. Capital requirements (Tier 1) respond to financial system uncertainty. Basel III liquidity provisions act as leading indicators of financial stability.
The empirical literature on the impact of Basel III liquidity standards on Islamic banks						
1.	Dawood Ashraf, Muhammad Suhail Rizwan, Barbara L'Huillier (2016)	IFSB Modified NSFR,	Financial stability (z-score)	<i>Bank-specific:</i> Size, Income sources, NITA, cost-to-income ratio <i>Country-specific:</i> GDP growth, bank concentration, Religiosity, Dummy crisis, Dummy control	Dynamic panel autoregressive model, Instrumental Variable model	The IFSB's modified NSFR for Islamic banks positively impacts financial stability. Results are robust even with an alternative measure of stability and estimation model.
2	Aisyah Abdul-Rahman, Ahmad Azam Sulaiman, Noor Latifah, Hanim Mohd Said (2018)	<i>Financing Structure:</i> real estate financing, financing concentration, short-term financing stability, medium-term financing stability	LCR, NSFR	<i>Bank-specific:</i> Size, CAR, ROA, Non-performing Financing, Financing <i>Macro-economic:</i> GDP, Inflation	Panel Regression model (Fixed Effect)	Increasing real estate financing and short-term FS stability in Islamic banks may increase both short- and long-term liquidity risks. Conventional banks show different liquidity risk behaviors. Separate liquidity risk management frameworks for Islamic and conventional banks are recommended.
3	Muhammed Habib Dolgun, Adam Ng, Abbas Mirakhor (2020)	Correlation between 1. Cash and profit 2. LCR and CAR			Correlation	Islamic banks hold higher cash than necessary. Suggests a maximum liquidity ratio for Islamic

						banks to manage assets appropriately and encourage financial intermediation to the real sector. Basel and IFSB standards are disincentives to risk-sharing investments.
General Empirical literature on Basel III liquidity standards						
1	Meilan Yan, Maximilian J.B. Hall, Paul Turner (2012)	Capital ratio, NSFR, real estate price inflation ratio, ROE, current account balance to nominal GDP ratio	Dummy crisis		Probit model, Vector Error Correction Model (VECM)	Basel III reforms have a significant net positive long-term effect on the UK economy. Optimal tangible common equity capital ratio is 10% of risk-weighted assets, higher than the Basel III target of 7%.
2	Isabelle Distinguin, Caroline Roulet, Amine Tarazi (2013)	Liquidity creation, the inverse of NSFR	Regulatory capital ratio	<i>Bank-specific:</i> ROE, Dividend pay-out ratio, asset risk, funding structure, bank charter value, size, bank capital regulation index Macro-Economic: GDP growth	GMM	Banks decrease their regulatory capital ratios when facing higher illiquidity or creating more liquidity. Small banks strengthen solvency standards with higher illiquidity.
3	Han Hong, Jing-Zhi Huang, Deming Wu (2014)	spread of the three-month LIBOR, LCR, NSFR	Bank Failure	Capital Ratio, ROA, NIM, loan mix, asset quality, size	Regression analysis	NSFR and LCR have limited effects on bank failures. Systemic liquidity risk is a major contributor to bank failures in 2009 and 2010.
4	Robert DeYoung, Karen Y. Jang (2016)	Log of assets, book equity, growth plan, public, mortgages, commitments,	loans-to-core deposits ratio NSFR		GMM, OLS	Banks managed liquidity positions by targeting loans-to-core deposits

		branches, deposit-weighted Philadelphia Fed Coincident Index				ratio and implicitly targeting NSFR. Small banks had stronger concordance with NSFR.
5	Laura Chiaramontea, Barbara Casu (2017)	Capital ratio, the ratio of tier1 capital to risk-weighted assets, The ratio of tier1 and tier 2 capital to risk-weighted assets, NSFR (2010), NSFR (2014)	Failed and distressed bank (dummy) variable	<i>Bank-specific:</i> Asset quality, bank operational efficiency, ROAA, bank diversification, size <i>Country-specific:</i> GDP growth, inflation, market share value, Dummy variable for Eurozone	Pooled logistic regression	Increased liquidity holdings decrease failure and distress likelihood. Capital ratios are significant only for large banks.
6	Kim Cuong Ly, Zhizhen Chen, Senyu Wang, and Yuxiang Jiang (2017)	NSFR is estimated and it was analyzed how these changes can affect net interest margin.			Stylized facts on bank balance sheets and net interest margins	Immediate-trading equilibrium leads to quick NSFR adjustments, reducing systemic risk. Small banks strengthen negative impact of NSFR adjustment speed on systemic risk.
7	Kolade Sunday Adesina (2019)	NSFR, LCR	bank loan growth rates	<i>Bank-specific:</i> Size, Capitalization effect, Cost of funding, ROAA, Loan Quality <i>Country-specific:</i> Inflation, GDP growth, banking concentration	two-step system GMM and QML estimations	Higher diversification reduces bank performance; higher human capital efficiency is positively associated with bank performance. Performance-reducing effects of diversification decrease with improved human capital efficiency.

Table 2.4 Qualitative approaches used in the context of Basel III or IFSB liquidity standards

S.No.	Authors	Objectives	Analytical Approach	Findings
1	Habib Ahmed (2015)	To examine the implications of Basel III liquidity ratios on the Islamic banking industry. To identify what challenges will these requirements bring for the Islamic banks and provide some suggestions to solve these challenges	Review	Basel III liquidity ratios pose challenges for Islamic banks due to Shari'ah restrictions. Solutions include identifying practices to meet liquidity needs.
2	Umami Sulaim Ahmad Rashid, Aisyah Abdul Rahman, Ruzian Markom (2018)	The study identifies the strengths and weaknesses of the regulatory framework (RF) in the Basel Committee on Banking Supervision (BCBS), Islamic Financial Services Board (IFSB) and Bank Negara Malaysia (BNM) for liquidity risk management (LRM) Islamic banking in Malaysia	Comparative content analysis	IFSB provides Shari'ah-compliant guidelines and is considered best practice for LRM in Islamic banking. BCBS is a key pillar for LRM but lacks Shari'ah compliance. IFSB should be a reference for managing liquidity risk in Islamic banking.
3	Muhammed Habib Dolgun, Abbas Mirakhor, Adam Ng (2019)	The Basel standards and the IFSB standards are not providing the appropriate level playing field required for Islamic banks. Although establishing the IFSB was a much-needed attempt, the standards introduced by this institution are far below the expectations of Muslim investors	Conceptual Paper	Proposes a new regulatory framework for Islamic banks' liquidity management based on risk-sharing and symmetric information. Suggests differentiated liquidity requirements for local and internationally active Islamic banks, with policy implications for regulators and supervisors.

This section has highlighted the development of research hypotheses. It can be seen that the focus of this research is to identify the impact of Basel III liquidity standards on the stability, profitability and cost of financial intermediation of all commercial banks in Pakistan. The model of research is incomplete without identifying internal/external factors affecting the dependent variables. These factors are known as control variables. From the review of previous literature various control variables have been selected for the study.

2.23 THEORETICAL FRAMEWORK

To synthesize the literature reviewed in this chapter and provide a clear theoretical basis for the empirical analysis in the following chapters, a theoretical framework is presented below in the figure 2.2. This framework illustrates the determinants of stability, profitability, and financial intermediation cost in the banking sector of Pakistan, highlighting the role of Basel III liquidity requirements (NSFR and LCR) and various control variables.

ALM theory emphasizes the importance of liquidity and stability in managing a bank's asset-liability structure. The inclusion of NSFR and LCR as independent variables is grounded in ALM theory, which aims to ensure banks have adequate liquidity to meet obligations and remain stable. Financial intermediation theory posits that banks' profitability is influenced by their ability to efficiently intermediate funds. NSFR and LCR ensure liquidity and reduce funding costs, affecting profitability. Also, both theories highlight the importance of maintaining balanced and efficient intermediation to minimize costs. NSFR and LCR are crucial in managing liquidity risks and funding costs.

The choice of these control variables is substantiated by extensive literature that highlights their significant impact on the respective dependent variables. This study builds on established empirical evidence, ensuring that the selected control variables are both theoretically relevant and empirically significant. By incorporating these variables, the analysis accurately reflects the dynamics within the banking sector of Pakistan, thereby providing robust and generalizable findings for both conventional and

Islamic banks. Detailed descriptions for each variable, along with the specific methodological approaches used, are provided in Chapter 3.

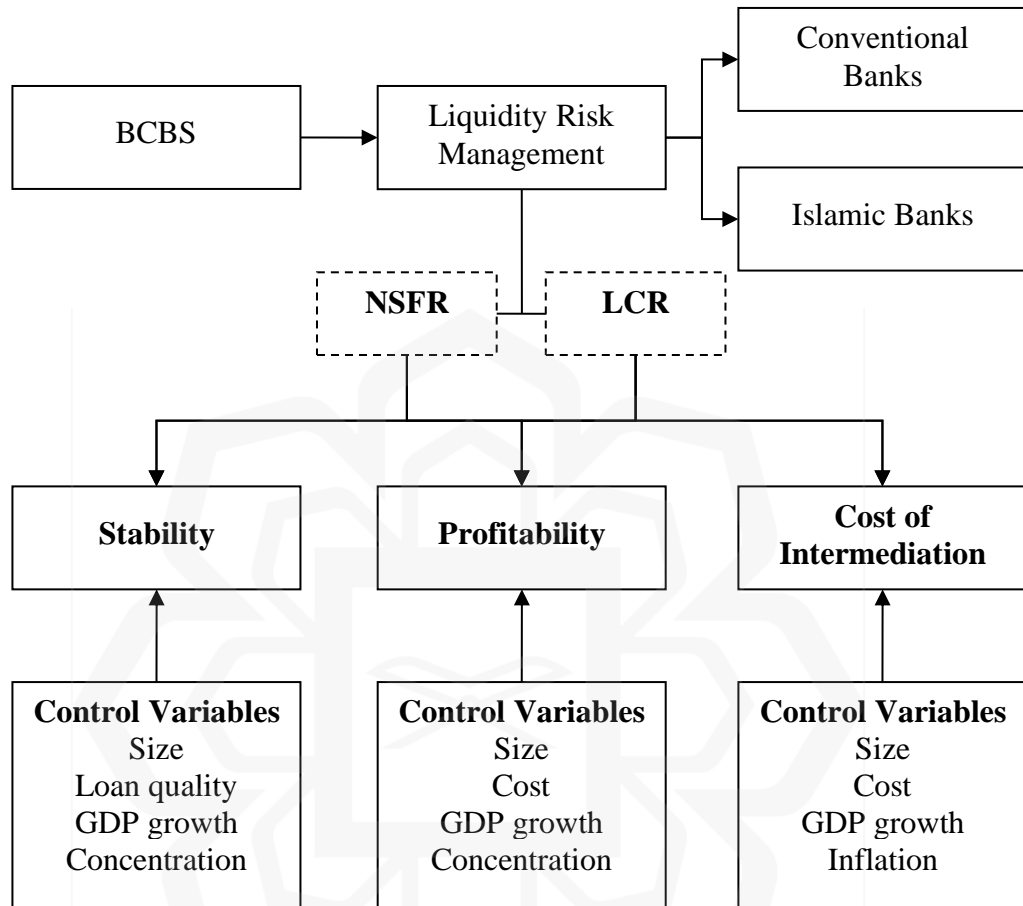


Figure 0.2 Theoretical Framework

2.24 CONCLUSION

Liquidity risk in a bank arises from maturity mismatch and imbalance of assets and liabilities. Islamic banks are no different in experiencing the risk. Islamic banks face an additional amount of liquidity risk due to a shortage of money market instruments as well as a lack of formal money markets in most countries. After the liquidity crunch of 2008, BSBC issued the Basel III accord for commercial banks, to improve their liquidity management practices. Banks are now required to hold various categories of liquid assets in different forms, in certain percentages. These standards do not differentiate between conventional or Islamic banks. In Pakistan, SBP has implemented Basel III

liquidity standards since 2017, and now all commercial banks are required to maintain both ratios greater than 100%. These standards have become a part of the liquidity management policies of the banks. The hypotheses of this research identify whether these liquidity standard ratios are among those statistically significant factors that influence the stability, profitability and cost of intermediation of commercial banks or not.



CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Research methodology is the way of solving the research problem scientifically and systematically (Kothari, 2017). It includes the study of numerous steps adopted to study the research problem with a logical explanation for each step. Also, to design methodology, it is important to know the underlying assumptions of research techniques, criteria of selection of research techniques, and procedures which includes designing the research that is an explanation of how the research will be conducted.

Basel III liquidity standards namely NSFR and LCR are implemented in Pakistan in 2017. The standards are applied to all types of banks simultaneously. It is imperative to understand the impact of these standards on the various aspects of the banking industry. In this section, the impact of Basel III liquidity standards on the stability, profitability and intermediation cost of conventional banks in Pakistan from 2007 to 2021, is discussed.

This chapter first describes the research methodology and then explains the preliminary tests. The next section presents the estimation models for conventional banks after which data analysis techniques are explained.

3.2 QUANTITATIVE RESEARCH DESIGN

Research design can be defined as the procedure of data collection and analysis that aims at combining relevance with the economy in the procedure to achieve research objectives (Kothari, 2017). The methodological choice of research design can be divided into three categories: quantitative research design, qualitative research design, or mixed methods research design.

Quantitative research address research objectives via empirical assessment that comprise of quantitative measurement and analysis approach (Zikmund, et.al, 2013). This type of research has no researcher interference and therefore reality is measured objectively using the data (Williams, 2007). This method is preferred when a researcher seeks to identify and establish correlations or relationships by using statistical modelling to explain or evaluate a phenomenon.

Qualitative research is used when the objective of the research is to explore and describe the variables under consideration (Williams, 2007). Since qualitative data is typically structured as participant replies, thoughts, feelings, etc., it frequently lacks a numerical interpretation. Numbers or a collection of data cannot be used to derive these results. Therefore, "qualitative understanding of social context can be crucial for recognising patterns in quantitative data" (Campbell & Russo, 1999).

3.2.1 Justification for Quantitative Research Design

The methodological choice for this research is the quantitative research design because the objective of this research is to empirically identify the impact of independent variables over the dependent variables by using secondary data. This research will use secondary data to empirically test the relationship between bank-specific, country-specific, and Basel III liquidity variables with bank stability, profitability, and cost of intermediation. Quantitative research design is generally associated with positivism. Positivist philosophy strictly focuses on scientific methodology to produce unbiased data and facts (Zikmund et.al, 2013). Epistemologically it focuses on discovering measurable facts that can be observed. According to Crotty, (1998) only observable and measurable phenomena can generate meaningful, credible data. Quantitative research is generally based on a deductive approach in which theory is tested by using data that examines the relationship between variables that can be measured numerically using statistical and graphical techniques (Zikmund, 2013).

3.2.2 Type of Research

The research is quantitative in nature, hence numerical data will be used, and results will be statistically tested. In quantitative research, this research will be explanatory as the relationship between prudential regulations of liquidity and stability, profitability and cost of intermediation be explained.

3.2.3 Data Collection and Preferences

3.2.3.1 Reference Period

The data were collected for a period of fifteen years i.e., from 2007-2021. This period has been selected because in Pakistan the substantial progressionⁱ of the Islamic banking industry emerged in 2007 as illustrated in figure 1.1 and 1.2.

3.2.3.2 Population and Sample

The first part of the research analysis deals with the impact of Basel III liquidity standards on conventional banks and the second part deals with all full-fledged Islamic banks in Pakistan. The target population of this research encompasses all public and private commercial banks in Pakistan. By the end of December 31st, 2021, the banking industry of Pakistan was comprised of 5 public and 20 private commercial banks. Among these 5 banks are full-fledged Islamic banks (IBs) seventeen are conventional banks with stand-alone Islamic banking branches (IBBs), and the rest three banks are pure conventional banks (APPENDIX A). For simplicity, pure conventional banks and IBBs are referred to as conventional banks (CBs). This classification is used to streamline the analysis by grouping together institutions that primarily follow

ⁱ Figure 1.1 and 1.2

conventional banking practices. In this research, two datasets have been used, one for conventional banks and the other for full-fledged Islamic banks.

3.2.3.2.1 Sample Selection for Conventional Banks

The research sample is derived from the 20 conventional banks as of December 31st, 2021. Among these, there are 5 public sector banks and 15 private sector banks. This study has used a period of fifteen years ranging from 2007 to 2021. Initially, the dataset is tested for the presence of outliers, missing figures, and anomalies. The following actions have been taken to resolve the above-said issues. Firstly, banks that were incorporated in later years were excluded from the dataset. Sindh Bank Ltd.: a public sector bank, incorporated in 2011 has been excluded from the dataset of conventional banks. Second, firm years of discrepancies in their financial statements and significant missing figures are also removed from the initial sample (Hill et al., 2010). Therefore, two more banks; First Women Bank Ltd. and Silkbank Ltd were excluded from the dataset of conventional banks.

3.2.3.2.2 Sample Selection of Islamic Banks

All full-fledged Islamic commercial banks in Pakistan constitute the population. During the period 2007-2021 some banks that have merged or discontinued their operations. For this reason, Emirates Global Islamic bank limited and Burj Bank Limited, are excluded because they merged their operations with Albaraka Bank Pakistan Limited in the year 2010 and 2016 respectively. By the end of December 31st, 2021, the Islamic banking industry of Pakistan was comprised of five full-fledged Islamic banks (IBs). In this research banks that are incorporated after 2007 are excluded. Therefore, MCB Islamic Bank is also excluded as it was incorporated in 2015. The final sample of the study is comprised of 4 full-fledged Islamic banks in Pakistan.

3.2.3.3 Data Cleaning

After the selection of the final sample, the study uses the study used the replacement method to deal with outliers. The data is winsorized at a 1% standard, and outliers are replaced with the average values of non-outlier measurements (Hellerstein, 2008; Hu et al., 2022). In panel data, replacing outliers with a non-outlying mean measurement is advantageous because removing one observation would delete the entire record from the sample (Johnston, 2014). After satisfying the basic requirements, the final sample is made up of 255 firm-year observations, representing a balanced panel of 17 conventional banks for 15 years.

3.2.3.4 Sources of Data

Data is presumed to be unbiased, as the data collection sources are annual reports of the respective bank, publications of the central bank that is State Bank of Pakistan, and publications of Pakistan Bureau of Statistics.

3.3 VARIABLES OF THE STUDY

This section presents a detailed explanation of the variables of the study. Here, the variables of the study, their measurement tools and the expected direction of impact of independent / control variables on dependent variables are discussed. Table 3.2, 3.3 and 3.4 provides a summary of this section.

In this research, the impact of Basel III liquidity standards has been evaluated on stability, profitability and cost of intermediation of Islamic as well as conventional banks of Pakistan. Hence, in this research, three models have been studied. First is the stability model, second is the ROA model and third is the NIM model for conventional banks and the NPM model for Islamic banks. In this section variables for each of the models have been explained in detail.

3.3.1 Model 1: Stability

3.3.1.1 Dependent Variable

The majority of the research focusing on the financial stability of banks has used the Z-score as a measure to evaluate financial stability as well as insolvency risk (Amara & Mabrouki, 2019; Ashraf et al., 2016; Beck, De Jonghe, et al., 2013; Djebali & Zaghdoudi, 2020; Ozili, 2018; Pak, 2019). It is important to note that Z-score has the capability of capturing both fee-based and interest-income streams for a bank. Because of this reason, it is preferred over the accounting-based measure of financial stability (Ashraf et al., 2016). According to Lepetit and Strobel, (2013), the robust approach to calculating the z-score is to use the mean and standard deviation of ROA that is calculated by considering the whole sample period and by using current values of capital adequacy ratio (CAR).

Banks with higher Z-scores are expected to have low chances of bank failure. Hence, a higher value indicates more stability. Also, previous research has indicated that Z-score is considered to be highly skewed, hence, to resolve this issue, a natural logarithm of the Z-score is used that is normally distributed (Beck, De Jonghe, et al., 2013; Fernández et al., 2016). Hence, in this research log of z-score is used as a measure of stability and it is calculated as:

$$Z - Score = \frac{E(ROA)_i + CAR_{it}}{\sigma(ROA)_i}$$

3.3.1.2 Independent Variables: Basel III Liquidity Ratios

LCR and NSFR are the current liquidity requirements by Basel III. (BIS, 2013; 2014) and these are the main independent variables in this study.

3.3.1.2.1 Liquidity Coverage Ratio (LCR)

As discussed earlier in the chapter that LCR is a ratio that is internally used by banks to evaluate the exposure to contingent liquidity incidents. It is based on the methodologies of conventional liquidity coverage ratio. According to Basel III banks have to maintain an LCR greater than 100% and by doing so the amount of unencumbered HQLA is expected to provide a defence in case of liquidity stress. Thus, it can be said that it is a holistic proxy for the systemic exposure of banks to systemic risk (Du, 2017). According to Basel III LCR is calculated as follows:

$$LCR = \frac{\text{Stock of HQLA}}{\text{Total net cash outflows over 30 days}}$$

The balance sheet information needed to calculate LCR is not detailed enough, hence, the granularity of the information is limited. Therefore, in this research, LCR is calculated by following the proxy suggested by Chiaramonte and Casu, (2017). This proxy has already been acknowledged and used in previous literature. (Adesina, 2021; Alaoui Mdaghri & Oubdi, 2022). LCR in this research is calculated as follows:

$$LCR = \frac{\text{Liquid assets}}{\text{Deposits} + \text{Short term funding}}$$

Hong et al., (2014) state that banks tend to increase LCR in anticipation of financial distress, an increase in insolvency risk, or bad economic conditions. Hossain et al., (2018) and Polizzi et al., (2020) also found a positive relationship between LCR and stability.

3.3.1.2.2 Net Stable Funding Ratio (NSFR)

NSFR is a ratio to mitigate the funding risk of the bank that is the inability to raise funds in a time of need. Banks with lower NSFR have high vulnerability towards bank failure and hence are less stable (Vazquez & Federico, 2015). Hence, according to previous literature, NSFR is expected to improve the stability of banks (Hossain et al., 2018;

L’Huillier et al., 2018; Polizzi et al., 2020). Basel III has provided the following formula to calculate NSFR:

$$NSFR = \frac{\text{Available amount of stable funding (ASF)}}{\text{Required amount of stable funding (RSF)}}$$

The calculation criteria of ASF and RSF are provided in detail in the standard. The data required to calculate ASF and RSF is not publicly available. Hence, for this research, NSFR is calculated as per the format given by Vazquez and Federico, (2015). The calculation criterion for NSFR is provided in Table 3.1.

Table 3.1 Factors used for the calculation of NSFR

ASSETS	Wt. (%)	LIABILITIES + EQUITY	Wt. (%)
1. Total Earning Assets		1. Deposits and Short-term funding	
1.A Loans	100%	1.A Customer Deposits	85%
1.A.1 Total Customer Loans		1.A.2 Customer Deposits-Savings	70%
Mortgages		1.A.3 Customer Deposits-Term	70%
Other Mortgages Loans		1.B Deposits from Banks	0%
Other Consumer/Retail Loans		1.C Other Deposits and Short-term Borrowings	0%
Corporate and Commercial Loans			
Other loans		2. Other Interest-Bearing Liabilities	
1.A.2 Reserves for Impaired Loans / NPLs		2.A Derivatives	0%
1.B Other Earning Assets	35%	2.B Trading Liabilities	0%
1.B.1 Loans and Advances to Banks		2.C Long-Term Funding	100%
1.B.2 Derivatives		2.C.1 Total Long-Term Funding	100%
1.B.3 Other Securities		Senior Debt	
Trading Securities		Subordinated Borrowing	
Investment Securities		Other Funding	
1.B.4 Remaining Earning Assets		2.C.2 Preference Shares and Hybrid Capital	100%
2. Fixed Assets	100%		
3. Non-Earning Assets		3. Other (non-interest bearing)	100%

3.A Cash and Due from Banks	0%	4. Loan Loss Reserves	100%
3.B Goodwill	100%	5. Other Reserves	100%
3.C Other Intangibles	100%		
3.D Other Assets	100%	6. Equity	100%

Source: Vazquez and Federico, (2015)

3.3.1.3 Control Variables

The stability of a bank is influenced by numerous factors. The literature has described many variables that can affect the stability of banks. These variables can be divided into two categories that are bank-specific and industry-specific variables. The following sub-section will explain the control variables for the research.

3.3.1.2.3 Bank-Specific Variables

Size: The size of the bank has a significant impact on the structure of banking assets as well as on the risk-taking nature of banks (Schwerter, 2011). The bank size is measured by taking a natural log of assets. But negative or insignificant results have also been found between these variables. According to past research, large banks are expected to have more power or regulatory protection (too big-to-fail), hence are more stable. Therefore, a negative coefficient represents this phenomenon of too-big-to-fail (Ashraf et al., 2016; Schwerter, 2011). However, a positive coefficient of Size represents improved risk management, as well as easy access to external funds (Bilal et al., 2013; Distinguin et al., 2013; Zeitun, 2012)

Asset Quality (Lq1t) is measured by taking a ratio of non-performing loans to total loans (Ozili & Outa, 2017). It is one of the key issues to study to improve the financial health of banks (Mostak Ahamed, 2017). According to Ozili, (2015), a lower value of this ratio measure implies that the asset quality of a bank is better which will subsequently result in improving stability.

3.3.1.2.4 Country-Specific Variables

Gross Domestic Product Growth Rate (GDP): GDP is a measure of a country's economic health. It plays a vital role in the stability of a financial institution in a country. It is expected that GDP growth is directly linked to the stability of a bank. With the decrease in GDP growth stability of banks is also expected to decrease (Chiaramonte & Casu, 2017; Le, 2016). According to Tan and Floros, (2012), growth in GDP can reduce stability in banks as well because an increment in economic growth leads to an improved business environment that can result in lowering entry barriers for banks. Therefore, a negative impact of GDP growth on stability can also be expected (Hossain et al., 2018).

Concentration (Conc): Five-bank asset concentration is used as a proxy of control of asset concentration over the stability of banks. High asset concentration means low competition in the industry. According to Ashraf et al., (2016), Saif-Alyousfi et al., (2020) and Uhde and Heimeshoff, (2009) increase in competition in the banking sector can lead to greater risk-taking. A negative relationship has been highlighted between market concentration and stability (Ashraf et al., 2016; Ibrahim et al., 2019). Concentration in this research is calculated as a ratio of the sum of five large banks' assets to the total assets of the banking industry.

Table 3.2 Summary of Variables of Model 1 (Stability)

Variable	Definition	Measure	Expected Sign	Source
	Model 1: Dependent Variable (Stab)			
Stab	Stability of Bank	$\log \left[Z - Score = \frac{E(ROA) + CAR}{\sigma(ROA)} \right]$		
Variable	Definition	Measure	Expected Sign	Source
	Main Independent Variables			

NSFR	Net Stable Funding Ratio	$NSFR = \frac{ASF}{RSF}$ (For factors and weightings ASF and RSF refer to Table 3.1)	+ve	(Hossain et al., 2018; L'Huillier et al., 2018; Polizzi et al., 2020)
LCR	Liquidity Coverage Ratio	$LCR = \frac{Liquid\ assets}{Deposits + Short\ term\ funds}$	+ve	(Hossain et al., 2018; Polizzi et al., 2020)
Bank Specific Variables				
Size	Bank size	Log (TA)	+ve/ -ve	(Bilal et al., 2013; Distinguin et al., 2013; Zeitun, 2012), (Ashraf et al., 2016; Schwerter, 2011)
LqIt	Asset quality	Non-performing loans / gross loans	- ve	(Ozili, 2015; Velliscig et al., 2022)
Country Level Variables				
GDP	Gross domestic product growth proxy of the economic activity	Annual real GDP growth rate	+ve/ - ve	(Chiaromonte & Casu, 2017; Le, 2016) (Hossain et al., 2018)
Conc	Concentration	5-banks asset concentration $\frac{A_1 + A_2 + A_3 + A_4 + A_5}{Total\ Industry\ Assets}$ Where A_i = Total assets of Bank i	- ve	(Ashraf et al., 2016; Bhatti & Hussain, 2010; Uhde & Heimeshoff, 2009)

3.3.2 Model 2: Return on Asset (ROA)

3.3.2.1 Dependent Variable

Return on Assets (ROA) is a measure of profitability that is calculated by dividing the net income of the firm by its total assets. It shows how effectively the corporations are utilising their resources. It is an accounting measure of profitability. It has been used as a measure of financial profitability by previous researchers as well (Le et al., 2020; Papadamou et al., 2021; Said, 2018).

3.3.2.2 Independent Variables: Basel III Liquidity Ratios

The impact of the Basel III liquidity ratios i.e., LCR and NSFR on the ROA of banks has been studied in this research.

3.3.2.2.1 Liquidity Coverage Ratio (LCR)

The proxy of LCR has been discussed in a detailed manner in the previous section. Past literature shows that the higher the value of LCR higher the liquidity and profitability (Bibi & Mazhar, 2019).

The LCR will be calculated as follows:

$$LCR = \frac{\text{Liquid assets}}{\text{Deposits} + \text{Short term funding}}$$

3.3.2.2.2 Net Stable Funding Ratio (NSFR)

NSFR according to BIS, (2014) is a ratio of average stable funding to required stable funding. In this research, the NSFR is calculated as per Vazquez and Federico, (2015) calculation as explained in table 3.1.

According to the research conducted by Le et al., (2020) higher level of NSFR has a negative impact on the profit efficiency of banks. Their findings suggest that if too many liquid assets are being held at a commercial bank or there is too much reliance on excessive long-term funding, the bank must experience high funding costs or low investment income. Therefore, a negative impact of NSFR on ROA is expected.

3.3.2.3 Control Variables

In this research, Size, Cost, GDP and Concentration have been used as control variables for the ROA model. Below is the detail of the selected control variables.

3.3.2.2.1 Bank-Specific Variables

Size: The size of the bank is an important determinant of profitability that generally represents the economies of scale (Athanasoglou et al., 2008). The bank size is measured by taking a natural log of assets. Generally, large banks are expected to have more power or regulatory protection (too-big-to-fail), and hence, a positive relationship can be expected between profitability and bank size (Bilal et al., 2013; Said, 2018). Some researchers have argued that an increase in size can result in diseconomies of scale after a certain time, hence, negative results can also be found (Akhtar et al., 2011a; Kořak & Āok, 2008).

Cost is a key variable in evaluating profitability (Ayayi & Sene, 2010; Ghosh & Sanyal, 2019). It can be proxied as a ratio of non-interest expense to total assets (Ali et al., 2021; Ghosh & Sanyal, 2019; Supiyadi, 2021). It is also known as a non-interest cost to Asset ratio or NIE ratio. The non-interest expense mainly includes operating expenses and welfare funds. It has also been defined by some researchers as an indicator of efficiency (Almaqtari, Al-Homaidi, et al., 2019; Bourke, 1989; Petria et al., 2015). According to them, this ratio explains the efficiency of management in managing the expenses of the bank. A lower ratio means higher efficiency or management capability which will result in higher profitability. Hence, a negative relationship was found between this ratio and profitability, more specifically ROA. Nevertheless, according to Molyneux and Thornton, (1992), an inverse relationship can also exist between efficiency and profitability because profitability can be increased by spending more on human resources therefore, increase payroll expenses can also increase the profitability of banks. This statement has also been endorsed by other researchers as well (Al-Harbi, 2019; Athanasoglou et al., 2006).

3.3.2.2.2 Country-Specific Variables

Gross Domestic Product Growth Rate (GDP): This ratio represents the economic health of a country. Growth in GDP represents positive economic conditions that can improve profitability. But growth in GDP can reduce the ROA of banks as well because an increment in economic growth leads to an improved business environment that can

result in lowering entry barriers for banks. Therefore, it can be said that mixed results have been found in the literature regarding the relationship between GDP growth and ROA (Almaqtari, Al-Homaidi, et al., 2019; Said, 2018; Tan & Floros, 2012).

Concentration (Conc): Five-bank asset concentration is used as a proxy of control of asset concentration in the economy over the profitability of banks. A higher ratio of concentration means low competition. Concentration in this research is calculated as a ratio of the sum of five large banks' assets to the total assets of the banking industry. The rise in concentration has resulted in lower competition and higher profitability, which is in line with the structure conduct performance paradigm. This theory suggests that greater market power, which is fueled by growth and concentration, is the primary driver of profitability. Several studies, including those by Molyneux and Thornton (1992), Petria et al., (2015) and Yuanita, (2019) have also demonstrated a positive correlation between concentration and profitability. Therefore, we expect the same impact on commercial banks in Pakistan as well.

Table 3.3 Summary of Variables of Model 2 (ROA)

Variable	Definition	Measure	Source	
Dependent Variable (ROA)				
ROA	Return on Asset	$ROA = \text{Net income}/\text{total assets}$		
Variable	Definition	Measure	Expected Sign	Source
Main Independent Variables:				
NSFR	Net Stable Funding Ratio	$NSFR = \frac{ASF}{RSF}$ (For factors and weightings ASF and RSF refer to Table 3.1)	-ve	(Le et al., 2020)
LCR	Liquidity Coverage Ratio	$LCR = \frac{\text{Liquid assets}}{\text{Deposits} + \text{Short term fu}}$	+ve	(Bibi & Mazhar, 2019)

Bank Specific Variables				
Size	Bank size	Log (TA)	+ve	(Adesina, 2021; Said, 2018; Sufian, 2009)
Cost	Operational efficiency	Non-interest expense / Total asset	-ve	(Al-Harbi, 2019; Athanasoglou et al., 2006)
Country Level Variables				
GDP	Gross Domestic Product	Annual GDP growth rate	+ve/- ve	(Abdilahi & Davis, 2022; Al-Homaidi et al., 2017; Almaqtari, Al-Homaidi, et al., 2019)
CONC	Concentration	$\frac{A_1 + A_2 + A_3 + A_4 + A_5}{Total\ Industry\ Assets}$ Where A_i = Total assets of Bank i	+ ve	Petria et al., (2015) and Yuanita, (2019)

3.3.3 Model 3: Cost of Intermediation

3.3.3.1 Dependent Variable

The cost of intermediation is defined as the difference between the income earned on loans and advances and the cost paid to banks' depositors. It is proxied as the Net interest margin (NIM) ratio. It is a crucial factor to consider in terms of managing risk and improving efficiency, especially in developing countries (Al-Jarrah, 2010). It has been used as a reliable measure of the cost of intermediation profitability of banks in previous studies as well (Afrin et al., 2022; A. Das Gupta et al., 2021; Jarmuzek & Lybek, 2020). Interest represents the main earning source for conventional banks. A high NIM can arise from low deposit interest rates and high loan interest rates. Islamic banking is a riba-free banking and therefore none of the contracts of an Islamic bank contains any element of interest. Islamic banks give profits to the depositors that is earned through various partnership, or sale or lease-based financing contracts. Therefore, the term interest margin cannot be used as it contradicts the basic philosophy of Islamic banking. The focus of this research is Islamic banks and conventional banks in Pakistan. Hence,

for conventional banks, the term, net interest margin (NIM) has been used and for Islamic banks Net Profit Margin (NPM) has been used.

For conventional banks, NIM is calculated as:

$$\text{Net Interest Margin (NIM)} = \frac{\text{Interest income} - \text{Interest expense}}{\text{Total Assets}}$$

For Islamic banks NPM is calculated as:

$$\begin{aligned} \text{Net Profit Margin (NPM)} \\ = \frac{\text{Markup earned on financing} - \text{Markup expensed on deposits}}{\text{Total Assets}} \end{aligned}$$

3.3.3.2 Independent Variables: Basel III Liquidity Ratios

The impact of the Basel III liquidity ratios i.e., LCR and NSFR on Net interest income (for conventional banks) and net profit margin (for Islamic banks) has been studied in this research.

3.3.3.2.1 Liquidity Coverage Ratio (LCR)

The proxy of LCR has been discussed in a detailed manner in the previous section. According to Sidhu et al., (2022), LCR has an inverse relationship with NIM, because the cost of holding high liquidity is higher than the relative interest earned. Therefore, an inverse relationship of LCR with NIM is expected in this research.

The LCR will be calculated as follows:

$$\text{LCR} = \frac{\text{Liquid assets}}{\text{Deposits} + \text{Short term funding}}$$

3.3.3.2.2 Net Stable Funding Ratio (NSFR)

NSFR according to BIS, (2014) is a ratio of average stable funding to required stable funding. In this research, the NSFR is calculated as per Vazquez and Federico, (2015) calculation as explained in Table 3.1.

Sidhu, et al., (2022) identified a negative relationship between NSFR and net interest margin. According to Pak, (2020), NSFR implementation would lead to maturity mismatch and lower spread (loans) therefore, it would lead to a decrease in the net interest margins of banks. According to King, (2013), the adoption of NSFR, which promotes holding more high-quality assets and fewer illiquid assets, is likely to result in a decrease in interest income and a subsequent decline in NIM.

But according to Said, (2018) increase in NSFR results in a better liquidity position for the bank that will ultimately have a positive impact on NIM. This is because, with the implementation of NSFR, it is anticipated that banks will partially divest from investing in lower- to medium-quality assets that offer high returns and instead invest in high-quality assets that offer lower returns, leading to a reduction in their interest margin. The level of a bank's NSFR is directly related to the amount of lower- to medium-quality assets it holds, with a higher NSFR resulting in lower interest margins. Therefore, there is an expected negative correlation between NSFR and NIM. While all banks are required to comply with the 100% NSFR threshold, there may be instances when they are unable to meet this requirement. A bank that lacks the necessary liquidity may become insolvent or fail. Consequently, a higher value of NSFR implies greater liquidity, which is linked to lower intermediation costs for banks. Hence, a positive correlation is expected between NSFR and NIM.

3.3.3.3 Control Variables

Control variables for the net interest income model for conventional banks or net profit margin for Islamic banks are size, cost, GDP and Inflation. A detail of these selected control variables is provided in the sub-section below.

3.3.3.2.1 Bank-Specific Variables

Size is measured by taking a ratio of equity and total assets. According to Golin and Delhaise, (2013), it is a basic measure of evaluating the capital strength of a bank. It has been widely used by practitioners to assess the status of the financial power of a bank. It is considered to be a significant factor affecting the cost of intermediation of banks (Khan & Jalil, 2020; Rahman et al., 2021). Larger banks often benefit from economies of scale in their operations, which can allow them to offer loans at a lower margin than smaller banks. At the same time, larger banks may also have greater market power, which can allow them to charge higher margins on loans compared to smaller competitors (Naceur & Kandil, 2009). A negative impact of bank size is expected with the cost of intermediation on banks in Pakistan (Ebrahimi et al., 2021; Khan & Jalil, 2020; Rahman et al., 2021).

Cost is a key variable in evaluating profitability (Ayayi & Sene, 2010; Ghosh & Sanyal, 2019). It can be proxied as a ratio of non-interest expense to total assets (Ali et al., 2021; Ghosh & Sanyal, 2019; Supiyadi, 2021). It is also known as a non-interest cost to Asset ratio or NIE ratio. The non-interest expense mainly includes operating expenses and welfare funds. It has also been defined by some researchers as an indicator of efficiency (Almaqtari, Al-Homaidi, et al., 2019; Bourke, 1989; Petria et al., 2015).

According to Khan and Jalil, (2020), cost is the most significant factor in deriving NIM in the banking sector of Pakistan. A positive impact of cost on NIM is expected as intermediation cost increases with the increase in operating cost (Doyran, 2013; Khan & Jalil, 2020).

3.3.3.2.2 Country-Specific Variables

Gross Domestic Product Growth Rate (GDP): This ratio represents the economic health of a country. The impact of economic growth on bank margins remains a subject of debate and there is no agreement on the matter. One hypothesis, known as the “Intertemporal risk smoothing hypothesis” (F. Allen & Gale, 1997), suggests that banks tend to stabilize deposit rates during economic downturns and then raise loan rates

during upturns as a means of compensation. This suggests that economic growth could lead to higher bank margins, as proposed by Claessens et al., (2001). Thus, it can be said that growth in GDP represents positive economic conditions for the country, and it can reduce the cost of intermediation that is reflected via an increase in NIM or NPM. However, Valverde and Fernández, (2007) offer a different perspective, as they found evidence of a negative correlation between economic growth and interest margins. Increment in economic growth leads to an improved business environment that can result in lowering entry barriers for banks, which ultimately can influence banks to reduce their interest income to remain competitive.

Therefore, it can be said that mixed results have been found in the literature regarding the relationship between GDP growth and NIM (Almaqtari, Al-Homaidi, et al., 2019; Said, 2018; Tan & Floros, 2012)

Inflation (Inf) is considered another macroeconomic variable for this research. Literature has provided mixed results for the impact of inflation on NIM. Higher inflation is viewed as a sign of macroeconomic instability and information asymmetries, and this appears to have a pronounced impact on interest margins, as they tend to increase along with inflation (Dwumfour, 2019). But an increase in inflation could also mean an increase in operating cost that can decrease NIM. If banks remain unable to forecast inflation the cost of banks increases which leads to a decline in NIM (Ebrahimi et al., 2021). Khan and Jalil, (2020) in their research also found a negative impact of inflation on NIM in Pakistan. Therefore, mixed results have been found in previous literature on the direction of the impact of inflation on intermediation costs.

Table 3.4 Summary of Variables of Model 3 (NIM / NPM)

Variable	Definition	Measure	Source	
	Model 1: Dependent Variable (NIM/NPM)			
NIM / NPM	Net Interest Income (for CBs) Net Profit Margin (for IBs)	$NIM = \frac{Interest\ income - Interest\ expense}{Total\ Assets}$ $NPM = \frac{Markup\ earned - Markup\ expense}{Total\ Assets}$		
Variable	Definition	Measure	Expected Sign	Source
	Main Independent Variables:			
NSFR	Net Stable Funding Ratio	$NSFR = \frac{ASF}{RSF}$ (For factors and weightings ASF and RSF refer to Table 3.1)	+ve / -ve	(Said, 2018; Sidhu, et al., 2022)
LCR	Liquidity Coverage Ratio	$LCR = \frac{Liquid\ assets}{Deposits + Short\ term\ fundi}$	-ve	(Sidhu et al., 2022)
	Bank Specific Variables			
Size	Bank size	Log (Total Assets)	-ve	(Ebrahimi et al., 2021; Khan & Jalil, 2020; Rahman et al., 2021)
Cost	Operating Efficiency	$Cost = \frac{Non - interest\ Expense}{Total\ Assets}$	+ ve	(Doyran, 2013; Khan & Jalil, 2020; Rahman et al., 2021)
	Country Level Variables			
GDP	Gross Domestic Product	Annual GDP growth rate	+ve/- ve	(Said, 2018; Tan & Floros, 2012; Valverde & Fernández, 2007)
Inf	Inflation	The annual inflation rate, consumer price index	-ve	(Dwumfour, 2019; Ebrahimi et al., 2021; Farooq et al., 2021; Khan & Jalil, 2020)

3.4 EMPIRICAL MODELS

Econometric models are developed based on the variable constructs supported by prior studies for the study of conventional banks below:

$$\text{Stab (CB)}_{it} = \beta_0 + \beta_1\text{NSFR}_{it} + \beta_2\text{LCR}_{it} + \beta_3\text{Size}_{it} + \beta_4\text{LqIt}_{it} + \beta_5\text{GDP}_{it} + \beta_6\text{Conc}_{it} + \varepsilon_i$$

$$\text{ROA(CB)}_{it} = \beta_0 + \beta_1\text{NSFR}_{it} + \beta_2\text{LCR}_{it} + \beta_3\text{Size}_{it} + \beta_4\text{Cost}_{it} + \beta_5\text{GDP}_{it} + \beta_6\text{Conc}_{it} + \varepsilon_i$$

$$\text{NIM}_{it} = \beta_0 + \beta_1\text{NSFR}_{it} + \beta_2\text{LCR}_{it} + \beta_3\text{Size}_{it} + \beta_4\text{Cost}_{it} + \beta_5\text{GDP}_{it} + \beta_6\text{Inf}_{it} + \varepsilon_i$$

Econometric models for the study are developed based on the variable constructs supported by prior studies of Islamic banks below:

$$\text{Stab (IB)}_{it} = \beta_0 + \beta_1\text{NSFR}_{it} + \beta_2\text{LCR}_{it} + \beta_3\text{Size}_{it} + \beta_4\text{LqIt}_{it} + \beta_5\text{GDP}_{it} + \beta_6\text{Conc}_{it} + \varepsilon_i$$

$$\text{ROA (IB)}_{it} = \beta_0 + \beta_1\text{NSFR}_{it} + \beta_2\text{LCR}_{it} + \beta_3\text{Size}_{it} + \beta_4\text{Cost}_{it} + \beta_5\text{GDP}_{it} + \beta_6\text{Conc}_{it} + \varepsilon_i$$

$$\text{NPM}_{it} = \beta_0 + \beta_1\text{NSFR}_{it} + \beta_2\text{LCR}_{it} + \beta_3\text{Size}_{it} + \beta_4\text{Cost}_{it} + \beta_5\text{GDP}_{it} + \beta_6\text{Inf}_{it} + \varepsilon_i$$

3.5 ESTIMATION TECHNIQUES FOR CONVENTIONAL BANKS

After fulfilling the requirements for regression analysis, this study employs panel data analysis to estimate various regression models, as it examines the cause-and-effect relationship. According to Baltagi, (2005), panel data is more detailed, flexible, and effective than other data types. Hsiao, (2014) also states that panel data can control heterogeneity in values. This thesis utilizes panel data models including pooled OLS, random effect, and fixed effect models to investigate the association between the variables under study. The selection between pooled OLS model and the fixed or random effect model for the estimation technique is based on the Breusch-Pagan Lagrange Multiplier (LM) test. In addition, the Hausman test is employed to determine the choice of fixed or random effect model. Furthermore, Stata statistical software is utilized for data analysis. The additional details and justification for employing the estimation methodologies will be covered in more detail in the following section.

3.5.2 Descriptive Statistics

Descriptive statistics are used to transform research data into an easily readable and understandable style. (Zikmund et al., 2013) asserts that it is the initial form of analysis. According to Quartey, (2003), descriptive statistics are crucial to any statistical analysis because they can help identify any irregularities in the dataset. Also, descriptive statistics can be particularly helpful in presenting unique yet desirable data qualities.

3.5.3 Multicollinearity Tests

One of the basic assumptions of the linear regression model is the absence of multicollinearity among the explanatory variables. Multicollinearity means high correlation. Hence, if a researcher is using the linear regression model it is required to make sure that none of the independent variables have a high correlation with one another. The Pearson correlation and the variance inflation factor (VIF) are employed to test this issue.

3.5.3.2 Correlation matrix

The relationship between variables is measured by Pearson's coefficient. The correlation coefficient is a measure of how much variance there is between two variables (Wester et al., 2013). If the coefficient of correlation's value is closest to -1 or +1, it indicates that the relationship between the variables is significantly negative or positive, respectively (Bishara & Hittner, 2012). If there is no correlation between the variables, the coefficient is zero (Wisdom et al., 2012). According to Gujarati, (2003) if the correlation coefficient is greater than 0.8 there exists multicollinearity among the variables. The correlation matrix is used as a tool to determine whether the regression equation contains multicollinearity.

3.5.3.3 Variance Inflation Factor (VIF) Test

Another test that is used to determine whether there is multicollinearity is called the Variance Inflation Factor (VIF). If the VIF value for independent variables is greater than or equal to 10, it implies a high level of multicollinearity (D. N. Gujarati, 2003).

3.5.4 Panel Data Analysis

This research study uses panel data analysis to examine the relationship between dependent variables and independent and mediating variables. Panel data analysis takes into account entities like countries and companies that may vary across time, and includes both time and cross-sectional dimensions in its regression analysis. Using only time series or cross-sectional analyses without accounting for variability can lead to misleading results. Panel data analysis is more detailed, flexible, and effective and can control for heterogeneity in values (Baltagi, 2005; Hsiao, 2014). Panel data can also produce efficient estimators even in the presence of misplaced values (Wooldridge, 2003). However, using panel data can present challenges with research design, data gathering, processing, and estimation (Song & Lee, 2012). This study uses a balanced panel data approach to ensure an equal number of observations for each unit. Pooled OLS, random effect, and fixed effect models are applied to investigate the association between study variables, based on their constant, fixed, or random sectional effects. Model selection is not random, but rather involves assessing each model and employing essential tests before choosing the appropriate one. Each of the three models will be discussed in detail.

3.5.4.2 Pooled OLS

If there are no significant individual or time effects in panel data, the Pooled OLS regression model will be used to provide reliable and well-organized estimates of the homogenous intercept and slope. This model is advantageous because it offers an easy way to estimate and interpret results. However, (Baum, 2006) noted that the Pooled OLS model may encounter complex issues like autocorrelation and heteroscedasticity

in panel units. To select the appropriate model, this study will employ two diagnostic tests. First, the Breusch-Pagan Lagrange Multiplier (LM) test will be used when choosing the Pooled OLS model. Second, the Hausman specification test will be performed to determine whether the fixed or random effect model is more suitable.

3.5.4.3 Fixed Effect Model (FEM)

The Fixed Effects model (FEM) slope coefficient is kept constant for all companies while allowing for variation in the intercepts. As noted by (Greene, 2003), variables can be accommodated in the constant term through the construction of FEM. Baltagi, (2005) also confirmed that the FEM is appropriate when the emphasis is on a specific set of (N) companies or regions. FEM also removes the assumption that the effects are not influenced by the error term. However, the FEM has limitations as its estimator cannot determine the impact of any time-invariant variable such as location. Additionally, excessive use of dummy variables can increase the problem of multicollinearity among the regressors.

3.5.4.4 Random Effect Model (REM)

When it is assumed that the fixed effect circulates arbitrarily among firms in panel data, the random effect regression model is quite effective. Compared to Fixed Effects (FE) estimators, Random Effects (RE) estimators are more creative. If (N) cross-sectional units of the vast population are uniformly drained, the random effects model is acceptable. Similar to this, the main drawback of the random effect paradigm is its reliance on complex assumptions regarding the direction of interaction between the outcomes and the descriptive variables (Hsiao, 2014).

3.5.5 Diagnostic Tests

3.5.5.2 Data Stationarity Test

It is important to check the stationarity of data. For this purpose, a unit-root test is performed. The null hypothesis is that data is not stationary. Hence the rejection of the null hypothesis means the variable is static at a normal level. If that is not the case researcher is required to make data stationary by taking the first or second difference. Various unit root tests are available. The researcher here has used Im-Pesaran-Shin unit-root test to check the stationarity.

3.5.5.3 Wooldridge Test for Autocorrelation

The issue of serial correlation should also be taken into account. Its existence demonstrates that the regression assumptions are broken by the models (Anderson et al., 2007). The Wooldridge test is used to determine whether there is a serial or autocorrelation. This test aids in identifying panel data's autocorrelation. Autocorrelation happens when there is a covariance between error terms. The null hypothesis for this test is no autocorrelation exists in panel data. Hence, acceptance of the null hypothesis means no autocorrelation exists in the data. If the null hypothesis is rejected, then we need a robust approach for our data.

3.5.5.4 Modified Wald test for GroupWise Heteroscedasticity

If Hausman tests give evidence of using the fixed effect model another preliminary test can be performed that is the modified Wald test for groupwise heteroscedasticity. The modified Wald test developed by Greene, (2003) was applied to detect variance between groups in fixed-effect models. For panel data, the modified Wald test as a group-wise heteroscedasticity test is used to estimate the process of errors within cross-section units that may be homoscedastic (Baum, 2001). The null hypothesis of the modified Wald test for groupwise heteroscedasticity is “*no GroupWise heteroscedasticity*”. The

relevance of the Wald statistics suggests that there is a heteroscedasticity issue that could have an impact on the estimates' standard errors. Regression estimation is therefore invalid when heteroscedasticity is present. Since it uses cross-sectional data, the test is a heteroscedastic test and therefore robust technique is needed.

3.5.5.5 Test of Cross-Sectional Dependence

This study is using panel data as an econometric approach because the data includes many banks and years. Results from panel data analysis could be biased if cross-sectional dependence (CD) across series is not taken into consideration and it can lead to inaccurate conclusions (Chudik et al., 2011; Pesaran, 2021). Several factors, including spatial spill-over effects, common unobservable shocks, social interaction, or a mix of all of these, may contribute to the CD of the series in the panel (Breitung & Pesaran, 2008). It is also a deciding element between panel unit root tests and co-integration tests. Selection of a suitable estimator in estimating the size of the long-term effect when co-integration is also discovered between variables relies on whether the data exhibit CD or not. Hence, to get precise results, the analysis must begin by looking into the CD. It can be examined through Lagrange Multiplier (LM) (Breusch & Pagan, 1980) and Cross-Section Dependence (CD) (Pesaran, 2021) tests. When the panel's time dimension (T) is larger than its cross-section dimension (N), the LM test is applied, and when both dimensions are significant, the CD test is applied. The null hypothesis is “no cross-sectional dependence”. Hence, if the null hypothesis is rejected it means CD is present, hence, a simple multiple regression / pooled OLS model will not be a suitable technique.

3.5.5.6 Modified Wald test for GroupWise Heteroscedasticity

If Hausman tests give evidence of using the fixed effect model another preliminary test can be performed which is a modified Wald test for groupwise heteroscedasticity. The modified Wald test developed by Greene, (2003) was applied to detect variance between groups in fixed-effect models. For panel data, the modified Wald test as a group-wise heteroscedasticity test is used to estimate the process of errors within cross-section units

that may be homoscedastic (Baum, 2001). The null hypothesis of the modified Wald test for groupwise heteroscedasticity is “no GroupWise heteroscedasticity”. The relevance of the Wald statistics suggests that there is a heteroscedasticity issue that could have an impact on the estimates' standard errors. Regression estimation is therefore invalid when heteroscedasticity is present. Because it uses cross-sectional data, the test is a heteroscedastic test and therefore robust technique is needed.

3.5.5.7 Durbin-Wu-Hausman Test for Endogeneity

For many fields of business and management research that rely on regression analysis to derive causal inferences, endogeneity is a significant methodological challenge. It can be broadly defined in regression as a situation when an explanatory variable is correlated with the error term (Roberts & Whited, 2013). According to Abdallah et al., (2015), the absence of explanatory variables in the regression may lead to endogeneity, which would violate a fundamental assumption of ordinary least squares (OLS) regression analysis by causing the error term to be linked with the explanatory variables. Endogeneity could also arise if the dependent variable is influenced by one or more independent variables, consequently, these independent variables are influenced by the dependent variable. Such endogeneity can take the form of simultaneous endogeneity, whereby concurrent realizations of the dependent variable and the relevant independent variables influence one another. Lastly, if there is an impact of the lagged dependent variable on present independent variables, dynamic endogeneity is present. Durbin Wu-Hausman's (1978) test can be used to test if stability, profitability or intermediation cost variables are endogenous.

3.6 ROBUST DATA ANALYSIS TECHNIQUES FOR CONVENTIONAL BANKS

3.6.2 Generalized Method of Moments (GMM)

For the estimation of dynamic panel data generalized method of moments (GMM) is a preferred method of estimation. According to (Arellano & Bonds, 1991), it provides reliable coefficients of variables. The usefulness of GMM is especially high when $N > T$ i.e. the number of years are greater than the number of groups, and when variables are endogenous i.e. correlation of the current variable is high with its past value and when the independent variable correlates with the error term in a regression model, leading to biased coefficients in OLS regression and spurious regression. GMM is also a feasible technique when data contains heterogeneity, heteroscedasticity and autocorrelation issues. In comparison to Ordinary Least Square (OLS) method, reliable and unbiased estimations are provided by GMM.

To check the robustness of the effect of Basel liquidity regulations on stability, profitability, and the cost of intermediation, we use the two-step difference Generalized Method of Moments (GMM). The dependent variables in our models are dynamic in nature, meaning their last year's value influences the current year's value. Additionally, difference GMM manages measurement errors and bias from omitted variables because it is difficult to account for all aspects in models. Two tests are reported by difference GMM for the overall validity of the employed instruments: the Hansen (1982) test and the Sargan (1985) test. Both tests' null hypothesis is that overidentifying constraints are legitimate. If the p-value of Hansen's test is greater than 0.05, it means that the null hypothesis is rejected and hence, the choice of instrument is supported. The J test is more robust than the Sargan test, ensuring the validity of the instruments. Arellano-Bond (1991) has also contributed to the development of a test for autocorrelation of the error term for panel data that is appropriate for linear GMM regressions. When lags are used as instruments, this test becomes essential. The original error term is serially uncorrelated and the moment requirements are correctly stated if the Arellano-Bond AR(2) test returns an insignificant p-value (i.e., greater than 0.05).

Difference GMM is the best suitable approach to estimate the stated models to maintain sample size, and eliminate endogeneity, and unobservable panel heterogeneity because the data used to estimate the models is a balanced panel. Businesses come in a variety of shapes and sizes, and these variations might affect a company's stability, profitability, or intermediation costs.

3.6.3 Driscoll Kraay's Covariance Matrix Estimator

The robustness of the results is also evaluated by Driscoll Kraay's covariance matrix estimator commonly known as DK estimator. This approach was introduced by Driscoll and Kraay, (1998) for both balanced and unbalanced panel data. It also produces reliable findings by solving cross-sectional dependency, heteroscedasticity, serial correlation, and other challenges in estimating panel data. DK estimator is considered to be one of the best techniques that produce strongly robust regression results in comparison to general forms of spatial and temporal dependence (Hoechle, 2007; Ozokcu & Ozdemir, 2017; Sarkodie & Strezov, 2019). It applies the Newey-West type correction to the cross-sectional average of the moment conditions in a sequence, which produces reliable robust estimates both for short and long panels (Orji et al., 2022). It is also considered to be a superior estimator in comparison to other conventional robust estimators for heteroscedasticity like FGLS and PCSE (Orji et al., 2022).

3.7 ESTIMATION TECHNIQUES FOR ISLAMIC BANKS

The data for Islamic banks is macro panel data as time (T) is greater than the number of firms (N). the data is also balanced panel data because the number of observations is equal for all cross-sectional units in the data. In this research Autoregressive-distributed lag (ARDL) model is applied for analysis. The model is presented by Pesaran et al., (2001). ARDL model is preferred over other approaches because it does not require the same sequence of cointegration in all models. Hence, variation in integration levels is allowed as far as integration is either I(0) or I(1) (Pesaran et al., 2001). ARDL is the appropriate method for this study due to the small size of the observations and multiple orders of integration of the study variables. It is a flexible and attractive method because

it has the tolerance of different lags in different variables. ARDL can only be applied if the data is stationary at the level or first difference (Pesaran et al., 2001). Also, it gives valid t-statistics and unbiased estimates despite the presence of endogeneity in some regressors (Jalil & Ma, 2008). The endogeneity issue is resolved in ARDL by removing residual correlation with fitting lag selection (Ali et al., 2016). The error correction method allows for the integration of the short-run modifications with the long-run equilibrium (ECM). Without losing any information about the long-term horizon, this is accomplished through a linear transformation (Ali et al., 2017). Another feature is that the methodology distinguishes between dependent and independent variables and permits outlier correction with impulse dummies (Marques et al., 2017, 2019).

Lastly, the ARDL model only requires a single-form equation (Bayer & Hanck, 2013), whereas other models need a system of equations. This makes the interpretation and implementation of the ARDL extremely simple (Rahman & Kashem, 2017). For small samples, this model is more reliable than Johansen and Juselius' cointegration method (Haug, 2002).

Three different estimators were used to run the ARDL panel dynamic heterogeneous regression model. The pooled mean group (PMG) estimators were established and described by Pesaran et al. (1999), the dynamic fixed-effects estimator (DFE), and the mean group (MG) as developed by Pesaran and Smith (1995). Maximum likelihood is used to generate all three estimators, which take into account the long-run equilibrium and the heterogeneity of the dynamic adjustment process (Ahmed, 2020; Samargandi et al., 2015). The MG estimator often produces consistent parameter estimates for cross sections with "high N and T." In contrast, the "PMG estimator" provides more reliable estimates; assuming the homogeneity assumption is still true, PMG is better suited for consistency and effectiveness.

Additionally, according to Ahmed, (2020), the MG estimator applies no cross-section homogeneity restriction on all relevant parameters. These parameters include intercept term variances of error, slopes of long-run and short-run "under the MG estimator, all relevant parameters It entails "estimating N time-series regressions" and then figuring out the unweighted averages of the bank-specific coefficients. On the other hand, PMG combines averaging and coefficient pooling. It limits the coefficients of a

long-run slope to cross-sectional homogeneity, unlike MG. The Dynamic Fixed Effect (DFE) estimator and the PMG estimate are extremely similar. DFE constrains the slope coefficients and variance in error to be the same in the long run across all individuals. It also generates intercepts that are country specific. However, in the event of a small sample size, because of the presence of endogeneity between the lagged dependent variable and the error term, there might be a presence of simultaneous equation bias in the DFE estimator (Samargandi et al., 2015). The DFE model additionally caps the short-run coefficient and speed of adjustment coefficient at -2.

The Hausman test approach is used to determine if the long-run coefficient estimates of MG and PMG differ significantly from one another, which is the null hypothesis (Hausman, 1978). The "homogeneity assumption" would be rejected if the Hausman test fails to reject the null hypothesis, in which case the PMG estimator would be chosen instead of the MG. Hausman test is again applied to test if estimates of DFE and PMG differ significantly from each other. Rejection of the null hypothesis means the PMG estimator would be chosen over DFE.

3.7.1 Justification for Using the ARDL Model:

Following are the justifications for using the ARDL model for the analysis of Islamic banks:

- i. **Flexibility in Handling Mixed Integration Orders:** The ARDL model is capable of handling variables that are integrated at different orders, making it suitable for our dataset, which includes variables that are not uniformly integrated. This flexibility is crucial for accurately analyzing the impact of NSFR and LCR on Islamic bank performance.
- ii. **Comprehensive Analysis of Dynamic Relationships:** The ARDL model captures both short-run dynamics and long-run relationships between dependent variables (e.g., stability, profitability, intermediation cost) and independent variables (NSFR, LCR). This dual capacity allows us to understand both the immediate and sustained effects of regulatory requirements, providing a holistic view of their impact on bank performance.

- iii. Addressing Endogeneity and Small Sample Size: Given the relatively small sample size of Islamic banks in Pakistan, the ARDL model is particularly appropriate as it provides unbiased estimates even in the presence of endogeneity among regressors. This robustness ensures accurate and reliable results for our study.
- iv. Policy Implications and Practical Relevance: The ARDL approach enables us to offer insights into how Islamic banks adjust to changes in NSFR and LCR in both the short and long term. This understanding is essential for policymakers and bank managers to navigate regulatory compliance while maintaining performance. The ability to distinguish between short-run adjustments and long-run equilibrium states directly informs strategic decision-making and policy formulation.
- v. Estimation of Impact Beyond Co-integration: While co-integration tests are part of the ARDL methodology to ensure the validity of long-term relationships, the primary focus remains on estimating the impact of NSFR and LCR on bank performance. The ARDL model's error correction representation quantifies how deviations from long-term equilibrium are corrected in subsequent periods, providing a detailed view of the regulatory impact.

3.7.2 Model Specification

The model is specified as follows:

$$\begin{aligned} \Delta Stab_t &= \pi_0 + \sum_{i=1}^{p1} \vartheta_{1i} \Delta Stab_{t-i} + \sum_{i=0}^{p2} \vartheta_{2i} \Delta NSFR_{t-i} + \sum_{i=0}^{p3} \vartheta_{3i} \Delta LCR_{t-i} + \\ &\sum_{i=0}^{p4} \vartheta_{4i} \Delta Size_{t-i} + \sum_{i=0}^{p5} \vartheta_{5i} \Delta Lqlt_{t-i} + \sum_{i=0}^{p6} \vartheta_{6i} \Delta GDP_{t-i} + \sum_{i=0}^{p7} \vartheta_{7i} \Delta Conc_{t-i} + \\ &\beta_1 Stab_{t-1} + \beta_2 NSFR_{t-1} + \beta_3 LCR_{t-1} + \beta_4 Size_{t-1} + \beta_5 Lqlt_{t-1} + \beta_6 GDP_{t-1} + \\ &\beta_7 Conc_{t-1} + \varepsilon_t \\ \Delta ROA_t &= \pi_0 + \sum_{i=1}^p \vartheta_{1i} \Delta ROA_{t-i} + \sum_{i=0}^p \vartheta_{2i} \Delta NSFR_{t-i} + \sum_{i=0}^p \vartheta_{3i} \Delta LCR_{t-i} + \\ &\sum_{i=0}^p \vartheta_{4i} \Delta Size_{t-i} + \sum_{i=0}^p \vartheta_{5i} \Delta Cost_{t-i} + \sum_{i=0}^p \vartheta_{6i} \Delta GDP_{t-i} + \sum_{i=0}^p \vartheta_{7i} \Delta Conc_{t-i} + \\ &\beta_1 ROA_{t-1} + \beta_2 NSFR_{t-1} + \beta_3 LCR_{t-1} + \beta_4 Size_{t-1} + \beta_5 Cost_{t-1} + \beta_6 GDP_{t-1} + \\ &\beta_7 Conc_{t-1} + \varepsilon_t \end{aligned}$$

$$\begin{aligned} \Delta NPM_t = & \pi_0 + \sum_{i=1}^p \vartheta_{1i} \Delta NPM_{t-i} + \sum_{i=0}^p \vartheta_{2i} \Delta NSFR_{t-i} + \sum_{i=0}^p \vartheta_{3i} \Delta LCR_{t-i} + \\ & \sum_{i=0}^p \vartheta_{4i} \Delta CA_{t-i} + \sum_{i=0}^p \vartheta_{5i} \Delta LqLt_{t-i} + \sum_{i=0}^p \vartheta_{6i} \Delta Inf_{t-i} + \sum_{i=0}^p \vartheta_{7i} \Delta Conc_{t-i} + \\ & \beta_1 NPM_{t-1} + \beta_2 NSFR_{t-1} + \beta_3 LCR_{t-1} + \beta_4 Size_{t-1} + \beta_5 Cost_{t-1} + \beta_6 GDP_{t-1} + \\ & \beta_7 Inf_{t-1} + \varepsilon_t \end{aligned}$$

Here, p_i stands for the optimal lag count for the ARDL model, ε_t stands for noise Δ represents the first difference. The implementation of ARDL involves a three-step process, as outlined by (Menegaki, 2019). Firstly, the stationarity of the data needs to be checked. Secondly, the existence of cointegration is determined using Kao residual test for cointegration. Lastly, the direction of causality is examined.

To investigate cointegration among the variables of interest, the order of integration is assessed using unit root analysis. The Im Pesaran Shin (IPS) unit root test is used to check for stationarity in the data. It is important to note that mixed integrated time series must be present to utilize ARDL. The panel cointegration test was used in the study to look at the long-term relationships between the model's variables. This test helps in explaining how fixed effects are heterogeneous across the different panel members and how long-run and short-run relationships exist simultaneously. Cointegration in the model is analysed by using the Kao residual cointegration test developed by Kao, (1999). Appropriate lag selection is based on the Akaike information criterion (AIC) (Akaike, 1974).

The null hypothesis of the Kao test for cointegration is “no cointegration” which can be statistically represented as $H_0: \beta_1=\beta_2=\beta_3=\beta_4=\beta_5=\beta_6=\beta_7=0$. When the null hypothesis is rejected, it means there is a presence of cointegration among the variables of the study. Therefore, the following long-run model will be estimated:

$$\begin{aligned} Stab_t = & \pi_0 + \sum_{i=1}^{p1} \gamma_{1i} Stab_{t-i} + \sum_{i=0}^{p2} \gamma_{2i} NSFR_{t-i} + \sum_{i=0}^{p3} \gamma_{3i} LCR_{t-i} + \\ & \sum_{i=0}^{p4} \gamma_{4i} Size_{t-i} + \sum_{i=0}^{p5} \gamma_{5i} LqLt_{t-i} + \sum_{i=0}^{p6} \gamma_{6i} GDP_{t-i} + \sum_{i=0}^{p7} \gamma_{7i} Conc_{t-i} + \mu_t \\ SROA_t = & \pi_0 + \sum_{i=1}^{p1} \gamma_{1i} ROA_{t-i} + \sum_{i=0}^{p2} \gamma_{2i} NSFR_{t-i} + \sum_{i=0}^{p3} \gamma_{3i} LCR_{t-i} + \\ & \sum_{i=0}^{p4} \gamma_{4i} Size_{t-i} + \sum_{i=0}^{p5} \gamma_{5i} Cost_{t-i} + \sum_{i=0}^{p6} \gamma_{6i} GDP_{t-i} + \sum_{i=0}^{p7} \gamma_{7i} Conc_{t-i} + \mu_t \end{aligned}$$

$$sNPM_t = \pi_0 + \sum_{i=1}^{p1} \gamma_{1i} NPM_{t-i} + \sum_{i=0}^{p2} \gamma_{2i} NSFR_{t-i} + \sum_{i=0}^{p3} \gamma_{3i} LCR_{t-i} + \sum_{i=0}^{p4} \gamma_{4i} Size_{t-i} + \sum_{i=0}^{p5} \gamma_{5i} Cost_{t-i} + \sum_{i=0}^{p6} \gamma_{6i} GDP_{t-i} + \sum_{i=0}^{p7} \gamma_{7i} Inf_{t-i} + \mu_t$$

where μ_t is the error term. The error correction model is used, in the manner of Engle and Granger, (1987) and Narayan, (2005), to identify the dynamic short-term relationship between dependent and independent variables. The following ECM model will be used to extract the short-term dynamics of ARDL:

$$\begin{aligned} \Delta Stab_t &= \pi_0 + \sum_{i=1}^{p1} \gamma_{1i} \Delta Stab_{t-i} + \sum_{i=0}^{p2} \gamma_{2i} \Delta NSFR_{t-i} + \sum_{i=0}^{p3} \gamma_{3i} \Delta LCR_{t-i} + \\ &\sum_{i=0}^{p4} \gamma_{4i} \Delta Size_{t-i} + \sum_{i=0}^{p5} \gamma_{5i} \Delta Lqlt_{t-i} + \\ &\sum_{i=0}^{p6} \gamma_{6i} \Delta GDP_{t-i} + \sum_{i=0}^{p7} \gamma_{7i} \Delta Conc_{t-i} + \sigma_i ECT_{t-i} + \mu_t \\ \Delta ROA_t &= \pi_0 + \sum_{i=1}^{p1} \gamma_{1i} \Delta ROA_{t-i} + \sum_{i=0}^{p2} \gamma_{2i} \Delta NSFR_{t-i} + \sum_{i=0}^{p3} \gamma_{3i} \Delta LCR_{t-i} + \\ &\sum_{i=0}^{p4} \gamma_{4i} \Delta Size_{t-i} + \sum_{i=0}^{p5} \gamma_{5i} \Delta Cost_{t-i} + \\ &\sum_{i=0}^{p6} \gamma_{6i} \Delta GDP_{t-i} + \sum_{i=0}^{p7} \gamma_{7i} \Delta Conc_{t-i} + \sigma_i ECT_{t-i} + \mu_t \\ \Delta NPM_t &= \pi_0 + \sum_{i=1}^{p1} \gamma_{1i} \Delta NPM_{t-i} + \sum_{i=0}^{p2} \gamma_{2i} \Delta NSFR_{t-i} + \sum_{i=0}^{p3} \gamma_{3i} \Delta LCR_{t-i} + \\ &\sum_{i=0}^{p4} \gamma_{4i} \Delta Size_{t-i} + \sum_{i=0}^{p5} \gamma_{5i} \Delta Cost_{t-i} + \sum_{i=0}^{p6} \gamma_{6i} \Delta GDP_{t-i} + \sum_{i=0}^{p7} \gamma_{7i} \Delta Inf_{t-i} + \\ &\sigma_i ECT_{t-i} + \mu_t \end{aligned}$$

Figure 3.1 presents the ARDL implementation strategies used for testing the hypotheses of Islamic banks. The flowchart is adapted from the work of Menegaki, (2019).

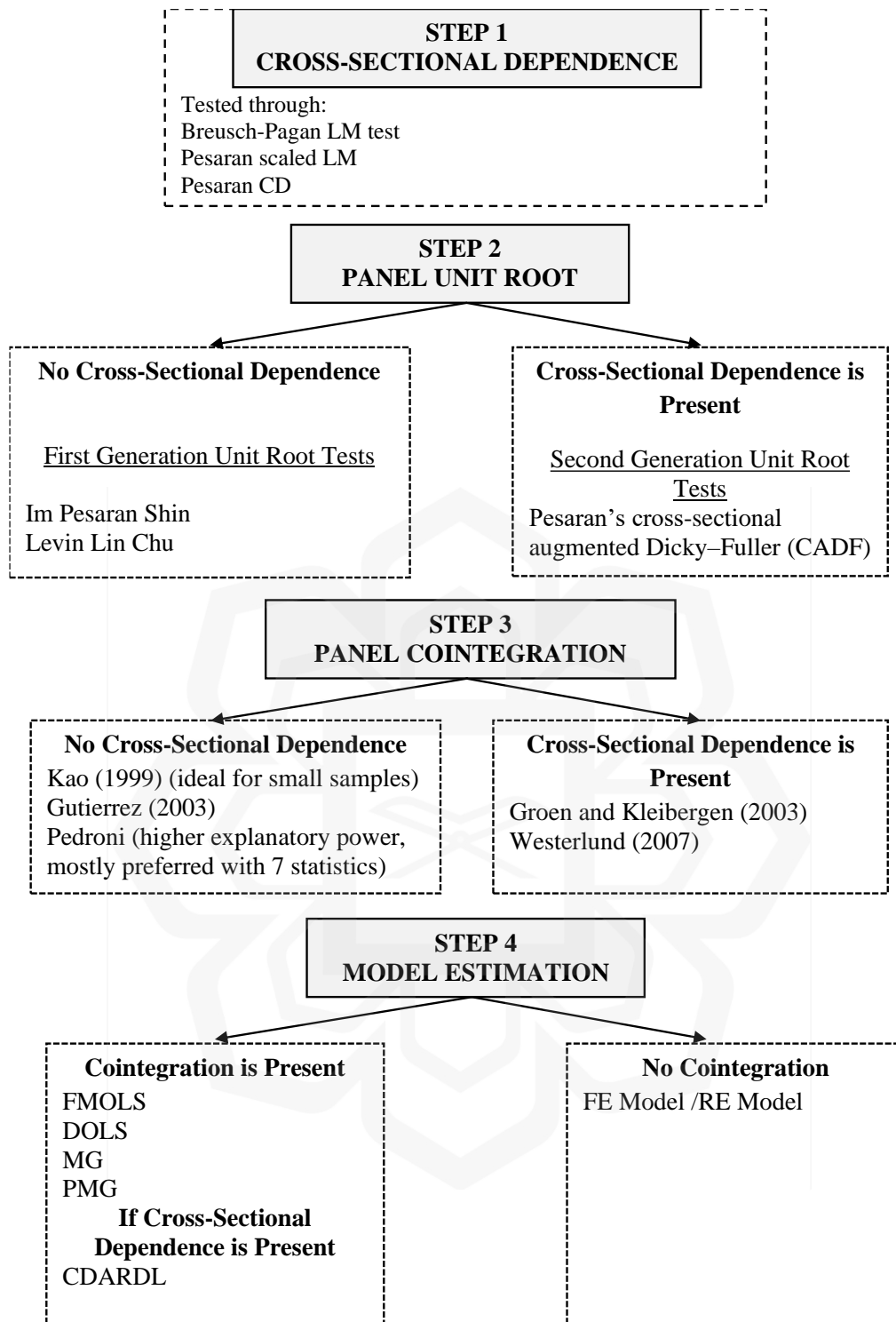


Figure 3.1 ARDL Implementation Strategies

3.8 CONCLUSION

This chapter explains the methodological choice of research design for evaluating the impact of Basel III liquidity regulations on the stability, profitability, and cost of financial intermediation of the conventional and Islamic banks of Pakistan. The adopted research methodology is quantitative research by utilizing secondary data based on two distinct datasets: one for conventional banks and the other for full-fledged Islamic banks. To accommodate the differing characteristics of both datasets different estimation techniques have been adopted. The dataset for the conventional banks is empirically tested by using the fixed effect model and the robustness is tested by using GMM and Driscoll Kraay covariance estimator and the data of Islamic banks is tested by using the panel ARDL model.

This chapter also explains the selected variables of the study along with the expected relationship of independent and control variables with the dependent variables and provides all the necessary details of required diagnostic tests for all the estimation techniques as well.

CHAPTER 4

RESULTS AND DISCUSSION FOR IMPACT OF BASEL III LIQUIDITY REQUIREMENTS ON STABILITY, PROFITABILITY AND INTERMEDIATION COST OF CONVENTIONAL BANKS OF PAKISTAN

4.1 INTRODUCTION

Basel III liquidity standards namely NSFR and LCR are implemented in Pakistan in 2017. The standards are applied to all types of banks simultaneously. In this research impact of these variables has been studied on the stability, profitability and intermediation cost of conventional banks in Pakistan. Therefore, in this chapter following hypotheses were tested are tested:

H_{1A}: There is an impact of NSFR and LCR on the stability of all conventional banks of Pakistan.

H_{2A}: There is an impact of NSFR and LCR on the intermediation cost of all conventional banks of Pakistan.

H_{3A}: There is a significant impact of NSFR and LCR on the profitability of conventional banks in Pakistan.

This chapter is divided into three parts. Each part provides complete detail of each model. The first part describes the impact of NSFR and LCR on the stability of Conventional banks. The second part explains the impact of NSFR and LCR on the profitability of Conventional banks and the last part explains the impact of NSFR and LCR on the intermediation cost of conventional banks in Pakistan.

4.2 IMPACT OF BASEL III LIQUIDITY REQUIREMENTS ON THE STABILITY OF CONVENTIONAL BANKS

4.2.1 Descriptive Statistics

Table 4.1 shows the distribution, central tendency and dispersion of the variables for all banks in the sample. The data is a balanced panel data, comprised of 17 Pakistani conventional banks for the period of 15 years from 2007 to 2021 with 255 observations.

The mean value for the stability is 3.91 and the standard deviation is 0.41. This shows that deviation from the mean for stability is high. It can also be seen that the difference in the maximum and minimum values of stability is also high. The maximum value of stability is 4.65 (Bank Al-Habib) and the lowest value is 2.45 (Summit Bank). There is no benchmark present for the stability of banking industry in Pakistan, hence no comment can be made in this regard. The mean values of NSFR and LCR are 123.4% and 58%, respectively, with standard deviations of 0.15 and 0.14. The NSFR values range from a minimum of 94.41% to a maximum of 175.14%, while the LCR values range from 30.51% to 96.70%. According to Basel III requirements, both NSFR and LCR should exceed 100%. While the average NSFR meets this criterion, indicating that banks in Pakistan generally maintain adequate stable funding, the average LCR falls short of the required threshold. This suggests that, on average, banks in Pakistan may face challenges in meeting their short-term liquidity needs. However, it is noteworthy that even before the implementation of Basel III, many banks in Pakistan were already maintaining an NSFR above the 100% requirement. The Size and LqIt are bank control variables of the study. The mean values for both are 19.83 and 9.21% respectively. The minimum value for Size is 16.83 and the maximum value is 22.02. For LqIt the minimum value is 0.027% of Bank Al-Habib and the maximum value is 56.58% of Summit Bank. According to Ozili, (2015), a lower value of this ratio reflects a better quality of loan; therefore, it can be said that Summit Bank's loan quality is bad. The standard deviation for Size and LqIt is 1.17 and 0.09 respectively. The external variables GDP and Conc have a mean value of 3.36% and 46.68% and the standard deviation for both is 0.02 and 0.03 respectively. The minimum value for GDP is -1.033%, showing a negative growth rate and the maximum value is 6.15%. The minimum value for Conc

is 42.59% and the maximum value is 54.58%. Value for Conc shows that 5-large banks in Pakistan hold 54.58% of the assets of the whole banking industry in 2021. A higher ratio reflects low competition. This shows competition in the industry has decreased in 2021.

Table 4.1 Descriptive Statistics for Stability Model

Variable	Obs	Mean	Std. Dev	Min	Max
Stab	255	3.9117	0.4090	2.4545	4.6475
NSFR	255	1.2365	0.1520	0.9441	1.7514
LCR	255	0.5787	0.1426	0.3051	0.9670
Size	255	19.8252	1.1658	16.8275	22.0163
Lq1t	255	0.1115	0.0921	0.0027	0.5658
GDP	255	0.0362	0.0193	-0.0133	0.0615
Conc	255	0.4668	0.0305	0.4259	0.5658

4.2.2 Testing for Multicollinearity

In regression analysis, there should not be any multicollinearity among the explanatory variables of the model (Gujarati & Dawn, 2022). To check this assumption Pearson correlation and VIF were performed.

It can be observed from Table 4.2 that all correlation coefficients have a value that is less than 0.65. According to Gujarati and Dawn, (2022), if the value of the correlation coefficient is greater than 0.8 the problem of multicollinearity exists in the variables. Hence, it can be said that there is no multicollinearity issue present in the data.

Table 4.2 Correlation Matrix for Stability Model

	NSFR	LCR	Size	Lqlt	GDP	Conc
NSFR	1					
LCR	0.6164	1				
Size	0.1464	0.0125	1			
Lqlt	-0.0326	-0.0886	-0.2664	1		
GDP	0.1503	0.0746	0.0902	-0.0744	1	
Conc	0.0980	0.0862	0.0798	-0.018	0.5143	1

A lower or moderate value of the coefficient does not assure the absence of multicollinearity in the data. Therefore, the Variance Inflation Factor (VIF) assures the absence of multicollinearity (Myers, 1990). According to Gujarati and Dawn, (2022), the threshold value is 10, which means if the value of the VIF of a variable is less than 10 then it can be said that multicollinearity is not present. The results in Table 4.3 show that the VIF of all explanatory variables is less than 10, therefore, we can deduce that multicollinearity is not present in the variables.

Table 4.3 Variance Inflation Factor (VIF) for Stability Model

Variable	VIF	1/VIF
NSFR	1.7	0.5876
LCR	1.66	0.6027
GDP	1.39	0.7194
Conc	1.37	0.7305
Size	1.12	0.8906
Lqlt	1.1	0.9115
Mean VIF	1.39	

4.2.3 Panel Unit Root Testing

It is important to evaluate the stochastic properties of data before evaluating the relationship between the dependent-independent variables. Firstly, the stationarity of the variables is checked using Im-Pesaran-Shin unit-root test. The null hypothesis for this test is data is non-stationarity in all the series and the alternative hypothesis is that at least one series is stationary. Results are presented in table 4.4. It can be seen that Stability, NSFR, GDP and Conc are found a significant at normal levels and the remaining variables, LCR, Size, and Lqlt are significant at first difference.

Table 4.4 Im-Pesaran-Shin Unit-root Test for Stability Model

Variable	Adjusted t*	P Value
Stab	-1.6964	0.0449
NSFR	-2.4242	0.0077
D.LCR	-8.0102	0.0000
D.Size	-6.3210	0.0000
D.Lqlt	-5.5334	0.0000
GDP	-6.1475	0.0000
Conc	-3.1347	0.0009

4.2.4 Diagnostic Tests for the Stability Model

To estimate regression models, the panel data technique is utilized. However, before delving into the main analysis, some preliminary diagnostic tests are carried out for OLS regression to verify that the basic assumptions are not violated. Specifically, the multicollinearity of variables and the stationarity of data are examined using the correlation analysis, Variance Inflation factor (VIF) test and Unit-root test, respectively. The findings of these tests have already been discussed in the above section.

The Breusch Pagan LM test has been applied to evaluate the heteroscedasticity in the OLS regression. Table 4.5 provides a summary of all diagnostic tests. Results show that the null hypothesis i.e., there is a constant variance in the residuals, is rejected. Hence, pooled OLS is not considered to be a feasible choice (Gujarati & Dawn, 2022). Hausman tests help us in selecting the optimal model among REM and FEM. The null hypothesis of the test is there is no substantial difference in the estimators of the fixed effect model and the random effect model. Rejection of the null hypothesis means REM is not suitable because there is a correlation of random effects with one or more independent variables (Gujarati & Dawn, 2022). The results of the Hausman test show that the p-value is less than 0.05, therefore, the null hypothesis is rejected. Hence, FEM is suitable for stability.

Wooldridge test shows that there is a presence of autocorrelation because the p-value is less than 0.05 therefore, the null hypothesis of no autocorrelation among the variables is rejected. Second, the result of the modified Wald test shows that GroupWise heteroscedasticity is present hence, the null hypothesis of this test is also rejected. The table next presents the result of Pesaran's test of cross-sectional independence. The null hypothesis of the test is there is no cross-sectional dependence. For the stability model the null hypothesis is rejected, hence, cross-sectional dependence is present in the Stability model. Lastly, the Durbin Wu-Hausman test is applied to test the presence of endogeneity. The results show that the issue of endogeneity is present in the model.

OLS or FEM model does not provide authentic results in the presence of heteroscedasticity, autocorrelation, and endogeneity. Therefore, these issues will be resolved by using robust analysis techniques, such as GMM and Driscoll-Kraay (DK) covariance matrix.

Table 4.5 Summary of Diagnostic Tests of the Stability Model

Test	Purpose (to test)	Probability	Decision
Breusch Pagan LM test	Heteroscedasticity / Pooled OLS or Random selection	0.0000	Heteroscedasticity is present. Pooled OLS is not feasible
Hausman Test	FEM / REM selection	0.0000	Apply FEM
Wooldridge test	autocorrelation	0.0000	Presence of autocorrelation; apply GMM, DK
Modified Wald test	GroupWise heteroscedasticity	0.0000	Presence of heteroscedasticity; apply GMM, DK
Pesaran's test	Cross-sectional independence	0.0000	Presence of cross-sectional dependence; apply GMM, DK
Durbin-Wu-Hausman	for Endogeneity	0.0124	Presence of endogeneity; apply GMM

The above-identified issues can be resolved by using alternative robustness techniques. To resolve the initial three biases, different techniques have been used by the researchers. In this research, GMM and Driscoll-Kraay's approaches have been used to correct autocorrelation, heteroscedasticity as well as cross-sectional dependence issues.

4.2.5 Model Estimation

The results of FEM for stability are presented in table 4.6. The results show that the model is significant at a 10% significance level with an F-value of 116.65. The value of goodness of fit (R^2) is moderate. It shows that approx. 48% of the variability in the

stability can be explained by the model. It is evident from the table that there is a positive impact of Basel III liquidity standards on the stability of conventional banks in Pakistan. The liquidity standard variables, NSFR and LCR, are highly significant at a 1% significance level with coefficients of 0.2315 and 0.6415 respectively. With a 1% increase in NSFR stability will increase by 23% approx. Also, a 1% increase in LCR will increase stability by 64% approx. Therefore, this study shows that Basel III liquidity standards have a positive impact on stability.

The results also show that among the banks' specific control variables size, and loan quality (Lq1t), both have a significant negative impact on stability. It is also evident from the results that both of the external factors namely, GDP and concentration (Conc) have no impact on the stability of conventional banks in Pakistan.

Table 06 Estimation Results of Stability Model Using Fixed-Effect Model (FEM)

Variables	Coefficient	Standard Error
NSFR	0.2315***	0.0717
LCR	0.6415***	0.0722
Size	-0.0538***	0.0113
Lq1t	-0.6360***	0.1055
GDP	-0.1117	0.4047
Conc	-0.3491	0.2528
Observations	255	
R ²	0.4767	
F-Stat	116.65***	
<p>Notes: “This table presents the Fixed-Effect Model Regression (FEM) with a natural log of z-score, which is a proxy for stability (dependent variable). Z-score is a ratio of the sum of mean ROA and CAR with a standard deviation of ROA. Size is the natural log of assets; Lq1t is a ratio of non-performing loans to gross loans; GDP is GDP growth rate; Conc is a ratio of assets of 5 large banks to total industry assets. The sample is comprised of 255 fir-year observations across 17 banks for the period 2007-2021. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively.”</p>		

4.2.6 Robustness Tests

After running the FEM, additional robustness tests have been performed to ensure that estimations of FEM are not biased and efficient. The results of all the tests are presented in Table 5.7. Three robust tests have been performed namely, GMM, and DK, the results of which are provided in table 4.7. According to the findings of this research NSFR and LCR have a significant positive impact on stability. Hence, it can be said that with the increase in the percentage of NSFR and LCR stability of conventional banks in Pakistan will increase as well. Hence, results give the evidence of improved stability of the banking sector in Pakistan through the implementation of Basel III liquidity standards. This study concludes that there is a significant positive impact of Basel III liquidity standards on conventional banks of Pakistan, thus hypothesis 1a is accepted. These results are supported by Hossain et al., (2018), L'Huillier et al., (2018) and Polizzi et al., (2020).

The results also highlighted the impact of bank-specific as well as country-specific variables on the stability of conventional banks in Pakistan. It can be seen from the results that among the bank-specific variables size has a significant negative impact on stability. Lq1t is found to have a significant negative impact on stability. Large banks are expected to have more power or regulatory protection (too-big-to-fail), hence are more stable. Therefore, a negative coefficient represents this phenomenon of too-big-to-fail (Ashraf et al., 2016; Schwerter, 2011). A negative impact of asset quality ratio has also been found on the stability in past research as well (Ozili, 2015; Velliscig et al., 2022). A lower ratio represents better asset quality that subsequently enhances stability.

Lastly, the impact of macroeconomic variables namely, GDP and market concentration on stability has also been presented in table 4.7. No statistically significant impact of GDP has been found on stability. Even though a majority of researchers have presented a statistically significant impact of GDP on stability (Hossain et al., 2018; L'Huillier et al., 2018; Mutarindwa et al., 2020), these results are still not unique. Ozili, (2018) and Pak, (2019) have also found the same results in their research. Conc is found to have a significant negative impact on the stability of conventional banks in Pakistan. This shows that with the increase in competition in the

industry, stability results in a rise in the riskiness of the industry. Ashraf et al., (2016), Saif-Alyousfi et al., (2020) and Uhde and Heimeshoff, (2009) also found the same results in their research.

Table 4.7 Estimation results of stability using GMM and Driscoll-Kraay Estimation Models

Variables	GMM		DK	
	Coefficients	Standard Error	Coefficients	Standard Error
NSFR	0.1324*	0.0754	0.2315***	0.0375
LCR	0.3642***	0.1012	0.6415***	0.1336
Size	-0.0251	0.0219	-0.0538***	0.0062
Lqlt	-0.5880***	0.1979	-0.6360***	0.1863
GDP	0.1280	0.4255	-0.1117	0.2227
Conc	-0.5452**	0.2688	-0.3491***	0.0782
Chi Sq	129.74***			
No. of Observations	221		255	
No. of Banks	17		17	
No. of Instruments	11			
Hansen test (p-value)	0.1070			
AR (2) test (p-value)	0.2200			
R ²			0.4767	
F-Stat			29.54***	
<p>Notes: “This table presents two-step difference generalized methods of moments (GMM) and Driscoll-Kraay (DK) Covariance estimator with the natural log of z-score, which is a proxy for stability (dependent variable). Z-score is a ratio of the sum of mean ROA and CAR with a standard deviation of ROA. Size is the natural log of assets; Lqlt is a ratio of non-performing loans to gross loans; GDP is GDP growth rate; Conc is a ratio of assets of 5 large banks to total industry assets. The sample is comprised of 255 firm-year observations across 17 banks for the period 2007-2021. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively.”</p>				

4.2.7 Discussion

The impact of Basel III liquidity requirements, specifically the Net Stable Funding Ratio (NSFR) and Liquidity Coverage Ratio (LCR), on the stability of conventional banks in Pakistan, is an important aspect to consider, as financial stability is a key objective of these regulations.

The significant positive impact of NSFR and LCR on the stability of conventional banks in Pakistan is consistent with the primary objective of these regulations, which is to enhance the resilience of the banking system and reduce the likelihood of liquidity and solvency crises.

The NSFR requirement is designed to ensure that banks maintain a stable funding structure over the long term, which reduces the risk of funding mismatches and limits the potential for liquidity crises. By requiring banks to maintain a minimum level of stable funding, the NSFR helps to promote the stability of the banking system by reducing the risk of liquidity shocks. Similarly, the LCR requirement is designed to ensure that banks hold sufficient high-quality liquid assets to cover potential short-term liquidity needs, which helps to reduce the risk of liquidity crises during periods of stress. The LCR requirement enhances the resilience of the banking system by ensuring that banks can meet their short-term obligations, even during periods of market disruption.

The positive impact of NSFR and LCR on the stability of conventional banks in Pakistan may also be attributed to the fact that banks with strong liquidity positions are better positioned to withstand market disruptions and continue to provide essential financial services to their customers. In turn, this helps to promote confidence in the banking system and to reduce the risk of financial instability.

Overall, the significant positive impact of NSFR and LCR on the stability of conventional banks in Pakistan is consistent with the objectives of these regulations, which aim to promote the resilience of the banking system and reduce the risk of liquidity and solvency crises.

4.2.7.1 Theoretical Support

Theory of Financial Intermediation: This theory suggests that financial intermediaries like banks play a crucial role in reducing information asymmetries and transaction costs between savers and borrowers. The positive impact of NSFR and LCR on stability aligns with this theory as enhanced liquidity standards ensure that banks maintain sufficient high-quality liquid assets, thereby reducing the risk of liquidity crises and enhancing the overall stability of the financial system. This stability fosters trust among savers and borrowers, which is fundamental to the intermediation process. Also, for the control variables it can be said that larger banks might benefit from a “too-big-to-fail” status, reducing their risk of failure due to implicit government support. Higher loan quality indicates better credit risk management, aligning with the theory's emphasis on the role of intermediaries in efficiently allocating resources and managing risks

Asset-Liability Management (ALM) Theory: ALM theory focuses on managing risks that arise from the mismatches between assets and liabilities. The significant positive coefficients of NSFR and LCR reflect that these liquidity requirements help banks manage their long-term and short-term funding risks, respectively. By aligning the maturity profiles of assets and liabilities, these standards reduce liquidity risk, thereby enhancing the stability of banks. This supports the ALM theory's premise that effective management of assets and liabilities is critical to mitigating financial risks and ensuring institutional stability. Also, Effective asset-liability management can lead to better loan quality and efficient scaling of operations in larger banks, contributing to their stability.

4.3 IMPACT OF BASEL III LIQUIDITY REQUIREMENTS ON PROFITABILITY OF CONVENTIONAL BANKS

4.3.1 Descriptive Statistics

Table 4.8 shows the distribution, central tendency and dispersion of the variables for all banks in the sample. The data is a balanced panel data, comprised of 17 Pakistani conventional banks for the period of 15 years from 2007 to 2021 with 255 observations. ROA has been used as a proxy of profitability in this research.

The mean value for ROA is 0.073%. This shows that the average profitability of conventional banks in Pakistan is relatively lower than the average ROA of 136 countries i.e. 1.57% (The Global Economy.com, n.d.). The standard deviation of ROA is 49%. This shows that deviation from the mean for ROA is minimum. The variation in ROA is not too large. The minimum value for ROA is -6.45% (Summit Bank) and the maximum value is 3.06% (MCB Bank). Mean values of NSFR and LCR are 123.4% and 58% respectively, with a standard deviation of 0.15 and 0.14. The minimum and maximum values for NSFR are 94.41% and 17.14%, while for LCR these values are 30.51% and 96.70% respectively. A mean NSFR of 123.4% indicates that, on average, banks have a stable funding base well above the minimum Basel III requirement of 100%, which is considered good for stability. However, the mean LCR of 57.87% is below the Basel III requirement of 100%, indicating that banks may not have enough high-quality liquid assets to cover short-term obligations in a stress scenario. The standard deviations of NSFR and LCR are 15.20% and 14.26%, respectively, suggesting some variability among banks. The minimum and maximum values for NSFR are 94.41% and 175.14%, respectively, while for LCR, these values are 30.51% and 96.70%. This range indicates that while some banks maintain strong liquidity positions, others may be vulnerable.

For bank-specific variables, Size and Cost, the mean value of Size is 19.83 (logarithm of total assets), indicating the average scale of the banks. The standard deviation is 1.17, with minimum and maximum values of 16.83 and 22.02, respectively. This suggests a moderate range in the size of banks. The mean value for Cost (cost-to-

income ratio) is 2.45%, with a standard deviation of 0.82%. The minimum and maximum values are 1.19% and 5.28%, respectively, indicating that some banks have significantly higher operational efficiency than others.

For external variables, GDP growth has a mean value of 3.62%, with a standard deviation of 1.93%. The minimum and maximum values are -1.33% and 6.15%, indicating variability in economic conditions over the study period. The mean value for Conc (concentration ratio) is 46.68%, with a standard deviation of 3.05%. The minimum and maximum values for Conc are 42.59% and 56.58%. These values suggest that the five largest banks hold a significant portion of the industry's assets, reflecting a high concentration and potentially low competition within the industry.

Table 4.8 Descriptive Statistics for ROA Model

Variable	Obs	Mean	Std. Dev	Min	Max
ROA	255	0.0073	0.0149	-0.0645	0.0306
NSFR	255	1.2365	0.1520	0.9441	1.7514
LCR	255	0.5787	0.1426	0.3051	0.9670
Size	255	19.8252	1.1658	16.8275	22.0163
Cost	255	0.0245	0.0082	0.0119	0.0528
GDP	255	0.0362	0.0193	-0.0133	0.0615
Conc	255	0.4668	0.0305	0.4259	0.5658

4.3.2 Testing for Multicollinearity

In regression analysis, there should not be any multicollinearity among the explanatory variables of the model (Gujarati & Dawn, 2022). To check this assumption Pearson correlation and VIF were performed.

Table 4.9 shows the correlation matrix for the explanatory variables of the ROA model. The results show that there exists a positive association between all of the variables except Cost. The cost has a negative association with all other explanatory variables. It can also be observed that correlation coefficients have a value that is less than 0.65. According to Gujarati and Dawn, (2022), if the value of the correlation coefficient is greater than 0.8 the problem of multicollinearity exists in the variables. Hence, it can be said that there is no multicollinearity issue present in the data. Also, the matrix shows that cost has a negative relationship with all other variables.

Table 4.9 Correlation Matrix for ROA Model

	NSFR	LCR	Size	Cost	GDP	Conc
NSFR	1					
LCR	0.6164	1				
Size	0.1464	0.0125	1			
Cost	-0.1434	-0.1053	-0.4307	1		
GDP	0.1503	0.0746	0.0902	-0.1364	1	
Conc	0.0980	0.0862	0.0798	-0.0867	0.5143	1

A lower or moderate value of the coefficient does not assure the absence of multicollinearity in the data. Therefore, the Variance Inflation Factor (VIF) assures the absence of multicollinearity (Myers, 1990). According to Gujarati and Dawn, (2022), the threshold value is 10, which means if the value of the VIF of a variable is less than 10 then it can be said that multicollinearity is not present. Table 4.10 shows that the VIF of all explanatory variables is less than 10, therefore, we can deduce that multicollinearity is not present in the variables.

Table 4.10 Variance Inflation Factor (VIF) for ROA Model

Variable	VIF	1/VIF
NSFR	1.69	0.592
LCR	1.64	0.609
GDP	1.39	0.717
Conc	1.37	0.732
Size	1.26	0.794
Lq1t	1.26	0.796
Mean VIF	1.43	

4.3.3 Panel Unit Root Testing

It is important to evaluate the stochastic properties of data before evaluating the relationship between the dependent-independent variables. Firstly, the stationarity of the variables is checked using Im-Pesaran-Shin unit-root test. The null hypothesis for this test is data is non-stationarity in all the series and the alternative hypothesis is that at least one series is stationary. Table 4.11 shows the results of the test. Results show that ROA, NSFR, GDP and concentration are found a significant at a level and the remaining variables, LCR, Size and Cost, are significant at first difference.

Table 4.11 Unit Root Test (IPS) for ROA Model

Im-Pesaran-Shin unit-root test		
Variable	Adjusted t*	P Value
ROA	-3.4067	0.0003
NSFR	-2.4242	0.0077
D.LCR	-8.0102	0.0000
D.Size	-6.3210	0.0000

D.Cost	-7.6217	0.0000
GDP	-6.1475	0.0000
Conc	-3.1347	0.0009

4.3.4 Diagnostic Tests

To estimate regression models, the panel data technique is utilized. However, before delving into the main analysis, some preliminary diagnostic tests are carried out for OLS regression to verify that the basic assumptions are not violated. Specifically, the multicollinearity of variables and the stationarity of data are examined using the correlation analysis, Variance Inflation factor (VIF) test and Unit-root test, respectively. The findings of these tests have already been discussed in the above section. Table 4.12 shows the results for the Breusch Pagan LM test, Hausman test, Wooldridge test, Modified Wald test, Pesaran's test, and Durbin Wu-Hausman test.

The Breusch Pagan LM test has been applied to evaluate the heteroscedasticity in the OLS regression. Results provided in table 4.12 shows that the null hypothesis i.e., there is a constant variance in the residuals, is rejected. Hence, pooled OLS is not considered to be a feasible choice (Gujarati & Dawn, 2022).

The Hausman test helps us in selecting the optimal model among REM and FEM. The null hypothesis of the test is there is no substantial difference in the estimators of the fixed effect model and the random effect model. Rejection of the null hypothesis means REM is not suitable because there is a correlation of random effects with one or more independent variables (Gujarati & Dawn, 2022). The result of the Hausman test shows that the p-value is less than 0.05, therefore, the null hypothesis is rejected. Hence, FEM is suitable for stability.

Wooldridge test shows that there is a presence of autocorrelation because the p-value is less than 0.05 therefore, the null hypothesis of no autocorrelation among the variables is rejected. Second, the result of the modified Wald test shows that GroupWise heteroscedasticity is present hence, the null hypothesis of this test is also rejected. The table next presents the result of Pesaran's test of cross-sectional independence. The null

hypothesis of the test is there is no cross-sectional dependence. For the stability model the null hypothesis is rejected, hence, cross-sectional dependence is present in the Stability model. Lastly, the Durbin Wu-Hausman test is applied to test the presence of endogeneity. The results show the issue of endogeneity is present in the model. A summary of all robust diagnostic tests is present in the table below.

The Breusch Pagan LM test has been applied to evaluate the heteroscedasticity in the model. The table below provides the results of the test. The null hypothesis of the Breusch Pagan LM test is a normal distribution of residuals. For the ROA model, the null hypothesis is rejected. Hence, pooled OLS is not considered to be a feasible choice (Gujarati & Dawn, 2022)

The Hausman test helps us in selecting the optimal model among REM and FEM. The null hypothesis of the test is there is no substantial difference in the estimators of the fixed effect model and the random effect model. Rejection of the null hypothesis means REM is not suitable because there is a correlation of random effects with one or more independent variables (Gujarati & Dawn, 2022). The result of the Hausman test shows that the p-value is less than 0.05, therefore, the null hypothesis is rejected. Hence, FEM is suitable for ROA.

After running the FEM, additional robustness tests have been performed to ensure that estimations of FEM are not biased and efficient. The results of all the tests are presented in the table. First, the Wooldridge test shows that there is a presence of autocorrelation because the p-value is less than 0.05 therefore, the null hypothesis of no autocorrelation among the variables is rejected. Second, the result of the modified Wald test shows that GroupWise heteroscedasticity is present hence, the null hypothesis of this test is also rejected. The table next presents the result of Pesaran's test of cross-sectional independence. The null hypothesis of the test is there is no cross-sectional dependence. For the ROA model, the null hypothesis is rejected, hence, cross-sectional dependence is present in the ROA model. Lastly, the Durbin Wu-Hausman test is applied to test the presence of endogeneity. The results show the issue of endogeneity is present in the model. A summary of all diagnostic tests is present in the table below.

Table 4.12 Summary of Diagnostic Tests for ROA Model

Test	Purpose (to test)	Model 2 (ROA)	Decision
Breusch Pagan LM test	Heteroscedasticity / Pooled OLS or Random selection	0.0000	Heteroscedasticity is present. Pooled OLS is not feasible
Hausman Test	FEM / REM selection	0.0001	Apply FEM
Wooldridge test	Autocorrelation	0.0001	Presence of autocorrelation; apply GMM, DK
Modified Wald test	GroupWise heteroscedasticity	0.0000	Presence of heteroscedasticity; apply GMM, DK
Pesaran's test	Cross-sectional independence	0.0000	Presence of cross-sectional dependence; apply GMM, DK
Durbin-Wu-Hausman	for Endogeneity	0.0019	Presence of endogeneity; apply GMM

The above-identified issues can be resolved by using alternative robustness techniques. To resolve the initial three biases, different techniques have been used by the researchers. In this research for robust testing, GMM and Driscoll-Kraay approaches have been applied. GMM, Driscoll-Kraay when data has issues of autocorrelation, heteroscedasticity as well as cross-sectional dependence issues.

4.3.5 ROA Model Estimation

The results of FEM for ROA are presented in table 4.13. The results show that the model is highly significant at a 1% significance level with an F-stat of 9.15. The value of goodness of fit (R^2) shows that approx.19% of the variation in the ROA can be

explained by the model. It is evident from the table that there is no impact of Basel III liquidity standards on ROA for conventional banks in Pakistan.

The results also show that both bank- specific control variables size and Cost have a significant negative impact on the ROA at a significance level of 10% and 1% respectively. The findings suggest that with the increase in bank size and cost, ROA decreases. Both macroeconomic variables, GDP and Conc are found to have an insignificant impact on ROA.

Table 4.13 Estimation Results of ROA using Fixed-Effect Model (FEM)

Variables	Coefficient	Standard Error
NSFR	0.0000	0.0067
LCR	-0.0025	0.0069
Size	-0.0022*	0.0010
Cost	-0.7952***	0.1120
GDP	0.0383	0.0406
Conc	-0.0061	0.0254
Constant	0.0726***	0.0232
Observations	255	
R ²	0.1913	
F-Stat	9.15***	
<p>Notes: “This table presents the Fixed-Effect Model Regression (FEM) with ROA, which is a proxy for profitability (dependent variable). ROA is a percentage of net profit after tax to total assets; Size is a natural log of assets; Cost is a ratio of non-interest expense to total asset non-performing loans to gross loans; GDP is GDP growth rate; Conc is a ratio of assets of 5 large banks to total industry assets. The sample is comprised of 255 fir-year observations across 17 banks for the period 2007-2021. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively.</p>		

4.3.6 Robustness Tests

The results of GMM and DK are provided in table 4.14. Factors affecting the ROA of conventional banks in Pakistan are presented in these tables. According to the findings of this research, NSFR has no significant impact on ROA. Some authors have presented contrasting results (Papadamou et al., 2021; Said, 2018; Veeramoothoo & Hammoudeh, 2022). However, the results of this research are also supported by Dietrich et al., (2014) and Omer, (2021). They also found no evidence of the impact of NSFR on ROA. The findings also show that there is a significant negative impact of LCR on ROA. Therefore, it can be said that the ROA of conventional banks in Pakistan decreases with the increase in the percentage of LCR. The results endorsed the findings of Adesina, (2021) and Bertay et al., (2015) that the cost of high liquidity is less bank intermediation thus, result in a negative relationship between LCR and ROA. This study concludes that there is a significant impact of Basel III liquidity standards on conventional banks of Pakistan, thus accepting hypothesis 2a.

The results also highlighted the impact of bank-specific as well as country-specific variables on the ROA of conventional banks in Pakistan. It can be seen from the results that none of the control variables except Cost has any significant impact on ROA. According to the previous literature, the lower the efficiency ratio the higher the management capability, thus higher the profitability. Hence, the findings provided by the research that there is a negative impact of efficiency on ROA is supported by the previous work as well (Al-Harbi, 2019a; Athanasoglou et al., 2006)

Previous literature does support the insignificant impact of other control variables on ROA. (Athanasoglou et al., 2008; Curak et al., 2012) reported insignificant results between bank size and ROA. Alharbi, (2017) and Ali and Mehmood, (2020) also found an insignificant impact of GDP on commercial banks. Lastly, no impact of concentration was also found by Chidinma and Chinaemerem, (2019) and Naceur and Kandil, (2009).

Table 4.14 Estimation results of ROA using GMM and Driscoll-Kraay Estimation Models

Variables	GMM		DK	
	Coefficients	Standard Error	Coefficients	Standard Error
NSFR	-0.0019	0.0062	0.0030	0.0077
LCR	0.0082***	0.0047	-0.0073	0.0064
Size	0.0009***	0.0004	0.0085	0.0188
Cost	0.0122	0.1101	-0.0710**	0.0319
GDP	-0.0187	0.0282	-0.0425	0.0267
Conc	-0.0075	0.0124	0.0030	0.0077
Chi Sq	784.28***			
No. of Observations	238		255	
No. of Banks	17		17	
No. of Instruments	11			
Hansen test (p-value)	0.7380			
AR (2) test (p-value)	0.3290			
R ²			0.4685	
F-Stat			70.85***	
<p>Notes: “This table presents two-step difference generalized methods of moments (GMM) and Driscoll-Kraay (DK) Covariance estimator with ROA, which is a proxy for profitability (dependent variable). ROA is a percentage of net profit after tax to total assets; Size is a natural log of assets; Cost is a ratio of non-interest expense to total asset non-performing loans to gross loans; GDP is GDP growth rate; Conc is a ratio of assets of 5 large banks to total industry assets. The sample is comprised of 255 firm-year observations across 17 banks for the period 2007-2021. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively.</p>				

4.3.7 Discussion

The purpose of the research is to study the impact of NSFR and LCR on the profitability of conventional banks in Pakistan. Results show a negative insignificant impact of NSFR and a positive significant impact of LCR on the profitability of the banks. The insignificant negative impact of NSFR on the return on assets (ROA) of conventional

banks in Pakistan could be due to several reasons. NSFR requirements are designed to ensure that banks maintain a stable funding structure, reducing the likelihood of funding mismatches. This can enhance the long-term sustainability of the bank, reducing the risk of liquidity and solvency crises. However, NSFR also limits banks' ability to fund themselves with short-term, high-yielding assets, which could reduce their profitability in the short run. The insignificant negative impact of NSFR on the return on assets (ROA) of conventional banks in Pakistan also suggests that the banks are complying with the NSFR requirement without significantly impacting their profitability. This indicates that the banks can maintain a stable funding structure while still generating a reasonable level of returns.

On the other hand, the positive significant impact of LCR on the ROA of conventional banks in Pakistan could be attributed to the fact that LCR requires banks to hold a certain amount of highly liquid assets, such as government securities, which can help them weather short-term liquidity shocks without having to sell their long-term, higher-yielding assets. As a result, banks with high LCR may be perceived as more stable by investors and customers, which could help them attract more deposits and lower their funding costs, leading to higher profitability. Moreover, banks with higher LCRs may also benefit from improved access to funding in the interbank market, which could lower their funding costs and improve their profitability. The positive impact of LCR on ROA could also reflect the fact that banks with strong liquidity positions may be better positioned to take advantage of investment opportunities, which could increase their earnings. Lastly, the positive significant impact of LCR on the ROA of conventional banks in Pakistan also indicates that banks with strong liquidity positions are better positioned to take advantage of investment opportunities, which could increase their earnings. This is in line with BCBS's objective of ensuring that banks hold sufficient high-quality liquid assets to cover potential short-term liquidity needs and remain resilient during periods of stress.

Overall, the results suggest that the Basel III liquidity requirements are achieving their intended objectives of promoting financial stability and ensuring that banks are better prepared to weather periods of stress and market disruptions. However, policymakers need to continue to monitor the impact of these regulations to ensure that

they are not unduly burdening banks and hindering their ability to lend to the real economy.

4.3.7.1 Theoretical Support

Theory of Financial Intermediation: This theory suggests that financial intermediaries, such as banks, play a crucial role in facilitating efficient allocation of resources by bridging gaps between savers and borrowers. The insignificant impact of NSFR on ROA can be interpreted through this theory, as NSFR requirements ensure stable funding over the long term, reducing risks but potentially limiting short-term profitability due to lower yields on stable funding. The significant negative impact of LCR on ROA can be explained by the costs associated with holding high-quality liquid assets, which, while enhancing stability, might reduce profitability by diverting resources from potentially higher-yielding investments. Also, higher operational costs can erode the profitability of banks, reducing their ability to effectively perform their intermediation role and the size of the bank could reflect increased complexity and operational inefficiencies, detracting from profitability.

Asset-Liability Management (ALM) Theory: ALM theory focuses on managing risks arising from mismatches between assets and liabilities. The insignificant impact of Basel III liquidity standards on ROA suggests that while these standards enhance stability, they may also constrain banks' ability to engage in short-term, higher-yielding investments, which aligns with the principles of ALM. Banks that are required to maintain high levels of liquid assets (LCR) might face reduced profitability due to lower returns on these assets. The significant negative impact of size and cost also supports ALM theory, indicating that as banks grow larger and incur higher operational costs, their ability to efficiently manage assets and liabilities diminishes, adversely affecting profitability.

4.4 IMPACT OF BASEL III LIQUIDITY STANDARDS ON INTERMEDIATION COST

4.4.1 Descriptive Statistics

Table 4.15 shows the distribution, central tendency and dispersion of the variables for all banks in the sample. The data is a balanced panel data, comprised of 17 Pakistani conventional banks for the period of 15 years from 2007 to 2021 with 255 observations.

The mean value for NIM is 3.04% which is slightly below the global average of 3.61% (The Global Economy.com, n.d.). This indicates that Pakistani conventional banks, on average, have a slightly lower net interest margin compared to the global benchmark. The standard deviation of NIM is 1.23%, suggesting moderate variability in the net interest margins among the banks in the sample. The minimum value for NIM is -0.99% (Summit Bank), indicating negative margins for the least profitable bank, while the maximum value is 6.45% (MCB Bank), showing that some banks achieve high margins. This range indicates significant differences in how banks manage their interest margins.

The mean values of NSFR and LCR are 123.4% and 57.87%, respectively. A mean NSFR of 123.4% indicates that, on average, banks maintain a stable funding base well above the minimum Basel III requirement of 100%, which is positive for stability. However, the mean LCR of 57.87% is below the Basel III requirement of 100%, indicating that banks may not have sufficient high-quality liquid assets to cover short-term obligations in a stress scenario. The standard deviations of NSFR and LCR are 15.20% and 14.26%, respectively, suggesting variability among banks. The minimum and maximum values for NSFR are 94.41% and 175.14%, while for LCR, these values are 30.51% and 96.70%. This range indicates differences in liquidity management practices among banks.

Bank internal variables, Size and Cost, the mean value is 19.83 and 2.45% respectively, and the deviation from the mean is 1.1658 and 0.0082. Both variables do not have a high difference between their respective minimum and maximum values.

The minimum and maximum values for Size are 16.83 and 22.02. The minimum and maximum values for Cost are 1.2% and 5.3% respectively. Lastly for external variables, GDP and Inf the mean values are 3.62% and 9.08%, and the standard deviation values are 0.02 and 0.03. The minimum and maximum values for GDP are 29%. Inflation at the time of the financial crisis in 2008 rose to this rate in Pakistan.

Table 4.15 Descriptive Statistics for NIM Model

Variable	Obs	Mean	Std. Dev	Min	Max
NIM	255	0.0304	0.0123	-0.0099	0.0645
NSFR	255	1.2365	0.1520	0.9441	1.7514
LCR	255	0.5787	0.1426	0.3051	0.9670
Size	255	19.8252	1.1658	16.8275	22.0163
Cost	255	0.0245	0.0082	0.0119	0.0528
GDP	255	0.0362	0.0193	-0.0133	0.0615
Inf	255	0.0908	0.0442	0.0253	0.2029

4.4.2 Testing for Multicollinearity

In regression analysis, there should not be any multicollinearity among the explanatory variables of the model (Gujarati & Dawn, 2022). To check this assumption Pearson correlation and VIF were performed.

Table 4.16 shows the correlation matrix for the explanatory variables of the NIM model. The results show that except for Cost and inf, there is a positive association between all explanatory variables. It can also be observed that correlation coefficients have a value that is less than 0.65. According to Gujarati and Dawn, (2022), if the value of the correlation coefficient is greater than 0.8 the problem of multicollinearity exists in the variables. Hence, it can be said that there is no multicollinearity issue present in the data.

Table 4.16 Correlation Matrix for NIM Model

	NSFR	LCR	Size	Cost	GDP	Inf
NSFR	1					
LCR	0.6164	1				
Size	0.1464	0.0125	1			
Cost	-0.1434	-0.1053	-0.4307	1		
GDP	0.1503	0.0746	0.0902	-0.1364	1	
Inf	-0.3940	-0.2706	-0.2837	0.2421	-0.5935	1

A lower or moderate value of the coefficient does not assure the absence of multicollinearity in the data. Therefore, the Variance Inflation Factor (VIF) assures the absence of multicollinearity (Myers, 1990). According to Gujarati and Dawn, (2022), the threshold value is 10, which means if the value of the VIF of a variable is less than 10 then it can be said that multicollinearity is not present. Table 4.17 shows that the VIF of all explanatory variables is less than 10, therefore, we can deduce that multicollinearity is not present in the variables.

Table 4.17 Variance Inflation Factor (VIF) for NIM Model

Variable	VIF	1/VIF
Inf	1.96	0.5095
NSFR	1.79	0.5575
LCR	1.65	0.6057
GDP	1.59	0.6293
Size	1.32	0.7573
Cost	1.26	0.7929
Mean VIF	1.60	

4.4.3 Panel Unit Root Testing

It is important to evaluate the stochastic properties of data before evaluating the relationship between the dependent-independent variables. Firstly, the stationarity of the variables is checked using Im-Pesaran-Shin unit-root test. The null hypothesis for this test is data is non-stationarity in all the series and the alternative hypothesis is that at least one series is stationary. Results are presented in table 4.18. it can be seen that NIM, NSFR, GDP, and inflation are found to be stationary at level and the remaining variables are stationary at first difference.

Table 4.18 Unit Root Test (IPS) for NIM Model

Variable	Adjusted t*	P Value
NIM	-1.4693	0.0709
NSFR	-2.4242	0.0077
D.LCR	-8.0102	0.0000
D.CA	-6.1258	0.0000
D.Cost	-7.6217	0.0000
GDP	-6.1475	0.0000
Inf	-2.1974	0.0140

4.4.4 Diagnostic Tests

Table 4.19 presents a summary of all diagnostic tests for the NIM model. The purpose of the Breusch Pagan LM is to evaluate the heteroscedasticity in the model. Its null hypothesis is a normal distribution of residuals. For the NIM model, the null hypothesis is rejected. Hence, pooled OLS is not considered to be a feasible choice (Gujarati & Dawn, 2022).

The Hausman test helps us in selecting the optimal model among REM and FEM. The null hypothesis of the test is there is no substantial difference in the estimators of the fixed effect model and the random effect model. Rejection of the null hypothesis means REM is not suitable because there is a correlation of random effects with one or more independent variables (Gujarati & Dawn, 2022). The result of the Hausman test shows that the p-value is less than 0.05, therefore, the null hypothesis is rejected. Hence, FEM is the suitable for NIM Model.

The Wooldridge test shows that there is a presence of autocorrelation because the p-value is less than 0.05 therefore, the null hypothesis of no autocorrelation among the variables is rejected. Second, the result of the modified Wald test shows that Groupwise heteroscedasticity is present hence, the null hypothesis of this test is also rejected. The table next presents the result of Pesaran's test of cross-sectional independence. The null hypothesis of the test is there is no cross-sectional dependence. For the NIM model, the null hypothesis is rejected, hence, cross-sectional dependence is present in the NIM model. Lastly, the Durbin Wu-Hausman test is applied to test the presence of endogeneity. A summary of all robust diagnostic tests is present in the table below.

Table 4.19 Summary of Diagnostic Tests for NIM Model

Test	Purpose (to test)	Prob.	Decision
Breusch Pagan LM test	Heteroscedasticity / Pooled OLS or Random selection	0.0000	Heteroscedasticity is present. Pooled OLS is not feasible
Hausman Test	FEM / REM selection	0.0000	Apply FEM
Wooldridge test	Autocorrelation	0.0000	Presence of autocorrelation; apply GMM, DK

Modified Wald test	GroupWise heteroscedasticity	0.0000	Presence of heteroscedasticity; apply GMM, DK
Pesaran's test	Cross-sectional independence	0.0000	Presence of cross-sectional dependence; apply GMM, DK
Durbin-Wu-Hausman	for Endogeneity	0.0564	Presence of endogeneity; apply GMM

The above-identified issues can be resolved by using alternative robustness techniques. To resolve the initial three biases, different techniques have been used by the researchers. In this research, GMM and Driscoll-Kraay's approaches have been used to correct autocorrelation, heteroscedasticity as well as cross-sectional dependence issues.

4.4.5 Model Estimation – Intermediation Cost

The results of FEM for NIM are presented in table 4.20. The results show that the model is highly significant at a 1% significance level with an F-value of 14.01. The value of goodness of fit (R^2) shows that approx. 27% of the variation in the NIM can be explained by the model. The results show that among the liquidity standards, NSFR has a significant negative impact on NIM while LCR has no impact on NIM for conventional banks in Pakistan.

The results also show that among the banks' specific control variables, Size has a significant negative impact on the NIM at a significance level of 1%, and Cost has a significant positive impact on the NIM at a significance level of 5%. The findings suggest that with a 1% increase in size, NIM will decrease by 0.03% and with a 1% increase in Cost NIM will increase by 16.66%.

Results also show the impact of country-specific variables namely GDP and inflation on NIM. Results show that GDP has a significant negative impact on NIM at

a significance level of 10%, while inflation is found to have an insignificant impact on NIM.

Table 4.20 Estimation Results of NIM Model using Fixed-Effect Model (FEM)

Variables	Coefficient	Standard Error
NSFR	-0.0108**	0.0048
LCR	-0.0064	0.0047
Size	-0.0028***	0.0009
Cost	0.1666**	0.0776
GDP	-0.0496*	0.0286
Inf	-0.0001	0.0152
Constant	0.1003***	0.0189
Observations	255	
R ²	0.2660	
F-Stat	14.01***	

Notes: “This table presents the Fixed-Effect Model Regression (FEM) with NIM, which is a proxy for intermediation cost (dependent variable). NIM is a ratio of the difference between interest income and interest expense with total assets. Size is a log of assets; Cost is a ratio of non-interest expense to total asset non-performing loans to gross loans; GDP is GDP growth; Inf is the annual inflation rate (CPI). The sample is comprised of 255 firm-year observations across 17 banks for the period 2007-2021. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively.”

From the diagnostic tests presented in table 4.19, it can be seen that the model contains the issues of heteroscedasticity, autocorrelation, as well as cross-sectional dependence. Therefore, robust estimation models are required to deal with all these issues.

4.4.6 Robustness Tests

Factors affecting the NIM of conventional banks of Pakistan are presented in table 4.21 via GMM and DK estimation approaches. According to the findings of these robust techniques, there is a difference in the results of both main independent variables. According to the results of GMM, there is no significant impact of NSFR on NIM and a negative significant impact of LCR on NIM. But DK has shown reverse results, i.e. there is a negative significant impact of NSFR on NIM and no impact of LCR on NIM. GMM is a superior technique of estimation in comparison to DK as it deals with all the issues in the model i.e., autocorrelation, heteroscedasticity or endogeneity. Even then because of the difference in estimation technique, the results of one technique cannot be ignored. Hence, both independent variables have a significant negative impact on NIM. These results are supported by the previously available literature (Dietrich et al., 2014; A. Sidhu, Virk, Rastogi, Gupte, et al., 2022b; A. V. Sidhu, Rastogi, Gupte, Rawal, et al., 2022). Therefore, it can be said that the NIM of conventional banks in Pakistan decreases with the increase in the percentage of LCR. The results endorsed the findings of Adesina, (2021) and Bertay et al., (2015) that the cost of high liquidity increases interest expenses, thus, resulting in a negative relationship between LCR and NIM. This study concludes that there is a significant impact of Basel III liquidity standards on conventional banks of Pakistan, thus accepting hypothesis 2a.

The results also highlighted the impact of bank-specific as well as country-specific variables on the NIM of conventional banks in Pakistan. It can be seen from the results that both bank-specific variables, Size has a significant negative impact on impact on NIM and Cost has a significant positive impact on NIM. Here, we can say that increase in size reduces the NIM. Even though larger banks may have certain advantages in terms of economies of scale, they may also face greater competition and regulatory scrutiny, which can increase their funding costs and reduce their NIM. This result is in line with previous work (Hoang et al., 2020; Islam & Nishiyama, 2016; Khan & Jalil, 2020). Cost as a measure of efficiency also presents a positive relationship with NIM. A lower ratio represents efficient management. Banks with lower non-interest expenses can potentially earn higher profits from their lending activities, as banks often transfer the added expenses of hiring more staff and other operational costs to their

clients by increasing the interest margin which leads to lower financial intermediation costs (Afrin et al., 2022).

Lastly, the impact of macroeconomic variables, namely GDP and inflation NIM has also been presented in table 5.21. Results show that GDP is found to have a significant negative impact on NIM, and no impact of inflation is found on NIM. The GDP growth rate has a direct impact on the demand and supply of deposits and loans, which affects banking activities. Researchers such as Demirgüç-Kunt and Huizinga, (1999) and Tarus et al., (2012) have examined the significance of economic growth rate in determining bank interest margins and have found an inverse relationship. Economic growth leads to prosperity in the economy, creating opportunities for investors to invest and for banks to finance green field projects. Banks can operate in a more favorable environment, which can result in lower interest margins (M. S. Islam & Nishiyama, 2016). The result for inflation is in contrast with the previous work, in which a negative significant impact of inflation on NIM was found (Dwumfour, 2019; Ebrahimi et al., 2021; Farooq et al., 2021; Khan & Jalil, 2020). Afrin et al., (2022), also found an insignificant impact of inflation on intermediation costs in Bangladesh.

Table 4.21 Estimation results of NIM using GMM and Driscoll-Kraay Estimation Models

Variables	GMM		DK	
	Coefficients	Standard Error	Coefficients	Standard Error
NSFR	-0.0004	0.1260	-0.0108*	0.0054
LCR	-0.0078*	0.0035	-0.0064	0.0052
Size	-0.0043**	0.0042	-0.0028***	0.0009
Cost	0.3951***	0.0021	0.1666*	0.0873
GDP	-0.0579***	0.1227	-0.0496***	0.0115
Inf	-0.0271	0.0114	-0.0001	0.0163
Chi Sq	280.62***			
No. of Observations	204		255	
No. of Banks	17		17	

No. of Instruments	10	
Hansen test (p-value)	0.1430	
AR (2) test (p-value)	0.9060	
R ²		0.2660
F-Stat		42.48***
<p>Notes: “This table presents two-step difference generalized methods of moments (GMM) and Dricoll-Kraay (DK) Covariance estimator with NIM, which is a proxy for intermediation cost (dependent variable). NIM is a ratio of the difference between interest income and interest expense with total assets. Size is a log of assets; Cost is a ratio of non-interest expense to total asset non-performing loans to gross loans; GDP is GDP growth; Inf is the annual inflation rate (CPI). The sample is comprised of 255 firm-year observations across 17 banks for the period 2007-2021. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively.”</p>		

4.4.7 Discussion

Basel III liquidity requirements, which include the Net Stable Funding Ratio (NSFR) and Liquidity Coverage Ratio (LCR), are intended to ensure that banks have sufficient liquidity to weather financial shocks and crises. However, these requirements may also have unintended consequences, such as increasing the cost of intermediation for banks. The negative impact of NSFR and LCR on the net interest margin (NIM) of conventional banks in Pakistan could be due to several factors. First, NSFR requires banks to maintain a certain level of stable funding, which can limit their ability to engage in short-term, high-yield lending activities. This can lead to a reduction in revenue streams, resulting in lower NIMs. Second, LCR requires banks to hold a certain amount of high-quality liquid assets, such as government securities, to cover potential short-term liquidity needs. However, these assets typically offer lower returns than other types of assets, such as corporate bonds or loans. This can reduce the overall profitability of a bank's asset portfolio and, in turn, lower NIM. Additionally, the increased regulatory compliance costs associated with meeting these liquidity requirements may also contribute to lower NIM for banks. Compliance costs can be significant, especially for smaller banks that lack the resources to implement complex liquidity management systems.

Overall, while the Basel III liquidity requirements are intended to promote financial stability, they can have unintended consequences for banks, including lower NIM. It is important for policymakers to carefully consider the potential costs and benefits of regulatory reforms to ensure that the overall impact on the financial system is positive.

4.4.7.1 Theoretical Support

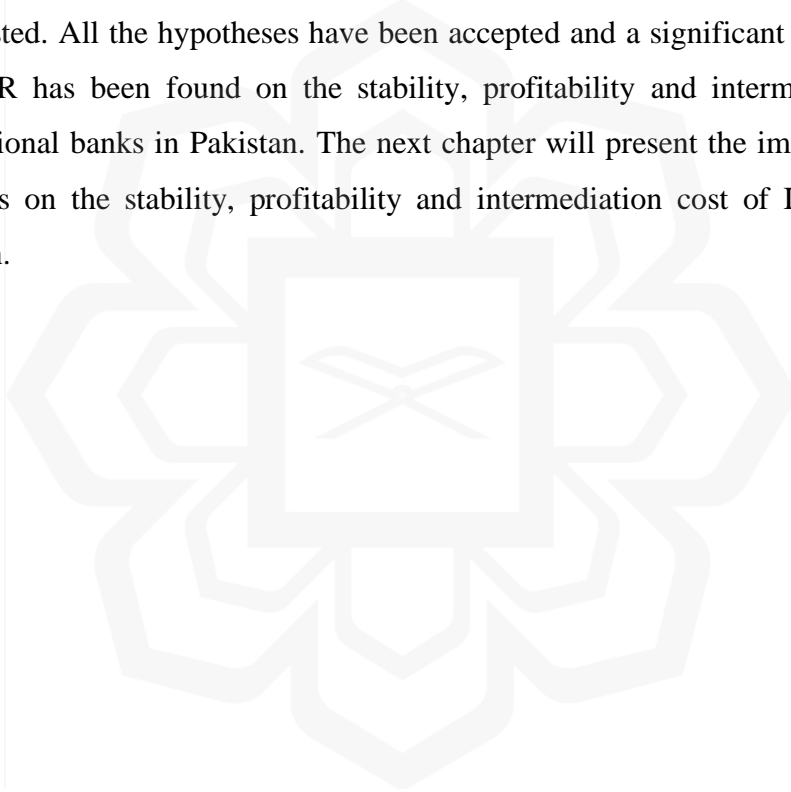
Financial Intermediation Theory: This theory explains the negative impact of liquidity requirements on NIM by emphasizing the trade-off between liquidity and profitability. While NSFR and LCR enhance stability by ensuring banks have sufficient liquid assets, they also restrict banks' ability to engage in profitable lending activities. The positive impact of operational costs on NIM aligns with this theory, as banks transfer higher operational costs to borrowers through higher interest margins, reflecting the cost structures inherent in financial intermediation. The significant negative impact of GDP on NIM is consistent with this theory, as economic growth often leads to increased competition and more favorable lending conditions, reducing the need for high-interest margins. The positive impact of cost on NIM can be interpreted through the lens of financial intermediation, where banks transfer operational costs to borrowers through higher interest rates, thereby maintaining their profitability. This theory underscores the trade-off between maintaining liquidity and achieving higher returns, explaining the dynamic interactions between bank size, costs, and economic conditions on NIM (Demirgüç-Kunt & Huizinga, 1999; Tarus et al., 2012).

Asset-Liability Management (ALM) Theory: The negative impact of NSFR on NIM can be understood through the lens of ALM Theory, which emphasizes the importance of stable funding for maintaining liquidity. This requirement limits banks' ability to engage in high-yield, short-term lending, thus reducing their interest margins. ALM, as an extension of liability management, supports this by highlighting the trade-off between maintaining liquidity and achieving higher returns. The negative impact of bank size on NIM can be explained by the increased complexity and regulatory scrutiny faced by larger banks, which may elevate their funding costs. Conversely, the positive impact of cost on NIM aligns with ALM principles, as efficient management of

operational expenses allows banks to better manage their interest margins. This efficiency can enhance the bank's ability to generate profits from its lending activities, reflecting the ALM approach of balancing liquidity and profitability (Ali, 2013; Asutay, 2015; Khan, 2010).

4.5 CONCLUSION

In this chapter impact of Basel III liquidity standards on the stability, profitability and intermediation cost of conventional banks in Pakistan has been studied and hypotheses were tested. All the hypotheses have been accepted and a significant impact of NSFR and LCR has been found on the stability, profitability and intermediation cost of conventional banks in Pakistan. The next chapter will present the impact of the same variables on the stability, profitability and intermediation cost of Islamic banks in Pakistan.



CHAPTER FIVE

IMPACT OF BASEL III LIQUIDITY STANDARDS ON

STABILITY, PROFITABILITY AND INTERMEDIATION COST

OF ISLAMIC BANKS IN PAKISTAN

5.1 INTRODUCTION

Basel III liquidity standards namely NSFR and LCR are implemented in Pakistan in 2017. The standards are applied to all types of banks simultaneously. In this research impact of these variables has been studied on the stability, profitability and intermediation cost of Islamic banks in Pakistan. Therefore, in this chapter following hypotheses were tested are tested:

H_{1B}: There is an impact of NSFR and LCR on the stability of all full-fledged Islamic banks of Pakistan.

H_{2B}: There is an impact of Basel III liquidity requirements NSFR and LCR on the profitability (ROA) of all full-fledged Islamic banks (IBs) of Pakistan.

H_{3B}: There is an impact of NSFR and LCR on the intermediation cost of all full-fledged Islamic banks of Pakistan.

This chapter is divided into three parts. Each part provides complete detail of each model. The first part describes the impact of NSFR and LCR on the stability of Islamic banks. The second part explains the impact of NSFR and LCR on the profitability of Islamic banks and the last part explains the impact of NSFR and LCR on intermediation costs of Islamic banks of Pakistan.

5.2 IMPACT OF BASEL III LIQUIDITY REQUIREMENTS ON THE STABILITY OF FULL-FLEDGED ISLAMIC BANKS

5.2.1 Descriptive Statistics

Table 5.1 shows the distribution, central tendency and dispersion of the variables for all banks in the sample. The data is a balanced panel data, comprised of 4 Pakistani conventional banks for the period of 15 years from 2007 to 2021 with 60 observations.

Table 5.1 demonstrated that the mean value for the stability among the Islamic banks in Pakistan is 2.9335 while the maximum value is 4.3282 and the minimum is 2.2203. The liquidity standards indicators i.e. NSFR and LCR have an average value of 114.54% and 53.9% with variations of 0.1557 and 0.1124 respectively. The bank control variables: Size and Loan quality have mean values of 18.6771% and 6.52% respectively. The minimum values of these bank control variables are 16.0062% and 0.008%. The maximum values of these are 21.37% and 19.34% respectively. The macro-economic variables: GDP and Conc have average values of 4.62% and 46.68%. The maximum values for the country-specific variables are 6.15% and 56.58%. Lastly, the minimum values for these are -1.33% and 42.59% respectively.

Table 5.1 Descriptive Statistics – Stability Model (IB)

Variable	Obs	Mean	Std. Dev	Min	Max
Stab	60	2.9335	0.4803	2.2203	4.3282
NSFR	60	1.1454	0.1557	0.7737	1.6809
LCR	60	0.5390	0.1124	0.2830	0.8320
Size	60	18.6771	1.1608	16.0062	21.3667
LqIt	60	0.0652	0.0480	0.0008	0.1934
GDP	60	0.0362	0.0195	-0.0133	0.0615
Conc	60	0.4668	0.0306	0.4259	0.5658

5.2.2 Testing for Multicollinearity

In regression analysis, there should not be any multicollinearity among the explanatory variables of the model (Gujarati & Dawn, 2022). Variance Inflation Factor (VIF) assures the absence of multicollinearity (Myers, 1990). According to Gujarati and Dawn, (2022), the threshold value is 10, which means if the value of the VIF of a variable is less than 10 then it can be said that multicollinearity is not present. The results in Table 5.2 show that the VIF of all explanatory variable is less than 10, therefore, we can deduce that multicollinearity is not present in the variables.

Table 5.2 Variance Inflation Factor (VIF) – Stability Model

Variable	VIF	1/VIF
NSFR	4.91	0.203795
LCR	4.33	0.230864
GDP	1.61	0.619983
Conc	1.59	0.630663
Size	1.08	0.927551
Lq1t	1.02	0.98099
Mean VIF	2.42	

5.2.3 Testing for Cross-Sectional Dependence

The results of tests for cross-sectional dependence are shown in Table 5.3. To investigate contemporaneous correlation across banks, this study takes into account the results of the Breusch-Pagan LM test, Pesaran scaled LM test, bias-corrected scaled LM test, and Pesaran CD test. The null hypothesis is no cross-sectional dependence. Results show that there is no cross-sectional dependence at a 5% significance level in the model. Hence, panel ARDL is suitable for analysis.

Table 5.3 Tests for Cross-Sectional Dependence – Stability Model (IB)

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	11.96509	6	0.0628
Pesaran scaled LM	0.567272		0.5705
Pesaran CD	1.525288		0.1272

5.2.4 Testing for Stationarity

Im Pesaran Shin (IPS) unit root test results are presented in table 5.4. Before applying the ARDL model, it is essential to check that each variable's unit root is stationary at I(2); otherwise, the studied findings will produce unexpected conclusions. The results show that NSFR and GDP are stationary at level, that is I(0) while, Stab, LCR, Size and Lq1t are stationary at I(1). This shows that data is suitable for the application of ARDL.

Table 5.4 Tests for Cross-Sectional Dependence – Stability Model (IB)

Variable	At Level	At difference
Stab	-1.2617	-3.9930***
NSFR	-1.5675**	
LCR	-1.2162	-2.6853**
Size	-1.0421	-3.5060***
Lq1t	-1.1188	-3.1367***
GDP	-2.9820**	
Conc	-1.5205*	

5.2.5 Testing for Cointegration

Kao residual cointegration test was performed to determine if there is a long-run relationship between two or more time series variables. Table 5.5 presents the results of

the Kao test. Results show that the t-statistic for the ADF test is -3.442494, which is the test statistic for the null hypothesis that there is no cointegration. Here the test is significant at the 1% level of significance, as the probability is reported as 0.0003. This suggests strong evidence of cointegration between the variables. Next, the residual variance is reported as 0.005225, which is the variance of the residuals from the cointegrating regression. This measures the degree of spread or dispersion of the residuals around the regression line. A low value suggests that the residuals are tightly clustered around the regression line, indicating a good fit for the model. Lastly, the HAC variance is reported as 0.002638, which is the heteroscedasticity and autocorrelation-consistent (HAC) variance estimator. This estimator is used to adjust the standard errors of the estimates in case of heteroscedasticity and autocorrelation in the residuals. A low value suggests that the model has a good fit and does not suffer from heteroscedasticity or autocorrelation.

In conclusion, the Kao residual cointegration test provides strong evidence of cointegration between the variables. The residuals are tightly clustered around the regression line, indicating a good fit of the model, and there is no evidence of heteroscedasticity or autocorrelation in the residuals.

Table 5.5 Kao Residual Cointegration Test – Stability Model

	t-Statistic	Prob.
ADF	-3.442494	0.0003
Residual variance	0.005225	
HAC variance	0.002638	

5.2.6 Model Selection

The Hausman test is used to select the most preferred model for ARDL among MG, PMG or DFE. Table 5.6 shows the Hausman results. It is evident that the p-values for

both MG or PMG and DFE or PMG are greater than 0.05, therefore PMG is the preferred model for this research.

Table 5.6 Hausman Test – Stability Model

Ho: Difference in coefficients not systematic	MG and PMG	DFE and PMG
chi2(6)	0.00	2.39
<i>p</i> -value	1.000	0.8811
Which model is good?	PMG	PMG

5.2.7 Panel ARDL-PMG Model for Stability

Panel ARDL model with PMG estimator has been applied to test the hypothesis of the research. Results are presented in table 5.7. For the selection of optimal lags in the model, Akaike information criteria (AIC) and Bayesian information criterion (BIC) have been used. Lags with the lowest values are selected. The optimal lags chosen for this study are (1 1 1 1 1 1). Long-run and short-run results are estimated. Table 6.7 presents the results of the long-run and short-run models of ARDL.

Table 5.7 Panel ARDL Estimation Results using PMG Estimator – Stability Model

	Coeff.	S.E.
<i>Short-run estimates</i>		
Cons	0.4696***	0.1327
D(NSFR)	0.3294	0.6219
D(LCR)	0.2911	0.3202
D(Size)	-0.4166*	0.2526
D(Lq1t)	-0.4181	0.6376

D(GDP)	-0.9913	1.2520
D(Conc)	-1.7603	1.1759
ECT	-0.4476**	0.2203
<i>Long-run estimates</i>		
NSFR	-0.4167	0.5456
LCR	1.3019*	0.7824
Size	0.0809*	0.0435
Lq1t	-2.4983***	0.6194
GDP	-11.0981*	5.7425
Conc	1.7895	7.2807
Optimal lags (1 1 1 1 1 1)		
<p>Notes: This table presents ARDL-PMG estimator results with a natural log of z-score, which is a proxy for stability (dependent variable). Z-score is a ratio of the sum of mean ROA and CAR with a standard deviation of ROA. Size is a natural log of assets; Lq1t is a ratio of non-performing loans to gross loans; GDP is GDP growth rate; Conc is a ratio of assets of 5 large banks to total industry assets. The sample is comprised of 60 firm-year observations across 4 banks for the period 2007-2021. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively.</p>		

In the short run, none of the independent variables or control variables is found to have a significant impact on the stability of full-fledged Islamic banks of Pakistan except size. Size is found negatively significant at a 10% level of significance. It can be said that a 1% increase in size will lead to -a .41% decrease in stability. (Ashraf et al., 2016; Schwerter, 2011) also found a negative significant impact of size on Stability. Overall, the results suggested that in Pakistan, the liquidity ratios NSFR and LCR may not have a significant impact on the stability of the Islamic banking sector in the short run.

The error correction term (ECT) represents how fast the system returns to long-run equilibrium after short-run disequilibrium. The ECT parameter would be extremely negative, in ideal cases. In our model, the PMG estimate has a negative ECT that is statistically significant at the 1% level. According to the PMG estimate's coefficient of the ECT, or speed of adjustment towards equilibrium, which is -0.4476 for full-fledged

Islamic banks in Pakistan, the deviation of variables from short-run disequilibrium to long-run equilibrium is significantly adjusted and corrected by 0.45% annually.

In practical terms, this means that if there is a shock to one or more of the independent variables (such as a change in NSFR or LCR), it may take some time for bank stability to adjust to the new equilibrium level. However, the ECT coefficient suggests that the adjustment process will eventually occur and that bank stability will return to its long-run equilibrium level. Therefore, policymakers and practitioners should consider the long-term effects of liquidity standards and other factors on bank stability, rather than focusing solely on short-term fluctuations.

Table 5.7 also presents the long-run results. Results show that in the long run, NSFR has no impact on the stability of the Islamic banks of Pakistan. While LCR has a weak significant impact on the stability of Islamic banks of Pakistan at a 10% significance level for PMG estimates. This shows that a 1% increase in LCR will improve stability by 1.3%. The results cannot be refuted or supported because there is a dearth of empirical data available to assess the effect of Basel III liquidity ratios on the stability of Islamic institutions. However, in the general context of the banking industry, NSFR has shown a contrasting result, as previous studies have found a significant positive impact of NSFR on the stability of banks (Hossain et al., 2018; L'Huillier et al., 2018; Polizzi et al., 2020). The results for LCR are supported by the literature in which a significant positive impact of LCR has been found on the stability of banks (Hossain et al., 2018; Polizzi et al., 2020).

A study of control variables in the long run shows that both bank-specific variables, Size and Lq1t are found significant at 10% and 1% significance level respectively. This shows that in the long run, a 1% increase in size will improve stability by 0.08%, and a 1% increase in Lq1t will decrease the stability by 2.50%. These results are in-line with past literature (Ashraf et al., 2016; Ozili, 2015; Rizvi et al., 2020; Velliscig et al., 2022). With respect to external variables, GDP is found to have a significant negative impact on stability at a 10% significance level and Conc is found to have an insignificant impact. These results are also supported by previous research (Ali & Iness, 2020; Hossain et al., 2018).

5.2.8 Discussion

Overall, the results show that in the context of the Islamic banking industry in Pakistan, the ARDL results suggest that both the NSFR and LCR are relevant liquidity measures for ensuring the long-term stability of Islamic banks. The significant positive coefficient for LCR, in the long run, indicates that a higher level of LCR compliance is associated with greater stability of Islamic banks in Pakistan over the long term. This finding is consistent with the Basel III framework, which requires banks to hold sufficient high-quality liquid assets to meet their liquidity needs over a 30-day stress period.

On the other hand, the non-significant coefficient for NSFR, in the long run, suggests that compliance with this measure may not have a significant impact on the stability of Islamic banks in Pakistan over the longer term. This finding is somewhat surprising, as the NSFR is considered a critical liquidity measure that aims to ensure banks' funding stability over a one-year horizon. However, this may be because Islamic banks in Pakistan already have excess liquidity (Faisal et al., 2020; Majeed & Zainab, 2021). In other words, if a bank already has a high level of stable funding or excess liquidity, then an increase in NSFR may not have a significant impact on the bank's stability. This could explain why the NSFR variable was found to be insignificant in the given ARDL model.

In the short run, the results show that neither NSFR nor LCR has a significant impact on the stability of Islamic banks in Pakistan. One of the possible reasons for this is the presence of excess liquidity. As it is highlighted before, in the presence of excess liquidity Islamic banks do not face any liquidity constraints and therefore, in the short run changes in NSFR or LCR do not have any influence on stability. However, it is important to note that the short-run results may be subject to some degree of volatility, and the long-run results may be more reliable for policy and decision-making purposes.

It is also worth noting that the impact of NSFR on bank stability may vary depending on the specific characteristics of the banking system and the macroeconomic environment in which it operates. For example, if the banking system is already highly liquid and stable, then the impact of NSFR on bank stability may be less significant. On the other hand, if the banking system is less liquid and more vulnerable to shocks, then NSFR may have a greater impact on bank stability.

Overall, the results suggest that compliance with both the NSFR and LCR measures may be important for maintaining the stability of Islamic banks in Pakistan. However, it is important to consider the unique characteristics of the Islamic banking industry, such as excess liquidity, and limited availability of money market instruments, when interpreting these results and developing policies to enhance the liquidity and stability of Islamic banks.

5.2.8.1 Theoretical Support

In the short run, the analysis reveals that the independent variables, including the NSFR and LCR, do not significantly impact the stability of full-fledged Islamic banks in Pakistan, except for the bank size, which negatively affects stability. This lack of short-term significance can be contextualized using the *Financial Intermediation Theory*. According to this theory, banks play a crucial role in mobilizing savings and allocating capital efficiently. Islamic banks, in particular, may be less sensitive to short-term liquidity measures like NSFR and LCR due to their unique operational frameworks and excess liquidity. The focus on profit-sharing and risk-avoidance principles in Islamic banking often means these institutions are inherently more cautious, potentially dampening the short-term effects of liquidity ratios. From the perspective of Financial Intermediation Theory, the positive impact of LCR on stability in the long-run can also be understood. By maintaining a higher level of liquid assets, Islamic banks are better positioned to fulfill their intermediation role during periods of financial stress. This increased liquidity reassures depositors and investors, reducing the risk of runs and enhancing overall stability. However, the lack of significant impact from NSFR in the long run suggests that Islamic banks, possibly due to their existing liquidity management frameworks and conservative approach to funding, do not see additional stability benefits from the NSFR requirements.

ALM is concerned with the strategic management of assets and liabilities to balance risks and ensure liquidity. The negative impact of size on stability in the short run suggests that larger Islamic banks might struggle with efficient ALM due to increased complexity and regulatory pressures. In the absence of significant short-term effects from NSFR and LCR, it can be inferred that these banks may already have robust

liquidity management practices that mitigate the immediate impact of these regulatory measures. The long-run results indicate that NSFR does not significantly affect stability, while LCR has a weak positive impact on stability. This aligns with ALM Theory, which emphasizes the importance of maintaining a balance between assets and liabilities to manage liquidity and interest rate risks effectively. The LCR, which requires banks to hold a buffer of high-quality liquid assets, ensures that banks can meet short-term obligations without jeopardizing their financial stability. For Islamic banks, adhering to the LCR standard may enhance their resilience against liquidity shocks, thereby positively influencing their long-term stability.

Control variables in the long run also show significant results. Size positively impacts stability by 0.08% with a 1% increase, while liquidity (Lq1t) negatively impacts stability by 2.50% with a 1% increase. These findings align with the Financial Intermediation Theory and ALM Theory, where effective asset and liability management is crucial for bank stability. A well-managed increase in bank size can enhance economies of scale and operational efficiency, contributing to stability. However, excessive liquidity, as suggested by Lq1t's negative impact, can imply inefficient use of resources, leading to reduced stability.

5.3 IMPACT OF BASEL III LIQUIDITY REQUIREMENTS ON THE PROFITABILITY OF FULL-FLEDGED ISLAMIC BANKS

5.3.1 Descriptive Statistics

Table 5.8 shows the distribution, central tendency and dispersion of the variables for all banks in the sample. The data is a balanced panel data, comprised of 4 Pakistani conventional banks for the period of 15 years from 2007 to 2021 with 60 observations.

The descriptive analysis shows that the mean value for the ROA among the Islamic banks in Pakistan is 2.9335 while the maximum value is 4.3282 and the minimum is 2.2203. The liquidity standards indicators i.e. NSFR and LCR have an average value of 114.54% and 53.9% with variations of 0.1557 and 0.1124 respectively. The bank control variables: Size and Loan quality have mean values of 18.6771% and 6.52% respectively. The minimum values of these bank control variables are 16.0062%

and 0.008%. The maximum values of these are 21.37% and 19.34% respectively. The macro-economic variables: GDP and Conc have average values of 4.62% and 46.68%. The maximum values for the country-specific variables are 6.15% and 56.58%. Lastly, the minimum values for these are -1.33% and 42.59% respectively.

Table 5.8 Descriptive Statistics for ROA Model (IB)

Variable	Obs	Mean	Std. Dev	Min	Max
ROA	60	0.0052	0.0123	-0.0285	0.0436
NSFR	60	1.1454	0.1557	0.7737	1.6809
LCR	60	0.5390	0.1124	0.2830	0.8320
Size	60	18.6771	1.1608	16.0062	21.3667
Cost	60	0.0322	0.0118	0.0085	0.0727
GDP	60	0.0362	0.0195	-0.0133	0.0615
Conc	60	0.4668	0.0306	0.4259	0.5658

5.3.2 Testing for Multicollinearity

In regression analysis, there should not be any multicollinearity among the explanatory variables of the model (Gujarati & Dawn, 2022). Variance Inflation Factor (VIF) assures the absence of multicollinearity (Myers, 1990). According to Gujarati and Dawn, (2022), the threshold value is 10, which means if the value of the VIF of a variable is less than 10 then it can be said that multicollinearity is not present. The results in Table 5.9 show that the VIF of all explanatory variables is less than 10, therefore, we can deduce that multicollinearity is not present in the variables.

Table 5.9 Variance Inflation Factor (VIF) – ROA Model

Variable	VIF	1/VIF
NSFR	4.92	0.2033
LCR	4.27	0.2340
GDP	1.75	0.5704
Conc	1.67	0.5991
Size	1.60	0.6248
Lq1t	1.58	0.6316
Mean VIF	2.63	

5.3.3 Testing for Cross-Sectional Dependence

The results of tests for cross-sectional dependence are shown in Table 5.10. To investigate contemporaneous correlation across banks, this study takes into account the results of the Breusch-Pagan LM test, Pesaran scaled LM test, bias-corrected scaled LM test, and Pesaran CD test. The null hypothesis is no cross-sectional dependence. Results show that there is no cross-sectional dependence at a 10% significance level in the model. Hence, panel ARDL is suitable for analysis.

Table 5.10 Tests for Cross-Sectional Dependence in ROA Model (IB)

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	11.14508	6	0.0840
Pesaran scaled LM	0.330557		0.7410
Pesaran CD	-1.852911		0.0639

5.3.4 Testing for Stationarity

Im Pesaran Shin (IPS) unit root test results are presented in table 5.11. Before applying the ARDL model, it is essential to check that each variable's unit root is stationary at I(2); otherwise, the studied findings will produce unexpected conclusions. The results show that except LCR and Size, all variables are stationary at level that is I(0) while LCR and Size are stationary at I(1). This shows that data is suitable for the application of ARDL.

Table 5.11 Unit Root Test – ROA Model (IB)

Variable	At Level	At difference
ROA	-1.8494**	
NSFR	-1.5675**	
LCR	-1.2162	-2.6853**
Size	-1.0421	-3.5060***
Cost	-1.8533**	
GDP	-2.9820**	
Conc	-1.5205*	

5.3.5 Testing for Cointegration

Kao residual cointegration test was performed to determine if there is a long-run relationship between two or more time series variables. Table 5.12 presents the results of the Kao test. The null hypothesis is there is no cointegration Results show that the t-statistic for the ADF test is -5.1079 which is statistically significant at a 1% level of significance. This suggests strong evidence of cointegration between the variables. Next, the residual variance is reported as 0.0055, which is the variance of the residuals from the cointegrating regression. This measures the degree of spread or dispersion of the residuals around the regression line. A low value suggests that the residuals are tightly clustered around the regression line, indicating a good fit for the model. Lastly,

the HAC variance is reported as 0.0030, which is the heteroscedasticity and autocorrelation-consistent (HAC) variance estimator. This estimator is used to adjust the standard errors of the estimates in case of heteroscedasticity and autocorrelation in the residuals. A low value suggests that the model has a good fit and does not suffer from heteroscedasticity or autocorrelation.

In conclusion, the Kao residual cointegration test provides strong evidence of cointegration between the variables. The residuals are tightly clustered around the regression line, indicating a good fit of the model, and there is no evidence of heteroscedasticity or autocorrelation in the residuals.

Table 05.12 Kao Residual Cointegration Test – ROA Model

	t-Statistic	Prob.
ADF	-5.107948	0.0000
Residual variance	0.005498	
HAC variance	0.002993	

5.3.6 Model Selection

The Hausman test is used to select the most preferred model for ARDL among MG, PMG or DFE. Table 5.13 shows the Hausman results. It is evident that the p-values for both MG or PMG and DFE or PMG are greater than 0.05, therefore PMG is the preferred model for this research.

Table 5.13 Hausman Test - ROA Model (IB)

Ho: Difference in coefficients not systematic	MG and PMG	DFE and PMG
chi2(6)	0.00	1.32
p-value	1.000	0.9708
Which model is good?	PMG	PMG

5.3.7 Panel ARDL-PMG Model for ROA

Panel ARDL model with PMG estimator has been applied to test the hypothesis of the research. For the selection of optimal lags in the model, Akaike information criteria (AIC) and Bayesian information criterion (BIC) have been used. Lags with the lowest values are selected. The optimal lags chosen for this study are (1 1 0 0 1 0 1). Long-run and short-run results are estimated. Table 5.14 presents the results of the long-run and the short-run models of ARDL.

Table 5.14 Panel ARDL Estimation Results using PMG Estimator – ROA Model

	Coeff.	S.E.
<i>Short-run estimates</i>		
Cons	-0.0346	0.0239
D(NSFR)	-0.3832	0.0880
D(LCR)	0.2551	0.0565
D(Size)	-0.0112	0.0028
D(Cost)	2.3846	0.9944
D(GDP)	-0.7694	0.1678
D(Conc)	1.7751	0.4281
ECT	-0.1371*	0.0793
<i>Long-run estimates</i>		

NSFR	-0.3832***	0.0880
LCR	0.2551***	0.0565
Size	-0.0112***	0.0028
Cost	2.3846**	0.9944
GDP	-0.7694***	0.1678
Conc	1.7751***	0.4281
Optimal lags (1 1 0 0 1 0 1)		
<p>Notes: “This table presents ARDL-PMG estimator results with a natural log of z-score, which is a proxy for ROA (dependent variable). ROA is a percentage of net profit after tax to total assets; Size is a natural log of assets; Cost is a ratio of non-interest expense to total assets and non-performing loans to gross loans; GDP is GDP growth rate; Conc is a ratio of assets of 5 large banks to total industry assets. The sample is comprised of 60 firm-year observations across 4 banks for the period 2007-2021. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively.”</p>		

In the short run, none of the independent variables or control variables is found to have a significant impact on the profitability of full-fledged Islamic banks of Pakistan except size. Overall, the results suggested that in Pakistan, the liquidity ratios NSFR and LCR may not have a significant impact on the stability of the Islamic banking sector in the short run.

The error correction term (ECT) represents how fast the system returns to long-run equilibrium after short-run disequilibrium. The ECT parameter would be extremely negative, in ideal cases. In our model, the PMG estimate has a negative ECT that is statistically significant at the 10% level. According to the PMG estimate's coefficient of the ECT, or speed of adjustment towards equilibrium, which is -0.1371 for full-fledged Islamic banks in Pakistan, the deviation of variables from short-run disequilibrium to long-run equilibrium is significantly adjusted and corrected by 0.14% annually.

In practical terms, this means that if there is a shock to one or more of the independent variables (such as a change in NSFR or LCR), it may take some time for bank stability to adjust to the new equilibrium level. However, the ECT coefficient suggests that the adjustment process will eventually occur and that bank stability will

return to its long-run equilibrium level. Therefore, policymakers and practitioners should consider the long-term effects of liquidity standards and other factors on bank stability, rather than focusing solely on short-term fluctuations.

Table 5.14 also presents the long-run results. Results show that in the long run, NSFR and LCR both have a significant impact on ROA at a 1% significance level. NSFR has a significant negative impact on ROA and LCR has a significant positive impact on ROA. This shows that a 1% increase in NSFR will decrease ROA by 38.32% and a 1% increase in LCR will improve the ROA by 25.51%. The results cannot be refuted or supported because there is a dearth of empirical data available to assess the effect of Basel III liquidity ratios on the stability of Islamic institutions. However, in the general context of the banking industry, there is an inverse correlation between a bank's NSFR and its profitability. A higher NSFR indicates that the bank holds more low- to medium-quality assets, which in turn results in lower profits. Thus, the more a bank's NSFR increases, the more its profitability is expected to decrease (Le et al., 2020). The results for LCR are supported by the literature in which a significant positive impact of LCR has been found on the profitability of banks (Abbas et al., 2019; Bibi & Mazhar, 2019; Mashamba, 2018). Therefore, we accept our second hypothesis of a significant impact of NSFR and LCR on ROA on full-fledged Islamic banks in Pakistan.

A study of control variables in the long run shows that both bank-specific variables, Size and Cost are found significant at 1% and 5% significance levels respectively. Size has a significant negative impact on ROA and Cost has a significant positive impact. This shows that in the long run, a 1% increase in size will decrease ROA by 1.11% and a 1% increase in Cost will increase ROA by 2.380 units. This shows that although bigger banks may benefit from economies of scale, they acknowledge that larger organizations can often be rigid and slow to seize market opportunities due to bureaucratic procedures. As a result, their operational efficiency and performance may be adversely affected (Petria et al., 2015). Also, as highlighted by Molyneux and Thornton, (1992), an inverse relationship can exist between Cost and profitability because profitability can be increased by spending more on human resources, therefore, increase payroll expenses can also increase the profitability of banks. This statement has also been endorsed by other researchers as well (Al-Harbi, 2019; Athanasoglou et al., 2006).

With respect to external variables, GDP is found to have a significant negative impact on ROA at a 1% significance level and Conc is found to have a significant positive impact at a 1% level of significance. As found by Rehman et al., (2018), economic growth can have a negative impact on bank profitability by leading to an increase in non-performing loans. They explain that during periods of high growth, there may be a greater allocation of credit to customers who may not be qualified or have the capacity to repay the loans they have taken. These results are also supported by previous research (Rashid & Jabeen, 2016; Singh & Sharma, 2016). Also, as highlighted by Molyneux and Thornton, (1992) and Yuanita, (2019), a rise in concentration results in lower competition and higher profitability, as greater market power, which is fueled by growth and concentration, is the primary driver of profitability.

5.3.8 Discussion

Overall, the results show that in the context of the Islamic banking industry in Pakistan, the ARDL results suggest that both the NSFR and LCR are not relevant liquidity measures for short-term profitability but are significantly relevant for ensuring the long-term profitability of Islamic banks. One of the possible reasons for the insignificant impact of Basel III liquidity regulations on profitability is the presence of excess liquidity (Faisal et al., 2020; Majeed & Zainab, 2021) the Islamic banks in Pakistan are not facing significant liquidity constraints in the short run, which means that changes in NSFR and LCR do not have an immediate impact on their profitability. In such a case, the impact of these variables may only become apparent in the long run when banks face more significant liquidity constraints.

In the long run, NSFR has shown a negative impact on ROA. One possible explanation for this is that the NSFR imposes a liquidity buffer requirement that restricts banks' ability to engage in profitable activities. As a result, banks may be forced to hold excess cash or low-yielding assets to meet the requirement, which can reduce their profitability in the long run. It is important to note that the NSFR was introduced as a key component of Basel III, to promote a more stable and resilient banking system by

ensuring that banks have sufficient liquidity to meet their funding needs in times of stress. The NSFR aims to achieve this goal by encouraging banks to hold a stable funding base, such as deposits or long-term debt, rather than relying on short-term funding sources. While the negative impact of NSFR on ROA may seem to contradict the original intention of Basel III, it is important to remember that the regulation was introduced to promote the stability and resilience of the banking system, rather than to maximize bank profitability. Therefore, the negative impact of NSFR on ROA may be seen as a necessary trade-off for achieving a more stable and resilient banking system. According to Ashraf (2016), ROA has a negative and significant impact on the stability of Islamic banks. Therefore, the trade-off between stability and ROA is evident from that research too. In summary, while the NSFR may have a negative impact on ROA in the long run, it is important to view this in the context of its intended purpose of promoting a more stable and resilient banking system.

The LCR is designed to ensure that banks have enough high-quality liquid assets to survive a short-term liquidity stress event. In the short term, the presence of excess liquidity in Islamic banks may make the LCR less relevant as these banks may already have enough high-quality liquid assets to meet any short-term liquidity demands. However, in the long term, the LCR can support the profitability of Islamic banks by ensuring that they have a sufficient buffer of high-quality liquid assets to weather any unexpected shocks to their liquidity. This can reduce the probability of default and increase the confidence of depositors, investors, and other stakeholders, which can ultimately lead to higher profitability. Additionally, meeting the LCR requirements can also improve the reputation of the bank and enhance its standing in the market, which can also positively impact profitability in the long run.

5.3.8.1 Theoretical Support

According to Financial Intermediation Theory, banks serve as intermediaries between savers and borrowers, facilitating the efficient allocation of resources. Islamic banks, in particular, adhere to Shariah principles which include risk-sharing and prohibition of interest. These unique characteristics influence their financial intermediation processes.

The lack of short-term significance for NSFR and LCR suggests that Islamic banks in Pakistan may not immediately translate liquidity compliance into profitability. This could be due to their existing liquidity surplus and the nature of their intermediation activities, which prioritize stability and compliance with Shariah principles over short-term profit maximization. From a Financial Intermediation perspective, the long-term negative impact of NSFR on ROA can be attributed to the requirement for Islamic banks to hold a stable funding base. This often involves holding more low- to medium-quality assets, which generate lower returns. This aligns with the theory's view that banks must balance between maintaining stability and achieving profitability. The positive impact of LCR on ROA, however, suggests that holding high-quality liquid assets can enhance profitability by ensuring banks are better prepared for liquidity shocks, thus maintaining depositor and investor confidence, which is critical for sustained profitability.

ALM Theory deals with managing the risks arising from the mismatches between the assets and liabilities of banks, particularly focusing on liquidity and interest rate risks. In the context of Islamic banks, the ALM framework is adjusted to comply with Shariah laws, which adds a layer of complexity. The non-significant short-term impact of NSFR and LCR indicates that Islamic banks might have robust ALM practices that mitigate immediate profitability impacts from liquidity standards. The significant negative impact of size on profitability could reflect the inefficiencies in managing larger, more complex asset portfolios within the ALM framework, leading to reduced short-term profits. The long-term dynamics of these variables can also be explained through ALM theory. The NSFR's negative impact on profitability reflects the constraints imposed on banks to maintain a stable funding structure, which can limit their ability to engage in more profitable, albeit riskier, investments. This trade-off is a core consideration in ALM, where the focus on stability may come at the cost of short-term profit maximization. Conversely, the positive impact of LCR on ROA is consistent with ALM principles, which advocate for maintaining a buffer of high-quality liquid assets. This buffer not only safeguards against liquidity crises but also enhances the bank's market reputation and investor confidence, ultimately contributing to higher long-term profitability.

5.4 IMPACT OF BASEL III LIQUIDITY REQUIREMENTS ON THE INTERMEDIATION COST OF FULL-FLEDGED ISLAMIC BANKS

5.4.1 Descriptive Statistics

Table 6.15 shows the distribution, central tendency and dispersion of the variables for all banks in the sample. The data is a balanced panel data, comprised of 4 Pakistani conventional banks for the period of 15 years from 2007 to 2021 with 60 observations.

Table 5.15 demonstrated that the mean value for the NPM among the Islamic banks in Pakistan is 3.331% while the maximum value is 5.21% and the minimum is 0.089%. The liquidity standards indicators i.e., NSFR and LCR have an average value of 114.54% and 53.9% with a variation of 0.1557 and 0.1124 respectively. The bank control variables: Size and Loan quality have mean values of 18.6771% and 6.52% respectively. The minimum values of these bank control variables are 16.0062% and 0.008%. The maximum values of these are 21.37% and 19.34% respectively. The macro-economic variables: GDP and Inf have average values of 3.62% and 9.08%. The maximum values for the country-specific variables are 6.15% and 20.29%. Lastly, the minimum values for these are -1.33% and 2.53% respectively. In the period of the financial crisis in 2008, the country recorded the highest percentage of inflation.

Table 5.15 Descriptive Statistics for NPM Model (IB)

Variable	Obs	Mean	Std. Dev	Min	Max
NPM	60	0.0331	0.0083	0.0089	0.0521
NSFR	60	1.1454	0.1557	0.7737	1.6809
LCR	60	0.5390	0.1124	0.2830	0.8320
Size	60	18.6771	1.1608	16.0062	21.3667
Cost	60	0.0322	0.0118	0.0085	0.0727
GDP	60	0.0362	0.0195	-0.0133	0.0615
Inf	60	0.0908	0.0445	0.0253	0.2029

5.4.2 Testing for Multicollinearity

In regression analysis, there should not be any multicollinearity among the explanatory variables of the model (Gujarati & Dawn, 2022). Variance Inflation Factor (VIF) assures the absence of multicollinearity (Myers, 1990). According to Gujarati and Dawn, (2022), the threshold value is 10, which means if the value of the VIF of a variable is less than 10 then it can be said that multicollinearity is not present. The results in Table 5.16 show that the VIF of all explanatory variables is less than 10, therefore, we can deduce that multicollinearity is not present in the variables.

Table 5.16 Variance Inflation Factor (VIF) for NPM Model

Variable	VIF	1/VIF
LCR	4.55	0.219985
NSFR	4.15	0.240984
Inf	2.07	0.483642
Size	2.05	0.488032
Cost	1.78	0.561002
GDP	1.61	0.619282
Mean VIF	2.70	

5.4.3 Testing for Cross-Sectional Dependence

The results of tests for cross-sectional dependence are shown in Table 5.17. To investigate contemporaneous correlation across banks, this study takes into account the results of the Breusch-Pagan LM test, Pesaran scaled LM test, bias-corrected scaled LM test, and Pesaran CD test. The null hypothesis is no cross-sectional dependence. Results

show that there is no cross-sectional dependence at a 5% significance level in the model. Hence, panel ARDL is suitable for analysis.

Table 5.17 Tests for Cross-Sectional Dependence in NPM

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	9.2236	6	0.1614
Pesaran scaled LM	-0.2241		0.8227
Pesaran CD	0.5383		0.5904

5.4.4 Testing for Stationarity

In Pesaran Shin (IPS) unit root test results are presented in table 5.18. Before applying the ARDL model, it is essential to check that each variable's unit root is stationary at I(2); otherwise, the studied findings will produce unexpected conclusions. The results show that NPM, NSFR, Cost and GDP are stationary at level that is I(0) while, LCR, Size and Inf are stationary at I(1). This shows that data is suitable for the application of ARDL.

Table 5.018 Unit Root Test- NPM Model

Variable	At Level	At difference
NPM	-2.2015**	
NSFR	-1.5675**	
LCR	-1.2162	-2.6853**
Size	-1.0421	-3.5060***
Cost	-1.8533**	
GDP	-2.9820***	
Inf	-1.0659	-4.9327***

5.4.5 Testing for Cointegration

The Kao residual cointegration test was performed to determine if there is a long-run relationship between two or more time series variables. Table 5.19 presents the results of the Kao test. Results show that the t-statistic for the ADF test is -1.378, which is the test statistic for the null hypothesis that there is no cointegration. Here the test is significant at the 10% level of significance, as the probability is reported as 0.0841. This suggests evidence of cointegration between the variables. Next, the residual variance is reported as 4.1e-05, which is the variance of the residuals from the cointegrating regression. This measures the degree of spread or dispersion of the residuals around the regression line. A low value suggests that the residuals are tightly clustered around the regression line, indicating a good fit for the model. Lastly, the HAC variance is reported as 2e-5, which is the heteroscedasticity and autocorrelation-consistent (HAC) variance estimator. This estimator is used to adjust the standard errors of the estimates in case of heteroscedasticity and autocorrelation in the residuals. A low value suggests that the model has a good fit and does not suffer from heteroscedasticity or autocorrelation.

In conclusion, the Kao residual cointegration test provides strong evidence of cointegration between the variables. The residuals are tightly clustered around the regression line, indicating a good fit of the model, and there is no evidence of heteroscedasticity or autocorrelation in the residuals.

Table 5.19 Kao Residual Cointegration Test -NPM Model

	t-Statistic	Prob.
ADF	-1.3780	0.0841
Residual variance	0.000041	
HAC variance	0.000020	

5.4.6 Model Selectionz

The Hausman test is used to select the most preferred model for ARDL among MG, PMG or DFE. Table 5.20 shows the Hausman results. It is evident that the p-values for both MG or PMG and DFE or PMG are greater than 0.05, therefore PMG is the preferred model for this research.

Table 5.20 Hausman Test- NPM Model

Ho: Difference in coefficients not systematic	MG and PMG	DFE and PMG
chi2(6)	0.00	2.82
<i>p</i> -value	1.000	0.4199
Which model is good?	PMG	PMG

5.4.7 Panel ARDL-PMG Model for NPM

Panel ARDL model with PMG estimator has been applied to test the hypothesis of the research. Results are presented in table 5.21. For the selection of optimal lags in the model, Akaike information criteria (AIC) and Bayesian information criterion (BIC) have been used. Lags with the lowest values are selected. The optimal lags chosen for this study are (1 1 0 1 1 1 1). Long-run and short-run results are estimated. Table 5.21 presents the results of the long-run and the short-run models of ARDL.

Table 5.21 Panel ARDL Estimation Results using PMG Estimator – NPM Model

	Coeff.	S.E.
<i>Short-run estimates</i>		
Cons	-0.0198***	0.0024
D(NSFR)	0.0194***	0.0042
D(LCR)	0.0310*	0.0180
D(Size)	-0.0050	0.0118
D(Cost)	0.4722***	0.1804
D(GDP)	-0.0912***	0.0217
D(Inf)	0.1173***	0.0366
ECT	-0.9826***	0.1295
<i>Long-run estimates</i>		
NSFR	0.0376***	0.0044
LCR	-0.0272***	0.0042
Size	0.0012	0.0009
Cost	0.2574***	0.0408
GDP	-0.1759***	0.0499
Inf	0.0394	0.0253
Optimal lags (1 1 0 1 1 1 1)		
<p>Notes: “This table presents ARDL-PMG estimator results with NPM, which is a proxy for intermediation cost (dependent variable). NPM is a ratio of the difference between markup earned and markup expensed with total assets. Size is a log of assets; Cost is a ratio of non-interest expense to total asset non-performing loans to gross loans; GDP is GDP growth; Inf is the annual inflation rate (CPI). The sample is comprised of 60 firm-year observations across 4 banks for the period 2007-2021. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively.”</p>		

In the short run and the long run, NSFR has a strong significant positive impact on NPM at a 1% level of significance. Previous studies also support these results (Sidhu, et al., 2022). An increase in NSFR brings an increase in NPM which ultimately decrease financial intermediation cost. LCR is also found to be a significant element of impact on NPM in the short as well as long run. The negative impact of LCR on NPM complements the findings of Sidhu, et al., (2022). Hence, we can say that our hypothesis

that there is a significant impact of NSFR and LCR on intermediation cost (NPM) is accepted.

A study of control variables in the short and long run shows that both bank-specific variables, Size has an insignificant impact on NPM in Islamic banks of Pakistan. Cost has a significant positive impact, and GDP has a significant negative impact on NPM. Inf however is found to have an insignificant impact in the short run and a positive significant impact in the long run. These results are supported by previous literature. Cost as a measure of efficiency also presents a positive relationship with NPM. A lower ratio represents efficient management. Banks with lower non-interest expenses can potentially earn higher profits from their lending activities, as banks often transfer the added expenses of hiring more staff and other operational costs to their clients by increasing the profit margin which leads to lower financial intermediation costs (Afrin et al., 2022). The GDP growth rate has a direct impact on the demand and supply of deposits and loans, which affects banking activities. Researchers such as (Demirgüç-Kunt & Huizinga, 1999; Tarus et al., 2012) have examined the significance of economic growth rate in determining bank interest margins and have also found an inverse relationship with NPM. Economic growth leads to prosperity in the economy, creating opportunities for investors to invest and for banks to finance greenfield projects. Banks can operate in a more favorable environment, which can result in lower interest margins (M. S. Islam & Nishiyama, 2016). Lastly, Higher inflation is viewed as a sign of macroeconomic instability and information asymmetries, and this appears to have a pronounced impact on interest margins, as they tend to increase along with inflation (Dwumfour, 2019). Therefore, the positive impact of inflation on NPM is also not unexpected.

The error correction term (ECT) represents how fast the system returns to long-run equilibrium after short-run disequilibrium. The ECT parameter would be extremely negative, in ideal cases. In our model, the PMG estimate has a negative ECT that is statistically significant at the 1% level. According to the PMG estimate's coefficient of the ECT, or speed of adjustment towards equilibrium, which is 98.26% (-0.9826) for full-fledged Islamic banks in Pakistan, that means, the deviation of variables from short-run disequilibrium to long-run equilibrium is significantly adjusted and corrected by 98% annually.

5.4.8 Discussion

Overall, the results show that in the context of the Islamic banking industry in Pakistan, the ARDL results suggest that both the NSFR and LCR are relevant liquidity measures that significantly affect the intermediation cost of full-fledged Islamic banks in Pakistan. Even though in Pakistan Islamic banks are found to have excess liquidity (Faisal et al., 2020; Majeed & Zainab, 2021), there is a positive and significant impact of NSFR on the intermediation cost of Islamic banks in the short as well as long run. The positive and significant impact of NSFR on NPM in both the short and long run, despite the presence of excess liquidity in Islamic banks of Pakistan, could be because NSFR is designed to ensure that banks maintain a stable funding profile over the longer term, which is achieved by promoting the use of stable funding sources, such as long-term deposits, equity, and long-term debt. In the short run, the positive impact of NSFR on NPM could be because maintaining a stable funding profile can help reduce funding costs and enhance the bank's profitability. In the long run, the positive impact of NSFR on NPM could be due to the fact that stable funding sources provide a more stable and predictable source of funding for the bank's lending activities, which can help reduce the bank's credit risk and enhance its overall financial stability. It is also possible that the presence of excess liquidity in Islamic banks of Pakistan may not be uniform across all banks and that some banks may be relying more heavily on short-term funding sources, which could make them more sensitive to changes in NSFR.

The positive impact of LCR on NPM in the short run may indicate that having a higher level of liquid assets helps Islamic banks generate more income from their assets, which may be because they can better manage liquidity risk and seize profitable investment opportunities. In the short run, banks may be able to take advantage of short-term market conditions to generate higher returns. However, in the long run, the negative impact of LCR on NPM may be because maintaining a high level of liquid assets can be costly, as they typically have lower yields than other assets. This could result in a lower return on assets and hence lower NPM. Moreover, holding excess liquidity for a prolonged period may not be optimal for profitability and shareholder value.

It is worth noting that Even though Islamic banks in Pakistan may have excess liquidity, the LCR still has a positive impact on NPM in the short run. This could be because the LCR acts as a buffer against liquidity shocks and uncertainty, allowing Islamic banks to continue to lend and earn interest income during short-term stress events. This, in turn, may lead to an increase in NPM in the short run. However, in the long run, the negative impact of the LCR on NPM could be explained by the fact that excess liquidity may not be as beneficial in the long run as it is in the short run. Excess liquidity can reduce the need for Islamic banks to seek out new lending opportunities and invest in profitable projects, which may lead to a decrease in NPM over time. Additionally, maintaining excess liquidity can also increase the cost of funding for Islamic banks, which may further reduce NPM in the long run. Overall, the positive impact of LCR on NPM in the short run and a negative impact, in the long run, suggest that there is a trade-off between liquidity risk and the cost of intermediation. Banks need to strike a balance between maintaining sufficient liquidity to withstand short-term shocks and generating investment income from their assets in the long run. The Basel III regulations aim to ensure that banks have sufficient liquidity buffers to weather short-term shocks, but they also recognize that excessive liquidity can be costly and may negatively affect profitability in the long run.

Overall, the results suggest that while LCR compliance may increase intermediation costs for Islamic banks in Pakistan, higher NSFR compliance can lead to short-term as well as long-term benefits in the form of higher net profit margins.

5.4.8.1 Theoretical Support

Financial Intermediation Theory explains the role of banks as intermediaries that facilitate the efficient allocation of resources between savers and borrowers. For Islamic banks, this involves adhering to Shariah principles, which shape their intermediation processes. The positive impact of NSFR on NPM indicates that as Islamic banks maintain a stable funding profile, they are able to reduce the costs associated with financial intermediation. By promoting long-term deposits and stable funding sources, Islamic banks can mitigate liquidity risk and enhance their ability to provide financing

at lower costs. This aligns with the theory's emphasis on reducing transaction costs and efficiently managing resources.

In the short run, a higher LCR helps Islamic banks manage liquidity risk more efficiently, enabling them to reduce the costs of financial intermediation. This is in line with Financial Intermediation Theory, which suggests that banks need to manage liquidity efficiently to minimize costs. In the long run, the negative impact of LCR on NPM can be attributed to the high cost of maintaining liquid assets, which typically yield lower returns and incur holding costs. This increases the overall intermediation costs, highlighting the trade-off between maintaining liquidity and minimizing costs.

ALM Theory focuses on managing the risks arising from mismatches between assets and liabilities, particularly liquidity and interest rate risks. For Islamic banks, the ALM framework must comply with Shariah laws, adding complexity. The positive impact of NSFR on NPM, despite excess liquidity, suggests that stable funding sources help lower the cost of funds, thus reducing intermediation costs. This is consistent with ALM principles that advocate for maintaining a balance between liquidity and profitability. The stable funding base facilitated by NSFR helps Islamic banks manage liquidity risk more effectively, reducing the costs associated with short-term funding and enhancing overall financial stability.

From an ALM perspective, the short-term positive impact of LCR on NPM suggests that maintaining a buffer of high-quality liquid assets helps banks manage liquidity shocks and reduce intermediation costs. However, in the long run, the cost of holding excess liquidity becomes apparent, as these assets yield lower returns and incur higher costs, impacting NPM negatively. ALM theory supports this finding by emphasizing the importance of balancing liquidity risk with intermediation costs. Banks must ensure they have enough liquidity to meet short-term obligations without excessively increasing their long-term intermediation costs.

5.5 CONCLUSION

In this chapter impact of Basel III liquidity standards namely NSFR and LCR on the stability, profitability and intermediation cost have been identified and hypotheses related to full-fledged Islamic banks of Pakistan have been tested by using statistical techniques. All the hypotheses have been accepted and a significant impact of NSFR and LCR have been found on stability, profitability and intermediation cost. The next chapter will present the conclusion, policy implications, contribution of the thesis, limitations and areas for further research.



CHAPTER SIX

CONCLUSION AND POLICY IMPLICATIONS

6.1 CONCLUSION

The financial crisis of 2008 gave the banking sector a call for new regulations that can improve the stability and resilience of the industry. In response to that Basel Committee for Banking Supervision issued Basel III. The liquidity regulations of Basel III in which two new ratios, NSFR and LCR, were introduced in the banking industry. The NSFR aims to ensure that banks maintain a stable funding structure over the long term to reduce the risk of funding mismatches and limit the potential for liquidity crises. It requires banks to maintain a minimum level of stable funding, based on the liquidity characteristics of their assets and liabilities. The LCR, on the other hand, requires banks to hold sufficient high-quality liquid assets to cover potential short-term liquidity needs, which helps to reduce the risk of liquidity crises during periods of stress. It is designed to enhance the resilience of the banking system by ensuring that banks can meet their short-term obligations, even during periods of market disruption. In summary, the purpose of issuing the NSFR and LCR is to promote the resilience of the banking system and reduce the risk of liquidity and solvency crises, ultimately contributing to financial stability.

The purpose of this research is to identify the impact of NSFR and LCR; the Basel III liquidity ratios, in a retrospective manner on the stability, profitability and intermediation cost of conventional as well as Islamic banks of Pakistan from 2007 to 2021. In this study, two different highly balanced datasets have been used. One for conventional banks comprised 17 banks, with 255 firm-year observations and the other for four full-fledged Islamic banks of Pakistan with 60 firm-year observations.

6.1.1 Summary of Key Results

6.1.1.1 Impact of NSFR and LCR on the Stability of Banks in Pakistan

Conventional Banks: The results show that NSFR and LCR have a significant positive impact on the stability of conventional banks in Pakistan. This provides evidence of improved stability in the conventional banking sector through the implementation of Basel III liquidity standards. For conventional banks, size has a significant negative impact on stability, loan quality has a significant negative impact, GDP has no impact, and concentration has a highly negative impact.

Islamic Banks: For Islamic banks in Pakistan, NSFR has no significant impact on stability, but LCR has a negative significant impact. The differences in business models between conventional and Islamic banks suggest a need for different regulatory requirements. Islamic banks rely on profit-sharing and risk-sharing financing modes, which may explain why NSFR has no impact on their stability, while LCR negatively affects it. For Islamic banks, size has a significant positive impact on stability in the long run, loan quality has a significant negative impact, GDP has a negative impact, and concentration shows no impact.

Combined Discussion: The findings indicate that Basel III liquidity standards have varying impacts on the stability of conventional and Islamic banks in Pakistan. While these standards positively impact conventional banks, they do not have the same effect on Islamic banks. This highlights the need for tailored regulatory approaches that consider the unique characteristics of each banking system.

6.1.1.2 Impact of NSFR and LCR on the Profitability of Banks in Pakistan

Conventional Banks: Results show that NSFR has no significant impact on the profitability of conventional banks, but LCR has a significant positive impact. Among the control variables, only size has a significant positive impact on profitability, while cost, GDP, and concentration show insignificant impacts.

Islamic Banks: In contrast, for Islamic banks, NSFR has a significant negative impact on profitability, while LCR has a significant positive impact. The control variables show that size and GDP have a negatively significant impact, while cost and concentration have positively significant impacts on profitability.

Combined Discussion: The differing results between conventional and Islamic banks underscore the importance of understanding their unique characteristics. The insignificant impact of NSFR on conventional banks' profitability versus its significant negative impact on Islamic banks suggests differing sensitivities to liquidity requirements. The significant positive impact of LCR on both types of banks highlights its importance for profitability.

6.1.1.3 Impact of NSFR and LCR on Intermediation Cost of Banks in Pakistan

The control variables used in the study were Size, Cost, GDP and Inflation. Results show that Size has a negative impact on the NIM of conventional banks and a positive impact on the NPM of Islamic banks. The Cost has a significant positive impact on the NIM/NPM of both Islamic and conventional banks. GDP has a negative impact on the NIM/NPM of Islamic and conventional banks. Lastly, Inflation has shown an insignificant impact on the intermediation cost of both banks. Results highlighted that Size has different impacts on Islamic and conventional banks. For conventional banks, the significant negative impact of size and GDP on the NIM suggests that larger banks and banks operating in larger economies may have economies of scale and scope that enable them to lower their cost of intermediation. For Islamic banks, the significant positive impact of size on the NPM suggests that larger Islamic banks may be able to generate higher returns and charge higher fees, which can increase their cost of intermediation.

The results suggest that the impact of the NSFR and LCR ratios on the cost of intermediation (NIM) for conventional and Islamic banks in Pakistan is different. Results show that for conventional banks, a significant negative impact of NSFR and LCR is found on the cost of intermediation. On the other hand, in the context of Islamic banks, NSFR is found to have a positive impact while LCR, has a negative impact on

the cost of intermediation. The negative impact of both ratios on the NIM of conventional banks highlights the potential trade-offs between meeting regulatory requirements and maintaining profitability. The positive impact of NSFR on the NPM of Islamic banks suggests that their unique funding structure may provide them with a competitive advantage in terms of the cost of intermediation. However, the negative impact of LCR on the NPM of Islamic banks highlights the importance of carefully managing their liquidity and funding sources to maintain profit margins.

Overall, the results suggest that the control variables have different impacts on the cost of intermediation for conventional and Islamic banks in Pakistan. The findings highlight the importance of considering the unique characteristics of conventional and Islamic banking systems when analysing the determinants of the cost of intermediation.

6.2 THEORETICAL CONTRIBUTION

The current study adopts a comprehensive approach by gathering data from various sources, thus addressing existing knowledge gaps and enhancing the understanding of critical issues within the banking sector. The study's theoretical contributions are multifaceted, offering insights into the regulatory frameworks for liquidity requirements faced by both conventional and Islamic banks, and the role of regulators and policymakers in shaping these frameworks.

6.2.1 Exploration of Regulatory Frameworks

This research delves into the national perspectives on regulatory frameworks, particularly focusing on the Basel III liquidity standards—NSFR and LCR. By analyzing the specifics of these frameworks, the study contributes to the understanding of how regulatory policies are formulated and implemented to address financial risks. It highlights the differing impacts of these standards on conventional and Islamic banks, thereby suggesting that regulatory frameworks need to be tailored to the unique characteristics of each banking system. The study provides evidence that while Basel III standards improve the stability of conventional banks, they do not uniformly benefit

Islamic banks due to their distinct business models, which rely on profit-sharing and risk-sharing financing.

6.2.2 Association Between Regulatory Frameworks and Risk Factors

The study examines the relationship between regulatory measures and risk factors, focusing on liquidity risk in the banking sector and its impact on bank operations. By investigating how regulatory policies influence stability, profitability, and intermediation costs, the research enhances theoretical understanding in these areas. The findings show that NSFR and LCR have a significant positive impact on the stability of conventional banks, while LCR negatively impacts the stability of Islamic banks. This underscores the need for different regulatory requirements for Islamic banks due to their unique liquidity and funding needs.

6.2.3 Focus on Pakistan's Banking Industry

The study offers valuable insights into the unique challenges and dynamics of Pakistan's banking industry, a context that has been underexplored in existing literature. By focusing on both conventional and Islamic banks, the research provides a comprehensive understanding of the sector's regulatory environment and its impact on bank stability and performance. This contributes to the broader discourse on financial regulation in emerging economies and highlights the need for context-specific regulatory approaches to enhance the resilience and stability of the banking sector.

In summary, this study significantly contributes to the theoretical understanding of how Basel III liquidity standards affect the stability, profitability, and intermediation costs of conventional and Islamic banks in Pakistan. It underscores the necessity for tailored regulatory frameworks that account for the distinct characteristics of different banking systems, thereby promoting overall financial stability and resilience.

6.3 METHODOLOGICAL CONTRIBUTION

By employing various econometric methods to assess the relationship between regulatory measures and risk factors, the study contributes to methodological

advancements in evaluating the effectiveness of regulatory frameworks. These methods are applied in the context of Pakistan's banking institutions, an emerging economy that has not been extensively explored in the literature. This research acknowledges the complexities associated with data analysis for both conventional and Islamic banks. To ensure the most reliable findings, the study employs differing methodologies specifically chosen to address potential limitations in the data for each banking system.

6.3.1 Conventional Banks:

Since the data for conventional banks might exhibit correlations between variables (collinearity), a robust fixed-effects model was utilized. This approach helps to account for these potential relationships and produce more accurate results. Additionally, to address situations where explanatory variables might influence the error term (endogeneity) and where data exhibits characteristics like dependence across observations (cross-sectional dependence) and unequal variance (heteroscedasticity), the study employed robust approaches like the Generalized Method of Moments (GMM) and the Driscoll-Kraay's Covariance Matrix Estimator. GMM is a powerful technique for handling endogeneity, while the Driscoll-Kraay method helps to account for cross-sectional dependence and heteroscedasticity, leading to more reliable estimates.

6.3.2 Islamic Banks

Due to the limited number of Islamic banks (only 5) and the timeframe of data collection (15 years), the research adopted the Autoregressive Distributed Lag (ARDL) approach. This method is particularly well-suited for smaller sample sizes and allows for the analysis of dynamic relationships between variables over time. This is crucial for understanding how regulations like Basel III impact Islamic banks over a period.

By employing these tailored methodologies, the research ensures the reliability and generalizability of its findings for both conventional and Islamic banking sectors in Pakistan.

6.4 POLICY CONTRIBUTION

The results of this study can aid policymakers in evaluating the impact of implementing Basel liquidity regulations on the improvement of stability, profitability or intermediation cost. The policy implications drawn from this study can be condensed into the following:

- **Strengthening regulatory compliance:** The results of the study suggest that the implementation of Basel III liquidity requirements has a significant positive impact on bank stability, and a negative impact on intermediation cost and profitability, especially for conventional banks. This implies that regulators should continue to enforce these regulations to ensure that banks maintain adequate liquidity buffers to withstand financial shocks.
- **Differential treatment for Islamic banks:** The results of the study suggest that the impact of Basel III liquidity requirements on Islamic banks may differ from that of conventional banks. Hence, regulators may need to tailor their regulations to address the unique characteristics of Islamic banking products and services.
- **Encouraging diversification of funding sources:** The study suggests that the NSFR, which emphasizes the importance of stable funding sources, has a significant positive impact on bank stability. Policymakers could encourage banks to diversify their funding sources to reduce their reliance on short-term funding, which can be volatile during periods of stress.
- **Encouraging the adoption of best practices:** The study highlights the importance of liquidity risk management for banks. Policymakers could encourage banks to adopt best practices in liquidity risk management, such as stress testing and contingency planning, to enhance their resilience to financial shocks.

Overall, the findings of the study suggest that the implementation of Basel III liquidity requirements has positive implications for bank stability but may also have negative implications for bank profitability and intermediation cost. Policymakers should strike a balance between these competing objectives to promote financial stability while ensuring the continued provision of financial services to the real economy.

6.5 LIMITATIONS OF THE STUDY

The following are the limitations of this research:

- For this study out of 25 commercial banks in Pakistan, 21 banks have been selected based on incorporation year or data unavailability. Data before 2007 was not included as out of five full-fledged Islamic banks in Pakistan four banks started reporting their results from 2007. MCB Islamic a full-fledged Islamic bank started its operations in 2014, Sindh Bank in 2010, First Women Bank and Silk Bank have not reported their results for the last 3 and 2 years respectively, hence all these four banks are excluded.
- Due to the unavailability of data, this research has used proxies for NSFR and LCR. Actual values of both can provide more sophisticated results.
- This study has used only one variable for each model i.e. z-score (with ROA) for stability, ROA for profitability and NIM for intermediation cost. Robust results can be found by using alternate dependent variables for the same model.
- Many internal or external factors can moderate or influence the impact of NSFR and LCR on stability, profitability or intermediation cost. Among those, few are selected for this research.
- For this research, the studied literature was only in the English language. Literature available in all other languages is excluded.

6.6 AREAS FOR FURTHER RESEARCH

The following areas are suggested for future research:

- Comparative analysis: The research focused on the impact of Basel III liquidity requirements on conventional and Islamic banks separately. Future research could investigate the comparative impact of these regulations on both types of banks to provide a better understanding of the similarities and differences between the two sectors.
- Cross-country analysis: The research focused on the banking sector in Pakistan. Future research could extend the analysis to other countries to provide a comparative perspective on the impact of Basel III liquidity requirements on banks in different regions of the world.
- Impact of regulatory arbitrage: Future research could examine whether the implementation of Basel III liquidity requirements has led to regulatory arbitrage, such as banks shifting their activities to less regulated markets or engaging in activities that are not captured by the regulations.

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APPENDIX A

LIST OF SELECTED BANKS

A. Conventional Banks

1. National Bank of Pakistan
2. The Bank of Khyber
3. The Bank of Punjab
4. Allied Bank Ltd.
5. Askari Bank Ltd.
6. Bank Al-Habib Ltd.
7. Bank Alfalah Ltd.
8. Faysal Bank Ltd.
9. Habib Bank Ltd.
10. Habib Metropolitan Bank Ltd.
11. JS Bank Ltd.
12. MCB Bank Ltd.
13. Samba Bank Ltd
14. Soneri Bank Ltd.
15. Standard Chartered Bank (Pakistan) Ltd.
16. Summit Bank Ltd.
17. United Bank Ltd.

B. Islamic Banks

1. Albaraka Bank (Pakistan) Ltd.
2. Bankislami Pakistan Ltd.
3. Dubai Islamic Bank Pakistan Ltd.
4. Meezan Bank Ltd.