DIGITAL PAYMENTS AND BANKING STABILITY IN PAKISTAN."

By

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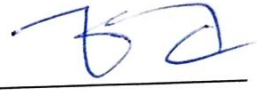
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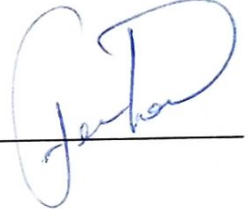
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<u>CERTIFICATE</u>

This is to certify that this thesis entitled: **"Digital Payments and Banking Stability in Pakistan."**. submitted by **Syed Afaq Ali Shah** is accepted in its present form by the PIDE School of Economics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfilment of the degree in Master of Philosophy in Economics and Finance.

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Author's Declaration

I Syed Afaq Ali Shah hereby state that my M.Phil. thesis titled **Digital Payments and Banking Stability in Pakistan** is my own work and has not been submitted previously by me for taking any degree from Pakistan Institute of Development Economics or anywhere else in the country/world.

At any time if my statement is found to be incorrect even after my Graduation the university has the right to withdraw my M.Phil. degree.

Date: 08/NOV/2024

Syed Afaq Ali Shah

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DEDICATION

This Effort is Dedicated to My Parents.

ACKNOWLEDGEMENT

Firstly, I express profound gratitude to Allah Almighty for His abundant gratuities and for endowing me with the courage, strength, and ability to successfully accomplish this study endeavor.

I wish to convey my deep gratitude to my supervisor, Dr. Ahmad Fraz, for his essential mentorship, assistance, and motivation during this research. I express gratitude for the valuable input, consistent acceptance, and specialized knowledge of the individual, which have significantly influenced the development of this work. I consider myself fortunate to have had the chance to acquire knowledge from him.

I am profoundly grateful to my parents for their everlasting belief in me, their unconditional love, and the sacrifices they have made. I attribute this achievement to the unwavering support and encouragement I have received from them, which have served as my sources of strength.

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I express my gratitude to each and every one of you for your remarkable support and for being a part of this momentous achievement in my life.

Syed Afaq Ali Shah
12 July, 2024

ABSTRACT

Digital payment system is the future of transactions of the world. This research investigates the impact of digital transactions on the stability of the banking sector in Pakistan. Banking stability, a critical component of financial wellbeing, is measured using the Z-score, while the independent variables include digital transactions, GDP growth rate, inflation, liquidity, non-performing loans (NPL), capital adequacy ratio (CAR), and COVID-19 as a dummy variable. Employing panel data analysis with fixed and random effects models, this study analyzes the data from 22 banks over the period of 11 years from 2012 to 2022.

The results suggest that digital transactions, including e-banking, internet banking, mobile phone banking, and e-commerce, have a substantial positive impact on banking stability. More precisely, the regression analysis indicates that there is a positive correlation between increasing digital transactions and better Z-scores, which indicates enhanced stability. Macroeconomic variables such as the increase of Gross Domestic Product (GDP) and the availability of liquid assets have a positive influence on the stability of the banking sector, whilst inflation and non-performing loans (NPLs) have a negative impact on it. Furthermore, the Capital Adequacy Ratio (CAR) and the COVID-19 dummy variable exhibit notable and beneficial impacts on the stability of the banking sector.

These findings emphasize the vital importance of digital financial inclusion in enhancing the banking system. Digital transactions enhance the strength of banks by making it easier for people to access financial services and improving the efficiency of their operations. The study recommends that policymakers and regulatory organizations in Pakistan should actively encourage the adoption of digital financial technologies and provide legal frameworks that facilitate their implementation in order to fully utilize their advantages.

Keywords: Digital transactions, Banking stability, Mobile payments, Cashless transfers

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LIST OF ABBREVIATIONS

ATM: Automated teller machine

SME: Small and medium size enterprises

BS: Bank Stability

DT: Digital Transactions

TAM: Technology Acceptance Model

FIT: Financial intermediate theory

IDT: Innovation Diffusion Theory

POS: Point of sales

RTOB: Real time online branch

SBP: State Bank of Pakistan

IB: Internet Banking

MPB: Mobile Phone Banking

GDP: Gross Domestic Product

NPF: Non-Performing Loans

NPL: Non-Performing Loans

ROA: Return on Assets

ROE: Return on Equity

CAR: Capital Adequacy Ratio

DFI: Digital Financial inclusion

CHAPTER 1

INTRODUCTION

1.1 Background

Financial digitalization has emerged as a key component in the financial landscape of today's world. It is the practice of doing transactions online and without the use of actual money or cheques so it can be defined as any type of transaction from one account to another without using hard cash and so ATM transactions are also considered as digital transactions. in fact many banking functions have been automated as a result of digitalization, which has reshaped banking operations, performances and efficiency (Haralayya, 2021). After the fourth industrial revolution, increasing digital finance is seen as one of the most important measures for banking sector stability, which further contributes to long-term economic growth (Banna, 2020). Furthermore, due to the rapid progress of technology, scholars and financial analysts have been considering ways to maximize its benefits. This digitalization of the means of payment will be considered as a landmark in the era of the future economy (Mohan, 2017). Modern consumers increasingly depend on digital channels for managing their accounts and carry out financial transactions, making digital banking a vital part of the contemporary financial industry. Essentially, the digital and cashless transaction system is the future for both developed and developing countries.

Digital transactions have become a fundamental and essential part of the financial environment in both developing and developed countries, although they are influenced by distinct factors and face varying obstacles. The extensive implementation of digital transactions in advanced economies is driven mainly by advanced technological infrastructure, widespread internet access, and robust regulatory frameworks that guarantee security and safeguard consumer interests. Nations such as the United States, the United Kingdom, and Japan have experienced a significant surge in the adoption of digital payment systems, including credit cards, mobile wallets, and online banking platforms. These systems provide convenience and effectiveness for both individuals and enterprises.

Conversely, emerging nations encounter distinct obstacles and possibilities when it comes to digital transactions. Although there may be limitations in technology infrastructure and internet connectivity, the need for financial inclusion and the necessity to decrease dependence on cash

transactions are strong incentives. India and Kenya have achieved significant progress through projects like India's Unified Payments Interface (UPI) and Kenya's M-Pesa, which have transformed digital payments by offering affordable and easily accessible financial services to marginalized communities. These measures have not only increased economic participation but also stimulated innovation in the financial technology sector. Nevertheless, developing nations must confront challenges such as cybersecurity vulnerabilities, regulatory deficiencies, and the disparity in access to digital technology in order to fully exploit the benefits of digital commerce.

The total number of digital transactions has been growing at an exponential rate annually, driven by advancements in technology, evolving consumer habits, and favorable regulatory structures. Internationally, there has been a significant increase in the implementation of digital payment systems such as mobile wallets, internet banking, and contactless payments, indicating a transition towards a society that relies less on cash. Likewise, in Pakistan the number of transactions shows an upward trend. Graph 1.1 shows the increasing trend in Pakistan for year 2012 to 2022. Clearly we can see an upward trend with each passing year which shows users are diverting to cashless transactions instead of cash based transactions.
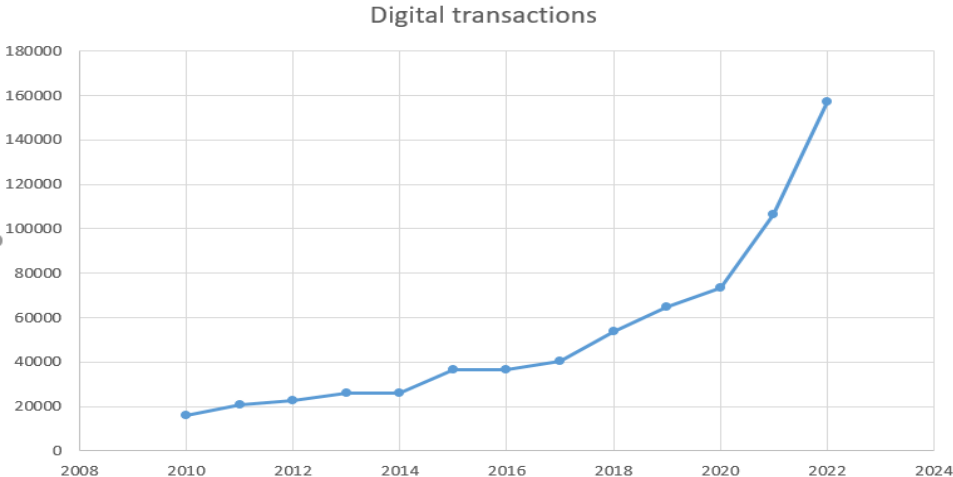
Figure 1. 1 shows the digital transactions trend in Pakistan from 2012-2022

Source: State bank of Pakistan

The emergence of digital banking has had an enormous effect on the banking industry worldwide, resulting in enhanced operational efficiency, client satisfaction, and cost efficiency through the automation of procedures including account opening, loan processing, and customer support. Research has indicated a direct relationship between the implementation of digital banking

services and the financial performance of banks, namely their Return on Assets (Bousrih, 2023). Furthermore, the traditional banking model has been disrupted by the emergence of digital banks, leading to increased competition and innovation within the banking sector. However, digital banking can have a complex impact on financial stability due to potential risks and challenges such as cybercrimes, regulatory concerns, and transaction fees. Banks must address these issues in order to ensure stability and promote growth. The process of digital transformation presents obstacles, including the possibility of job displacement caused by automation and a reduced demand for bank employees as digital services become more widespread (Turhan, 2023). whereas in order to maintain the stability of the banking industry, regulators must pay close attention to the issues that digital banking presents in addition to its many benefits.

Bank-related indicators, such as Non-Performing Loans (NPLs), liquidity, and solvency, are crucial factors in assessing the stability of a bank. Elevated levels of non-performing loans (NPLs) signify that a substantial section of a bank's loan portfolio is not earning the anticipated profits, which may slowly reduce the bank's capital reserves and potentially result in solvency concerns. In this situation, it is frequently necessary to allocate more funds for prospective loan defaults, which decreases the bank's profitability and could potentially result in bankruptcy if the trend continues. Equally vital is the liquidity of a bank, which refers to its capacity to fulfil its immediate financial obligations. Inadequate liquidity can lead to a bank's incapacity to fulfil withdrawals and meet other immediate obligations, causing a bank run and destabilizing the financial institution. Conversely, sufficient liquidity guarantees the seamless functioning of a bank even in times of financial strain. Solvency, which pertains to a bank's capacity to fulfil its long-term financial commitments, is crucial for upholding trust and assurance among depositors and investors. A solvent bank is characterized by a strong financial position, indicating that its assets surpass its liabilities. Together, these elements combine to affect the overall stability of the financial system. Efficiently handling non-performing loans (NPLs), keeping adequate liquidity, and assuring solvency are crucial techniques for protecting against financial instability and promoting a robust banking system.

Macroeconomics variables has an important role in countries banking stability. Research has indicated a favorable association between digitization and macroeconomic metrics, including GDP per person, labor productivity, value-added, and exports of products and services (Tudose et al., 2023). Another study suggests GDP had an adverse effect on the stability of Islamic banking during

the COVID-19 epidemic, although BI rate and exchange rate had beneficial effects (Kartal et al., 2023). Another study relived that bank stability in Nepal was positively impacted by interest rates and the money supply, while inflation and currency rates had the opposite effect (Apau et al., 2023). Similarly, we examined the impact of macroeconomic factors on Pakistan's financial stability, including the money supply, GDP growth rate, and inflation. This study will assist decision-makers in developing banking stability policies that take the impact of macroeconomic variables into account.

1.2 Channels of Digital Transactions

1.2.1 Digital Transactions

Digital transactions can be defined as refers to the practice of doing banking operations via electronic means. This covers using electronic payment methods, mobile banking, and internet banking. Through e-banking, users can transact money without going to a bank branch by using the internet, mobile apps, ATMs, and other electronic channels. With the help of this definition the digital transactions are classified into seven different types of payment systems. The whole digital transactions are sum of all these 7 means of payments and transfer of money from one account to another. According to state bank of Pakistan Figure 3.1 shows all the means of transfer of money that made up the digital transactions for a year.
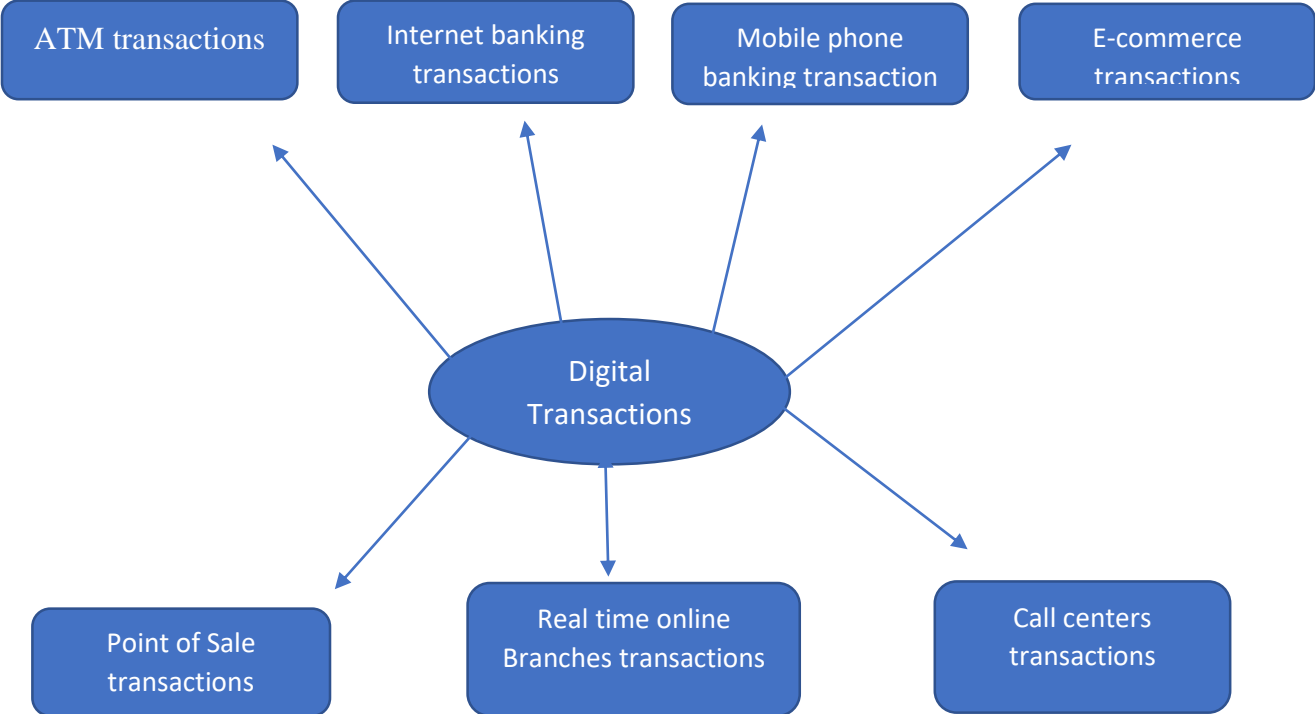
As we can see that the digital transactions for Pakistan depends upon seven different means of transactions which are Atm transactions, internet banking, mobile phone banking transactions, E-commerce transactions, point of sale transactions (POS), Real time online branches transactions (BROT), call center transactions.

Channels of transactions

In this part of the study we will discuss all these types briefly and will identify the trends they are showing since 2012 to 2022. This part of study will also identify the share of each mean in whole economy`s digital transactions.

1.2.2 ATM transactions

According to the state bank of Pakistan ATM transactions can be defined as an electromechanical device that allows authorized individuals, usually with machine-readable plastic cards, to retrieve money from their accounts and/or utilize other services, such as checking their balance, transferring payments, or making deposits. ATMs can be operated in two ways: online, which allows real-time access to an authorization database, or offline (*A Glossary of Terms Used in Payments and Settlement Systems*, 2003). Figure 3.2 shows the trend Atm transactions have showed since 2012 to 2022
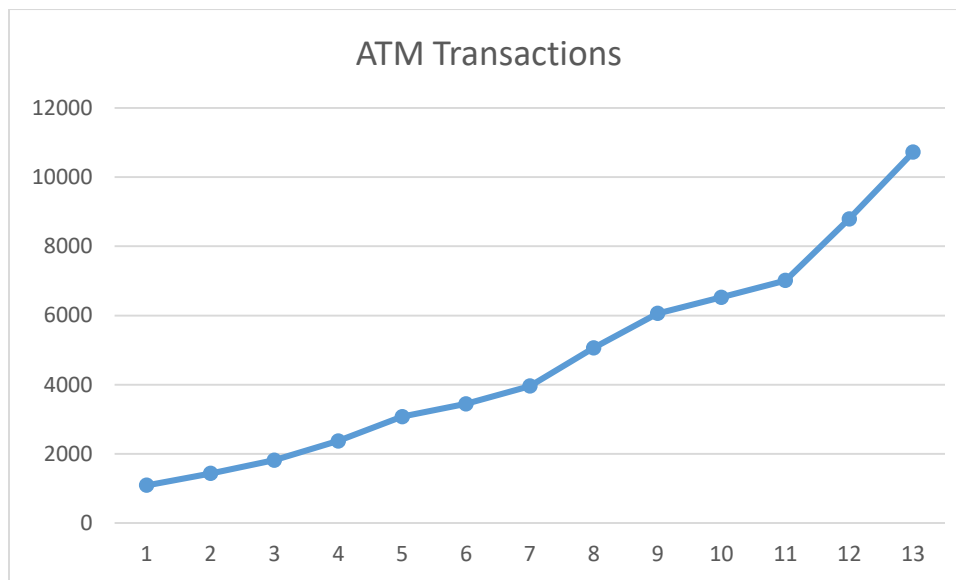
Figure 1.3 **shows the upward trend in ATM transactions from 2012-2022**

1.2.3 Real time online branch transactions

In online electronic money systems, the term "online" refers to the process of establishing a direct connection to a centralized computer system in order to obtain authorization or validation prior to executing a transaction. In the context of payment and settlement systems, the phrase "online" pertains to the transmission of transfer instructions by users. This is done by electronic means, such as computer-to-computer interfaces or electronic terminals. These instructions are then fed into a transfer processing system using automated methods. The phrase may also denote the act of storing data by a transfer processing system on a computer database, enabling the user to directly access the data, often in real time, through input/output devices like terminals (*A Glossary of Terms Used in Payments and Settlement Systems*, 2003). Figure 3.3 shows the trend in RTOB from 2012 to 2022
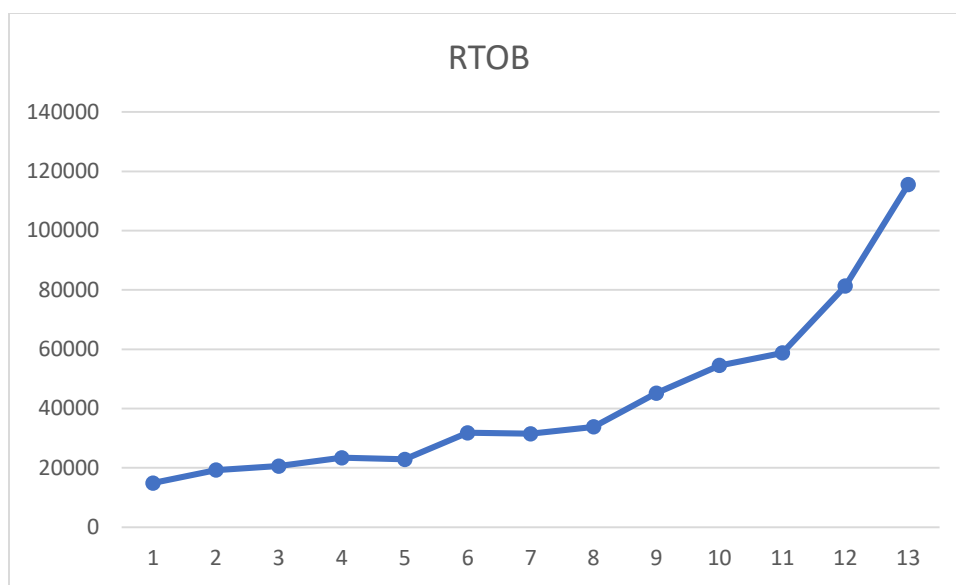
Figure 1.4 **shows the upward trend of RTOB from 2012 to 2022 in Pakistan.**

1.2.4 Point of sale transactions (POS)

Point of Sale (POS) Transactions are the specific time and place where a retail transaction is finalized. At the point of sale (POS), the merchant computes the total sum due by the consumer, and the customer proceeds to make a payment for the goods or services. This transaction can take place either in brick-and-mortar stores utilising a point-of-sale (POS) terminal or online using e-commerce platforms. According to SBP it can be defined as an interconnected system consisting

of banks, individuals using debit cards, and businesses that enables customers to electronically make immediate payments at the point of sale. The monies are transferred straight from the cardholder's account to the merchant's account (*FEDERAL RESERVE BANK of NEW YORK - Serving the Second District and the Nation - FEDERAL RESERVE BANK of NEW YORK*, n.d.). figure 3.4 shows the trend of point of sale in Pakistan from 2012-2022
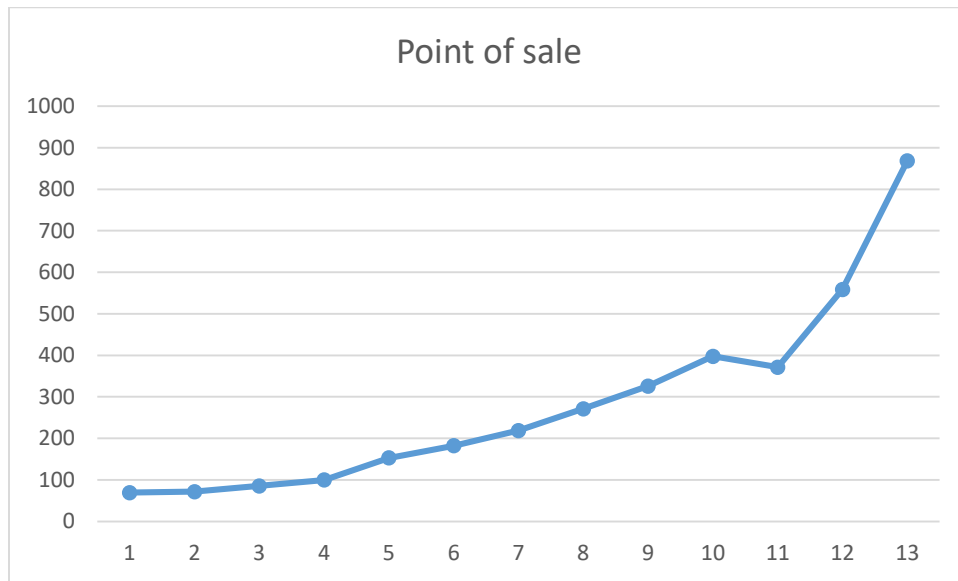
Figure 1.5 shows the upward trend of point of sale from 2012 to 2022 in Pakistan

1.2.5 E-Commerce transactions

E-commerce transactions encompass the transfer of value, such as money, commodities, or services, between two or more parties through digital technology, predominantly the internet. E-commerce transactions include various categories, such as business-to-business (B2B), business-to-consumer (B2C), consumer-to-consumer (C2C), and consumer-to-business (C2B). E-commerce transactions commonly utilise digital payment methods, including credit/debit cards, digital wallets, mobile banking apps, and online payment gateways. Figure 3.5 shows the trend of e-commerce in Pakistan
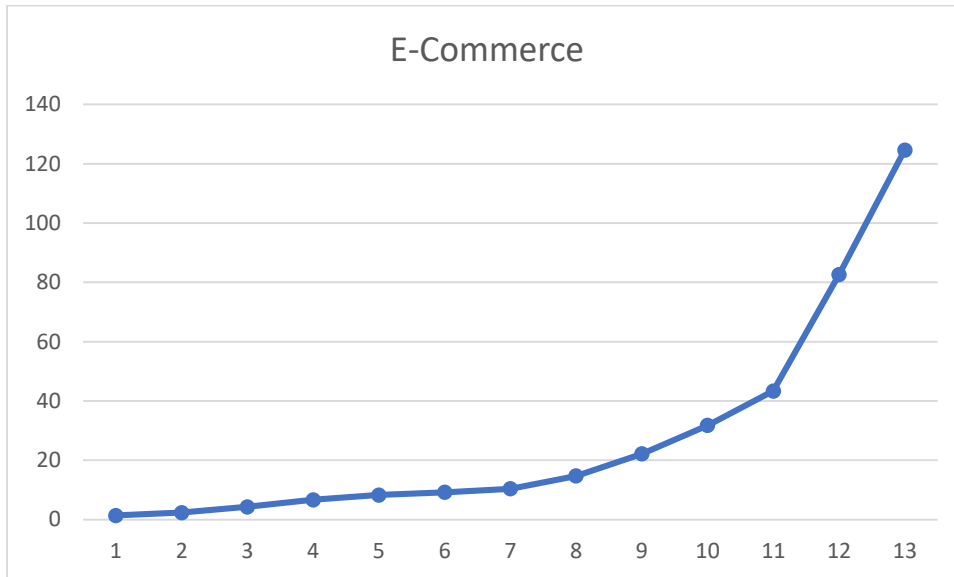
Figure 1.6 **shows the steadily upward trend of e-commerce transactions in Pakistan**

1.2.6 Internet banking transactions

Internet banking, or online banking, is the provision of digital banking services that enable clients to access and control their financial accounts and carry out a range of banking transactions via the internet using a computer, smartphone, or other digital devices. Figure 3.6 shows the trend of internet banking in Pakistan.
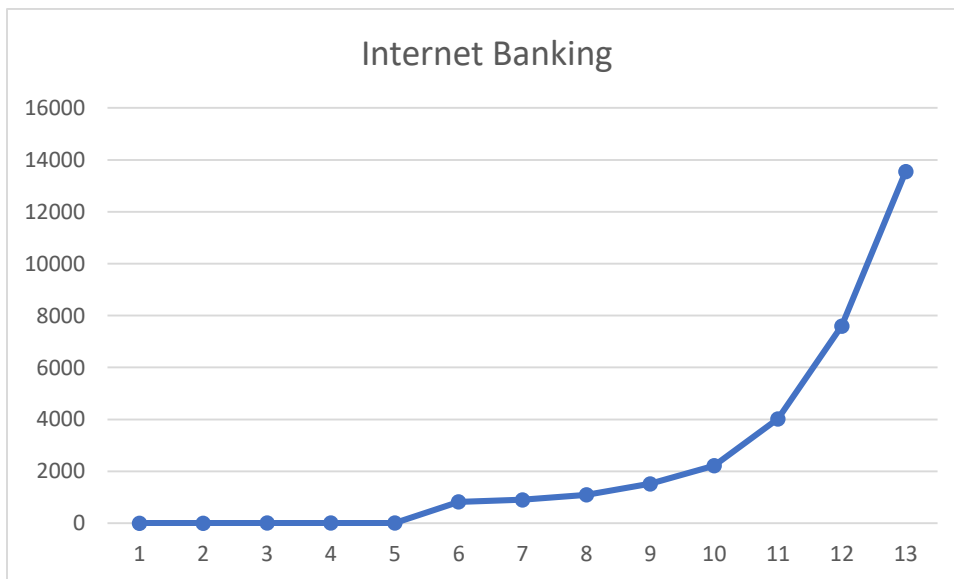
Figure 1.7 shows the steadily upward trend of internet banking in Pakistan

1.2.7 Mobile phone transactions

Mobile phone banking, or mobile banking, is the practice of using a mobile device, like a smartphone or tablet, to access and control one's bank accounts and carry out different banking operations. Mobile phone banking enables users to conveniently manage their bank accounts, including checking account balances, transferring funds, paying bills, and conducting various other banking transactions, all through a mobile device. In addition, numerous banks offer services such as mobile cheques deposit, person-to-person (P2P) payments, and credit card account management. Figure 3.7 shows the trend of mobile phone transactions in Pakistan
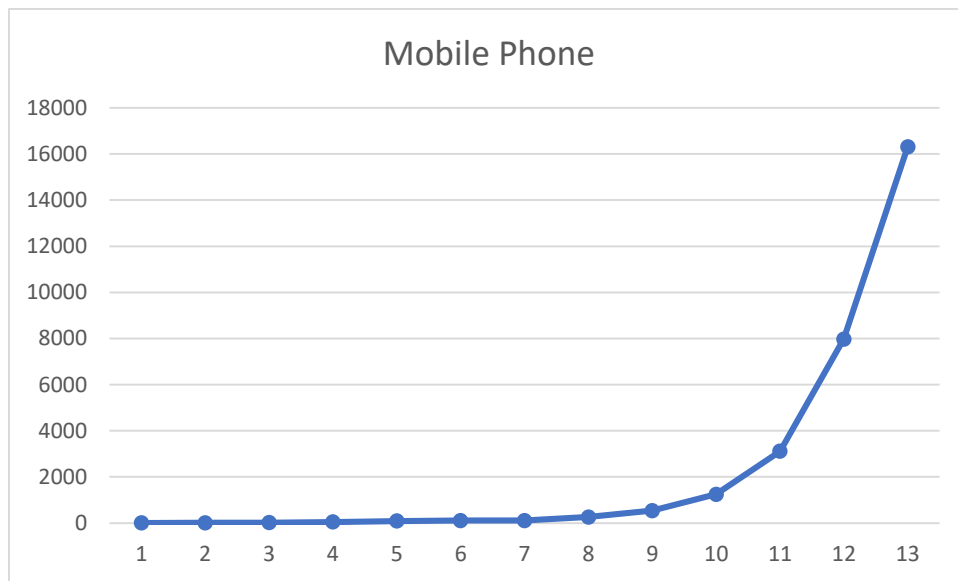
Figure 1.8 shows the steadily upward trend in mobile phone transactions in Pakistan

1.2.8 Call center transactions

The term "call center" refers to the interactions and services that clients engage in with a bank. These transactions entail communicating with customer service representatives (CSRs) by telephone to handle their banking requirements. Call centers offer a diverse array of banking services, ranging from basic questions to intricate financial operations, guaranteeing that consumers can obtain guidance and aid at any given moment. Figure 3.8 shows the trend of call center transactions in Pakistan.
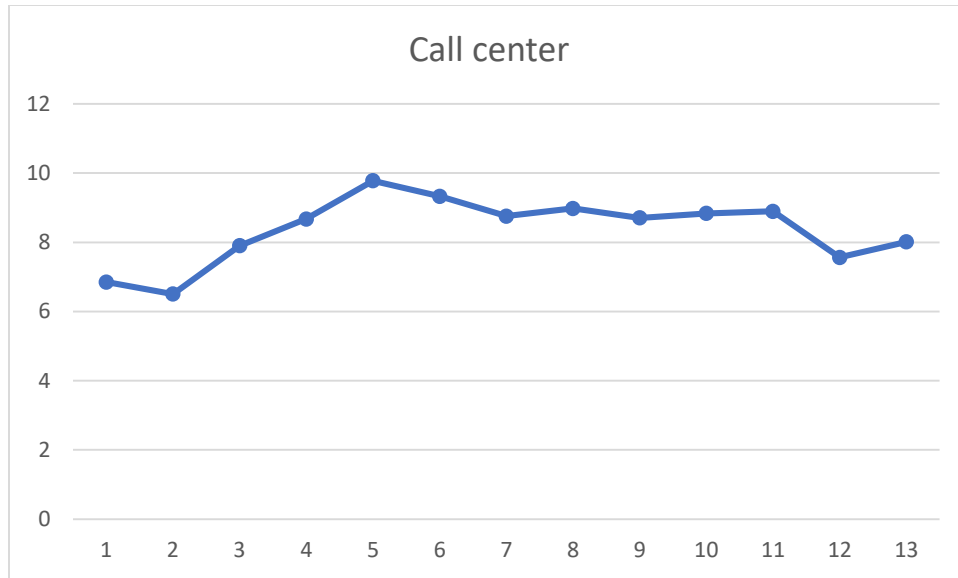
Figure 1.9 shows the trend of call center in Pakistan from 2012-2022

1.3 Problem Statement

Developed nations have already transitioned to a cashless payment system, and many developing nations are also making efforts to do so. This shift is primarily motivated by the desire for banking stability and economic expansion. The introduction of digital payment services in the banking sector in India has had a substantial impact and importance, leading to enhanced profitability and efficiency for banks and convenience for clients. Pakistan has a lower adoption rate of digital payments compared to other countries in South Asia. One significant factor contributing to this change is the expansion of the economy. In instance, financial stability is crucial for the economic growth of any country. In Pakistan, digital payments are being examined for their potential impact on banking stability. If digital payments are adopted, it could contribute to achieving a certain level of economic growth.

As financial stability plays a major role in the economic growth of a country so whether in Pakistan financial stability is the problem that is restricting it from attaining economic growth. If so, can digital transactions can overcome this stability issue by providing firmness to the financial sector.

1.4 Research Questions

- What is the impact of digital payments on banking stability in Pakistan?

- How bank specific variables and macroeconomic variables effect Banking stability?

1.5 Research Objectives

- To assess the impact of digital payments adoption on the stability of banks in Pakistan.

- To develop an understanding of how macro and bank specific variables effects banking stability.

1.6 Significance of the study

The significance of this study is significant as governments increasingly transition from traditional barter systems to digital payment systems, making it the future of any nation. Countries moving towards cashless payments due to a number of reasons, e.g. convenience, ease, less time delay and accessibility. Initial technical improvements have changed financial transactions, making digital payments an everyday approach in different areas, including Islamic economics (Maksimova et al., 2022). Another reason for the significance of this study is as development of payment systems in the economy is critical for the proper operation of the economy and the circulation of money flows (Rukmana et al., 2023). Similarly, the digital payment system enables individuals, corporations, and governments to engage in transactions without physical touch or the use of cash, hence enhancing independence and convenience. Based on the aforementioned grounds, we regard this topic as a significant and developing concern in the contemporary world.

Furthermore, digital transactions have many other significant effects on economic growth and financial inclusion. The advancement of digital infrastructure, digital loans, and digital payments significantly impact real per capita income, public health, education levels, and the expansion of small and medium companies (SME) (Sirait et al., 2023). The usage of digital transaction contributes in improving climate changes as a study suggest that the increased deployment of ATMs has the potential to reduce carbon emissions, suggesting a possibility for achieving environmental sustainability (Latinovic et al., 2022). To conclude. Keeping all aspects of digital transactions and its effect on banking stability this study is of top significance.

1.7 Scheme of the study

This study consists of 5 chapters. First chapter consists of introduction, background, research significant and Problem statement of the study. Chapter 2 will cover all the existing literature and theoretical background regarding our topic. Chapter 3 will cover data and research methodology of this study. Chapter 5 will be our results and discussions. Chapter 6 will be quantitative part and conclusion/ policy recommendation.

CHAPTER 2

LITERATURE REVIEW

This section of the study explores all the existing literature regarding the digital transactions and its effect on banking stability. This section will also examine how digital transaction have evolved over the years and its importance in modern world with help of already existing. We will also explore the existing literature available on the channels of digital transactions. At last will look at the existing literature on the independent variables such as macroeconomic variables and bank specific variables and its link with z-score which shows the banking stability of the country.

2.1 Digital Financial inclusion and banking stability

A system known as Digital transactions allows financial service providers, clients, individuals, and companies to access their accounts, conduct transactions, and get up-to-date information on financial services and products via public or private networks e.g. the internet (Siddik et al., 2016). The last few decades have seen a fast advancement in technology, which has changed how people live and do business (Sardana & Singhania, 2018). One of the main reason for this change is adoption and innovation in transaction`s stream. Digital transactions have emerged as an essential tool in modern word. The introduction of digital payments marked the beginning of new, practical, and efficient financial transaction methods (Aladwani, 2001). Digital transactions and Fintech has been involved in every aspect of businesses. Technology such as digital transactions are being used by banks and other organizations to increase productivity, enhance customer satisfaction, and attract in new customers (Kannabiran & Narayan, 2005).

Digital payments have been seen to improve bank stability in a variety of countries. Many developed and developing countries both have shifted from cash transactions into cashless transactions, it has helped them in attaining banking stability and economic growth as well. In his study (Kasri et al., 2022) investigated the influence of digitalization on financial stability, namely banking stability for Indonesia, he used time series data of bank specific and macro variables and   found out the long term link between the said variable. Likewise, the study of (Sumaylo et al., 2022) tested the same hypothesis in case of Philippines according to the study, there is a positive link between digital financial inclusion and banking soundness among Philippine universal and commercial banks. Likewise, in his paper (Shaikh & Anwar, 2023) whose objectives were to test whether digital transactions and cashless payments helping in attaining banking stability in India used panel data analysis for 32 public and private banks explored acceleration in economic growth and cost cut in banking transactions which helped banking sector attaining stability.

(Fernando & Disanayaka, 2024) study examines it in the border way and deployed data from 36 developing nations covering period from 2011 to 2017, objective was to find the impact of digital financial inclusion on banking stability. With the help of panel data analysis his results show that there is a significant effect of financial inclusion on banking stability in these countries.

In a study (Banna, 2020) seeks to examine the potential impact of digital financial inclusion (DFI) on banking stability in Association of Southeast Asian Nations (ASEAN) countries. It also explores if this link could have implications for the post-Covid-19 pandemic age. By using unbalanced data of 234 banks form 4 countries in (ASEAN) and deployed principle component analysis, OLS and two step dynamic system generated the empirical results showed the DFI enhances the stability of ASEAN's banking sector, reducing the risk of default for banks and increasing financial mobility in the region. In another study (Banna et al., 2022) aim to explore the role of DFI in stabilizing the Islamic banks amidst the Covid 19 pandemic. He used panel-corrected standard errors, two stage panel least square instrumental variable and two step generalized method of moments. Panel data of 65 Islamic banks were used from six different countries over the period of 2011-2020. The result showed that DFI promotes banking stability in Islamic banking institutions as well, which reduce the default risk for banks in the study region.

(Boachie et al., 2023) study investigates and link this relationship with economic growth as well for the sub-Saharan African countries given the interconnectedness between them. The study focused on 18 countries in Sub-Saharan Africa. A 11-year data was collected from 2008 to 2018 and used panel system generalized method of moments for regression. Empirical results of this study shows that they all are positively related which means that FDI will enhance the banking stability which have a positive effect on economic growth of the targeted region. Digital financial inclusion has been very important for every region as it brings along a lot of positive aspects such as convenience and security. (Pham & Doan, 2020) in there study investigated the same hypothesis for Asian economies. Country level and bank specific variables of 42 countries were used for three separate years 2011, 2014 and 2017, DFI was assessed by two paradigm usage of financial services and secondly access to financial systems   effect model and also feasible generalized least square method regression for enhancing robustness in the model empirical results showed a weak positive relationship between the digital financial inclusion and z-score which is the banking stability for those 42 countries.

2.2 Channels of Digital transaction

Channels are very important aspect of digital transactions, as smooth transaction channels with offer ease for transfer of funds from one account to another, as we have described different channels established by state bank of Pakistan in our study. We will look at the existing literature on the channels. E-banking has been an important channel for the digital transactions, it can be refers to a banking technique that allows

users to do their financial transactions online without having to visit a bank location (Simpson, 2002). E-banking offers several advantages, including time savings, eliminating the need for clients to physically visit the bank, and the chance for banks to grow their customer base and thereby increase profitability (Okibo & Wario, 2014). (Sokolov, 2007) argues that financial institutions can support a broader range of banking services and merchandise that are specifically created to support e-commerce, in addition to offering standard banking products and services. These services are usually known as internet banking, mobile phone payments, call centers and electronic cards.

Mobile banking enables clients to carry out a range of banking transactions using their mobile devices. Mobile banking refers to the execution of banking activities through the use of mobile internet technologies (Chong, 2013). (Sadi, 2010) examined the extent to which the banking industry has adopted communications technology and assessed the potential of mobile banking in Oman. It was discovered that the majority of banks and telecom companies has the capabilities to provide Omani citizens with higher-quality electronic and mobile services. Most of the literature use TAM model as a theoretical foundation. A study attempted to investigate the main factors that led to the country's embrace of mobile banking. The study developed a research model by adding two cognitive determinants (autonomous and regulated incentives) to the original TAM. This research model was then evaluated using survey data from 225 mobile banking customers. Neural network modelling and SEM were two stages of the study approach used in the analysis of the raw data. The results demonstrate that among Dubai's mobile banking users, perceptions of trustworthiness, utility, and convenience of use, as well as autonomous and controlled motivation, strongly influence intended behavior to use mobile banking. Perceived trust and perceived utility are the two key factors determining the acceptance of mobile banking, according to neural network modelling (Sharma, 2019).

Two studies of (Rouibah, 2007, 2009) tried to investigate the reason behind the adoption of mobile banking or e-banking for Kuwait, Regression research using data from 175 respondents revealed that gender and experience have a significant impact on mobile payment acceptance. Findings showed that while enjoyment matters more for female users, perceived utility and enjoyment of both experienced and inexperienced male users had an impact on users' intentions to embrace digital transactions. Paying for goods and services with mobile devices, such as wireless phones, and near field communication-based gadgets, is known as mobile payment (Nath, 2008). A study of (Kulu et al., 2022) examines the effect of mobile transitions on the banking sector performance of Ghana, using monthly data from 2015-2020. By the help of an index made up by three indicators depth, stability and efficiency of the banking sector. After using ARDL test for cointegration, the ECM and impulse response function, the results showed that the performance of the banking industry is negatively impacted by mobile money transactions. Another study tries to

investigate the impact of using digital transactions on the satisfaction of the individual. The sample size consisted of 360 users of different means of digital transactions have been tested hypothesis through simple regression The findings demonstrated a statistically significant effect of the mobile banking service's overall dimensions on customer e-satisfaction. Additionally, a basic regression analysis revealed that privacy and accessibility have greater influence than the other mobile banking dimensions.

2.3 Country specific variables and Banking Stability

There are a lot of elements which can affect the efficiency of banking stability. We can divide these elements into two broad group first one is unfavorable circumstances and second one is poor management (Sirait et al., 2023). To define these both elements we can say bad term refers to the variables that are not in control of the bank, which could be economic circumstances or any shock in economy such as GDP and inflation (Messai & Jouini, 2013). Likewise poor management can be defined as those elements which can be controlled by bank itself such as decision making, inefficient resource allocation etc which can significantly affect the firm's financial ratio, such as loan to deposit ratio, as well as external factors like economic growth (Nugroho & Endri, 2022).

Unfavorable or external elements as explained are those which are beyond the management`s control and are associated with the macroeconomic issues. These variables could be money supply, interest rate, Real gdp growth and inflation. We will keep our discussion to the last two as macroeconomic variables have significant impact on the FS of the banks (Kiganda, 2014). A study conducted by (Rahman et al., 2021) examined how important macroeconomic factors, like GDP growth and interest rates, affected Pakistan's banking industry's financial sector. Likewise a study investigated the effect of inflation on FS, the price of bank shares and rate of inflation are correlated significantly (Al Sharif, 2023). According to a study of (Akbar et al., 2018) capital structure, liquidity and macroeconomic variables all have a major impact on a bank`s stability.

GDP is one of the most often used macroeconomic indicators to assess how cyclical macroeconomic performance affects the financial sector, namely the supply and demand for loans and deposits(Zhang & Daly, 2014). This hypothesis was also examined by (Neely & Wheelock, 1997) and he concluded that the gross national product (GNP) per capita and the annual GDP growth rate have a positive relationship with the stability of the banking industry's profits in a favorable economic environment. It is considered that when a economy macroeconomic variables are performing well then the demand for bank services are enhanced, which will lower the risk of default and will eventually improve the bank`s asset quality (Bikker & Hu, 2002; Laker, 1999). A study (Clair, 2004) by pointed out that there is a significant effect of GDP on

BS. According to a study of (Bikker & Hu, 2002) claims that when Singapore's GDP rises, commercial banks there are encouraged to work in riskier industries, for better performance and higher earnings could be the result from this. Conversely, when the GDP expands, commercial banks' total expenses will rise more quickly than their income. Accordingly, it has been suggested that the GDP and banks' FS have a two-part relationship.

One of the earliest study that shows the relation of inflation with FS is of (Revell, 1979), Assuming that whether or not banks' operational expenses and the wages they pay rise at a faster rate than inflation will determine the macroeconomic impact of inflation on banks' performance. Moreover author also examined the macroeconomic attraction between banks FS and the rate of inflation (Jamel & Mansour, 2018). According to (Perry, 1992) who aggress with (Bourke, 1989) both concluded that the effect on inflation depends upon FS if its anticipated or expected before. If the management and regulatory authorities of banks accurately predict the rate of inflation, the banking sector can see quicker revenue growth compared to its operational costs, leading to increased economic profitability (Sufian & Habibullah, 2009). Nevertheless a large number of researchers including (Molyneux & Thornton, 1992; Zhang & Daly, 2014) have shown a sustainable positive correlation between the rate of inflation and bank performance.

(Mirović et al., 2024) investigated that GDP and the inflation rate had a significant influence on the banks profitability. A study while investigating the factors that affect the assets liquidity found economic growth can be helpful in it (Prastiwi & Anik, 2021). Inflation is a measure of the overall increase in prices within a country, which is caused by a decrease in the purchasing power of the national currency. Previous results show varying results. Such as (Vodova, 2011) concluded that for banks in Czech the inflation has a positive relation with the FS. Whether in contrast Harvath et al, 2014 found out that there is no relation between inflation and bank liquid assets. (Moussa, 2015) study investigated the factors that explain the risk of Tunisian banks and found that the inflation rate has a large and negative impact on risk.

In theory, inflation is believed to have a beneficial impact on liquidity, particularly because banking liquidity positions are very sensitive to changes in inflation. Significant inflation can diminish the capacity of borrowers or consumers seeking credit to meet their responsibilities, leading to a decline in their actual income. Hence, increasing inflation rates and unforeseen changes can lead to a troublesome amount of loans for banks. Thus, in theory, there should be a positive correlation between inflation and liquidity (Nkusu, 2011).

2.4 Theoretical Background

This part will briefly discuss the theoretical framework that supports the relationship between banking stability and digital transactions. If we look at the existing literature the theories that supports this argument are financial intermediation theory, technology acceptance model, innovation diffusion theory and financial stability theory. In this chapter we will explain the relationship between BS and DT insight of these theories.

2.4.1 Theory of Financial inclusion

Theory of financial inclusion is considered as the main and overarching theory for this study. The Theory of Financial Inclusion discusses how broadening access to financial services can yield beneficial economic and social results, particularly for marginalized or excluded groups. It underscores the need of offering affordable, accessible, and suitable financial products (such as banking, credit, savings, insurance, and digital payment systems) to individuals and enterprises who typically lack access to formal financial institutions. The vulnerable group theory of financial inclusion stresses targeting underprivileged groups to integrate them into the formal financial system, enabling access to services that can reduce their economic woes (Ozili, 2024).

The essence of the concept is to guarantee that all individuals, irrespective of income, geographic location, or social standing, have access to formal financial institutions. This include banks, credit institutions, mobile money services, and digital banking systems. Financial inclusion enables disenfranchised or low-income individuals to engage in economic activities, such initiating small enterprises, obtaining credit, saving funds, or investing. This results in enhanced economic mobility and assists individuals in escaping poverty.

2.4.2 Financial intermediation theory

The Financial Intermediation Theory is an economic concept that discusses the function and significance of financial intermediaries, such as banks, within the economy. Modern concepts highlight the significance of financial intermediaries in minimizing transaction costs and

informational asymmetries, even in the face of technological developments and market deepening (Giscard et al., 2015).

The Financial Intermediation Theory describes how banks and other financial intermediaries help savers and borrowers transfer money. By contributing in risk management, cost reduction, and effective resource allocation, these intermediaries promote economic growth and stability. When combined with digital transactions, this idea can greatly improve the stability of banks. A Study has demonstrated that various factors, including inflation, management systems, and deposit interest rates, have distinct effects on financial intermediation, influencing credit, financial mass, and intermediation margins (Giscard et al,. 2022). The mechanism can improve the banking stability through a lot of factors. Some of them could be cost reduction, enhanced efficiency and transparency/accountability.

So to conclude we can say when it comes to digital transactions, Financial Intermediation Theory provides a thorough framework for understanding how digital banking might improve stability. Digital transactions strengthen the adaptability and stability of banking institutions by increasing efficiency, cutting costs, strengthening risk management, and fostering financial inclusion. Banks gain from this integration, but it also promotes overall economic growth and stability.

2.4.2 Technology Acceptance Model

TAM is most often used technology adoption theory in this field is and its extension. The TAM has been one of the most popular theoretical frameworks used to research how different technologies get adopted. Fred Davis in 1986 created the TAM, which helps both academics and professionals to evaluate user intention and comprehend the factors that influence the acceptance or rejection of a good or service. Many scholars have intensively studied TAM in the area of information technology, as it also explains the relationship between user friendliness, perceived usefulness, attitude, and intention to adopt. It has been extensively established that TAM fails to sufficiently account for the complexity of customer intention. As a result, several scientists have combined TAM with other concepts.

TAM's validity and dependability have been demonstrated in extensive studies and is applicable in a variety of sectors (Silva, 2015).The aspects which makes this theory worth using are usefulness

and acceptability. in TAM The correlations between perceived usefulness and acceptability, as well as between usefulness and ease of use, have been found to be strongly correlated by TAM. However, the relationship between acceptance and ease of use is less strong (Ma & Liu, 2004). The culture of organizations is also considered as a important aspect while using TAM. cultural aspects have been found to be significant issues to take into account when implementing TAM in global corporations, emphasizing the necessity for an advanced awareness of technology acceptability in various contexts (Silva, 2015).

The two primary factors that determines the acceptance of technology are perceived Ease of use and perceived usefulness. These two factors influence the attitude towards the usage of technology (Mirusmonov et al., 2023). Users' perceptions of the usefulness and ease of use of digital transaction systems, such as contactless payment methods, online banking platforms, and mobile banking apps, have a significant impact on their adoption. Users will be more accepting of and likely to utilize these technologies if they think they improve their banking experience and are simple to use. Likewise, the amount of digital transactions rises as more customers and companies use them because they are thought to be convenient and useful. This increased volume helps banks operate more profitably and more efficiently, which strengthens their stability.

2.4.3 Innovation Diffusion Theory
A multidisciplinary theory called "Inventive Disruptive Technology" (IDT) was created by E.M. Rogers in 1962, It argues that innovative qualities like conformance, intricacy, observability, trainability, and other related advantages have a significant influence on how quickly new technologies are adopted. According to Rogers Diffusion is defined as "the process in which an innovation is communicated through specific channels, over time, among the members of social system," and innovation is a concept that can be defined as "an idea, practice, or an object which is perceived as new by an individual or any other unit of adoption."

The theory draws from a variety of disciplines, including economics, social sciences, and marketing. It investigates the factors that influence the successful adoption of innovations, the role of communication channels in the diffusion process, and the significance of comprehending user requirements in order to design effective service systems(Zheng & Ma, 2023). Innovation diffusion theory is closely linked with digital transactions and banking stability. As according to IDT Comparing digital transactions to traditional banking methods reveals a number of benefits,

including increased security, cost savings, speed, and convenience. These advantages increase the appeal of digital transactions to companies and customers, accelerating their adoption (Tan & Teo, 2000). Another reason is communications channels Effective communication channels are essential for raising knowledge of the advantages of digital transactions. These include social media, marketing efforts, and word-of-mouth. Digital banking solutions are expected to be adopted by more people and organizations as knowledge spreads through these channels (Laukkanen & Kiviniemi, 2010).

2.4.4 Financial Stability theory

The goal of Financial Stability Theory is to minimize financial crises and ensure sustained economic growth by examining the circumstances under which financial systems function smoothly and resist economic shocks. Understanding the function of financial institutions, market laws, systemic hazards, and the mechanisms by which financial systems remain stable are just a few of the many elements that make up this theory (Crockett, 1996).

There exists a strong relationship between financial stability theory and digital transactions and banking stability by reducing systematic risk. Reducing expenses and transaction times, digital transactions improve the overall soundness of financial institutions and increase the efficiency of financial operations (Claessens et al., 2013). It can also help in enhancing liquidity management and automation infact real-time payment settlement made possible by digital transactions helps financial institutions manage their liquidity better and lowers their risk of liquidity problems and automation reduce the chances of human error which ensure enhanced liquidity management and finally contributes to banking stability (Gomber et al., 2017).

2.5 Research Gap

The future of the world lies in digital banking as the process of digitization is rapidly spreading across the globe. Many countries are transitioning towards electronic payments. Significant advancements have been made in recent times on this emerging subject, while the majority of these developments mostly focus on developed countries worldwide. Financial transactions in Pakistan could be revolutionized by digital payments (Hamza & Jedidia, 2020).

As it's an emerging topic only few literature is available on this important issue. Few authors have tried to investigate the allover effect of digital transactions and banking stability (Kasri et al., 2022). The SBP has classified the channels of E-banking into seven different channels. The distribution of digital transactions

into different channels described by SBP is a gap which will be filled by this paper. We not only investigate the effect of digital transactions on BS in Pakistan but will look at how each of the channel in effecting the BS as well. We hope this study will help people in Pakistan as well as the policy makers in identifying the channels which are contributing the most in BS and make policies according to that.

CHAPTER 3

DATA AND RESEARCH METHODOLOGY

3.1 Introduction

This chapter will highlight the research methodology of this study. In the first step the research strategy will be discussed followed by the research approach. In the next step we will construct the dependent and independent variables respectively. Likewise, the empirical model and the econometric techniques will be discussed in further steps.

3.2 Research Strategy

The strategy of our research usually depends upon the type of data we are going to use. The use of already existing data is known as Archival research also known as secondary research strategies. In both of these we use the already existing data without any interference of primary data. Millar 2011 defined Archival research as "the process of locating, selecting, and using records or archives in order to answer a research question or achieve a specific research objective." To extract useful information, she emphasizes the need of understanding the context of the records and using proper research methodologies. As we are also using secondary data from different sources, we can call our strategy as archival research and we will interpret the existing data. We will not have any survey or experiments which will lead us to new data.

3.3 Research Approach

(Booth et al., 2003) define research approach as "the strategy or plan for finding answers to your research questions." They emphasize that the research approach should align with the nature of the research problem and involve systematic investigation and analysis. The two types of approaches for research are inductive or deductive approach the research falls under the umbrella of deductive research as our hypothesis is already a part of existing economics theory. We are just going to test the theory that whether with digital banking the banking stability of banks increases or not.

3.4 Construction of Variables

The following is a description of all the dependent, independent, and control variables utilized in this research:

3.4.1 Dependent variable
  ➢ **Banking stability:**

we will use the most commonly used proxy for banking stability which is Z-score as it seizes banks' insolvency risk or default risk. This measure analyzes a bank's capital and asset capacity for dealing with volatility in returns. The more value of Z-score shows more stability (Abedifar et al., 2013). Overall, the Z-score measures financial stability that is utilized in many different contexts and can provide valuable insights into the health of the banking sector (Kaliyev & Nurmakhanova, 2020).

The technique used to find Z-score is:

$$Z_{it} = \frac{ROA_{it} + (^E/_{A_{it}})}{sd.(ROA_{it})}$$

Or

$$Z_{it} = \frac{ROA + \frac{Equity}{Assets}}{\sigma ROA}$$

Where

ROA= return on assets

ROE= return on equity

σROA= standard deviations from ROA.

3.4.2 Independent Variables
  • **Digital Transactions**

Digital transactions can be defined as the transfer of funds from one payment account to another via a digital device or channel with this definition the payment can be with card or non-card transaction. We will use E-banking transactions instead of Digital Transactions. E-transactions and banking stability are closely related. There is a long run optimistic relationship among digital transactions and banking stability in India (Syed et al., 2022). Likewise, the expansion of digital

financial services in the United States constantly enhances the efficiency and stability of the banking sector, both in the short and long run (Jameaba, 2022).

- **Inflation**

Inflation is another variable in this study, inflation basically shows the rise in prices in an economy but for our use it also shows the price stability in an economy. The monetary policy of Pakistan is mostly inflation targeted. In inflation the rise in price decrease the purchasing power of the individual and person have to spend more nominal money to buy the same good. Banking stability can highly be effected due to inflation. Inflation has a negative and severe impact on banking stability since it reduces the return on assets (ROA) and affects the saving amounts in bank deposits, resulting in fewer loans being given for investment (Rasheed & Ishaq, 2022). Furthermore, the implementation of inflation targeting (IT) policy in Asian economies has been found to have a negative influence on financial stability (Pratama, 2019). In addition, excessive household sector debt can lead to endogenous financial crises, and aggressive inflation targeting regimes may weaken both price stability and financial stability.(Sethi & Acharya, 2020).

- **GDP Growth rate:**

The GDP growth rate is a quantitative indicator that reflects the percentage change in a country's Gross Domestic Product (GDP) within a defined time interval. The economic performance of a country is commonly measured as a percentage, which provides an indication of the overall performance of the economy. Research indicates that financial instability can be impacted by variables such as financial development, financial liberalization, and the rate of GDP growth (Hussain et al., 2022). Studies suggest that a well-functioning banking industry can help reduce the adverse effects of a financial crisis on the growth of a country's gross domestic product (GDP), hence enhancing economic resilience in times of crisis for both advanced and emerging nations (Stewart & Chowdhury, 2021).

- **Non-performing Loans**

Non-performing loans (NPLs) are those on which the borrower has failed to make scheduled payments for 90 days or more. These loans may or may not be generating interest, and they are a crucial measure of a lender's overall creditworthiness. Non-performing loans can effect banking stability in various ways. In the short run, NPL shocks have a negative influence on risk-adjusted

return and loan growth while positively impacting risk-adjusted capitalization (Katuka et al., 2023). Whereas NPLs can cause instability in bank balance sheets, limiting lending to the real economy and harming financial stability (yanti Elda, 2023).A study found out that effective non-performing credit policies can decrease the risk of NPLs, enhance financial positions, and increase overall financial stability (AROGHENE & IKEORA, 2022). In a study for Nigeria, NPLs, capital adequacy, and corporate governance have a beneficial but insignificant impact on bank stability (Nasir et al., 2022).

- **Liquidity:**

Liquidity plays a huge role in bank stability. Different studies on different countries showed that liquidity effects banking stability. These studies indicate that liquidity risk has an adverse effect on bank stability, highlighting the importance of appropriate liquidity risk management measures. Furthermore, the findings indicate that liquidity risk is inextricably linked to credit risk, with an increase in liquidity risk leading to an increase in credit risk, so affecting bank stability. A study conducted for Jorden by (Ismail & Ahmed, 2023) liquidity risks can have serious consequences for individual financial institutions and may indirectly influence their overall stability. Another paper for Vietnam by (Huu Vu & Thanh Ngo, 2023) showed similar results as imply that bank liquidity has a favorable impact on stability through its mediating function in liquidity generation, and that asset diversification moderates the relationship between liquidity creation and stability

- **Solvency:**

The solvency of a bank significantly affects its stability. We will use capital adequacy ratio as a proxy for bank solvency (Sebayang, 2020). Solvency risk refers to the possibility that a bank may not be able to meet its financial obligations when they become due because its net worth is negative. The correlation between the solvency of a bank and its funding expenses is significant and can result in serious consequences. A study reveals a significant correlation between the solvency of banks and their financing expenses, where higher solvency leads to lower funding costs and vice versa (Schmitz et al., 2017).

- **Covid:**

we will use Covid as our dummy variable in this study. Using covid as dummy will help as COVID-19 is a major and unanticipated external shock to the world economy. By utilizing it as a dummy variable, we may isolate and estimate its influence on digital payments and the stability of banking in Pakistan. Research has indicated that uncertainty resulting from the pandemic has had an adverse impact on the utilization of digital banking services (Singh et al., 2023).Another study suggest the adoption of online technologies, such as internet banking and digital wallets, has experienced a substantial growth during the COVID-19 epidemic (Kamela et al., 2022). So by using Covid as dummy we will investigate the effect of covid on banking stability.

Incorporating covid in this study is important. As the banking system in all over the world reshaped during the Covid19 pandemic. The COVID-19 epidemic induced exceptional economic disruptions worldwide, and Pakistan's economy was similarly affected. The interruptions, such as lockdowns and business restrictions, resulted in heightened financial strain on consumers and enterprises, impairing their capacity to fulfil loan obligations. This increased the likelihood of non-performing loans (NPLs) and presented a substantial threat to banking stability. During the pandemic, the necessity for digital financial services intensified because to the transition from physical banking to digital platforms. The implementation of social distancing protocols and the shutdown of physical bank branches resulted in a rise in digital transactions, electronic banking, and mobile banking. The increase in digital transactions may have stabilised the banking industry by offering other revenue sources, enhancing liquidity, and maintaining client involvement during the crisis. Incorporating COVID as a dummy variable enables the assessment of the distinct impacts of this heightened adoption on banking stability.

Table 3. 1 shows the variables and descriptions

Variable	Definition	Source	Time duration
Z-score	$z = \frac{ROA+KA}{\partial\ (ROA)}$ A higher Z-score indicates that the banks have higher financial soundness.	Author calculation	2012-2022
Digital Transactions	Transfer of funds from one payment account to another via a digital device or channel	State bank of Pakistan	2012-2022
GDP growth	Refers to the annual change in a nation's GDP.	WDI, SBP	2012-2022
Inflation	Refers to the increase in prices over time	SBP	2012-2022
Non-performing loans	Nonperforming loans are loans that are not being repaid in accordance with their original terms.	Annual reports of banks	2012-2022
Capital Adequacy Ratio	Solvency is an indicator that measures a bank's fiscal well-being and its capacity to withstand future losses.	Annual reports of banks	2012-2022
Liquidity	Liquidity refers to the degree of ease with which an asset can be readily converted into cash or another asset, without causing a substantial impact on its market price.	Annual reports of banks	2012-2022
Covid	Pandemic occurred in 2019	Dummy	2012-2022

Table 1 shows all the variable in this study. It also defines all the variables along the source of the variable and time duration

3.5 Empirical Model

As this main contribution of this study is to investigate the relationship between digital transactions and banking stability so the general form of our model will be:

$$Zscore = \beta_0 + \beta_1 DT_{it} + \beta_2 GDP_{it} + \beta_3 INF_{it} + \beta_4 LIQ_{it} + \beta_5 NPL_{it} + \beta_6 CAR_{it} + \beta_7 COVID_{it} +$$

$$\epsilon_{it} \tag{4.1}$$

Equations for channels

For ATM Transactions

$$Zscore = \beta_0 + \beta_1 ATM_{it} + \beta_2 GDP_{it} + \beta_3 INF_{it} + \beta_4 LIQ_{it} + \beta_5 NPL_{it} + \beta_6 CAR_{it} + \beta_7 COVID_{it} + \epsilon_{it} \qquad (4.2)$$

For Internet banking Transactions

$$Zscore = \beta_0 + \beta_1 IB_{it} + \beta_2 GDP_{it} + \beta_3 INF_{it} + \beta_4 LIQ_{it} + \beta_5 NPL_{it} + \beta_6 CAR_{it} + \beta_7 COVID_{it} + \epsilon_{it} \qquad (4.3)$$

For Mobile Phone Transactions

$$Zscore = \beta_0 + \beta_1 MP_{it} + \beta_2 GDP_{it} + \beta_3 INF_{it} + \beta_4 LIQ_{it} + \beta_5 NPL_{it} + \beta_6 CAR_{it} + \beta_7 COVID_{it} + \epsilon_{it} \qquad (4.4)$$

For Point of Sale Transactions

$$Zscore = \beta_0 + \beta_1 POS_{it} + \beta_2 GDP_{it} + \beta_3 INF_{it} + \beta_4 LIQ_{it} + \beta_5 NPL_{it} + \beta_6 CAR_{it} + \beta_7 COVID_{it} + \epsilon_{it} \qquad (4.5)$$

For E-commerce Transactions

$$Zscore = \beta_0 + \beta_1 ECOM_{it} + \beta_2 GDP_{it} + \beta_3 INF_{it} + \beta_4 LIQ_{it} + \beta_5 NPL_{it} + \beta_6 CAR_{it} + \beta_7 COVID_{it} + \epsilon_{it} \qquad (4.6)$$

For RTOB Transactions

$$Zscore = \beta_0 + \beta_1 RTOB_{it} + \beta_2 GDP_{it} + \beta_3 INF_{it} + \beta_4 LIQ_{it} + \beta_5 NPL_{it} + \beta_6 CAR_{it} + \beta_7 COVID_{it} + \epsilon_{it} \qquad (4.7)$$

For Call Center Transactions

$$Zscore = \beta_0 + \beta_1 CC_{it} + \beta_2 GDP_{it} + \beta_3 INF_{it} + \beta_4 LIQ_{it} + \beta_5 NPL_{it} + \beta_6 CAR_{it} + \beta_7 COVID_{it} + \epsilon_{it} \qquad (4.8)$$

3.6 Estimation technique

This study aims to empirically investigate the effects of digital transactions on the stability of the banking sector. Prior to selecting an appropriate econometrics technique, it is necessary to examine the characteristics of the data. Descriptive statistics is employed to comprehend the measures of central tendency, variability, and distributional form of the data. Since this study utilizes a panel data set, the most suitable methods for estimation include pooled OLS, random effect model, and fixed effect model. The Hausman test is utilized to choose the appropriate model, either random or fixed effect, for the analysis.

3.6.1 Descriptive statistics

Descriptive statistics is an aspect of statistics that focuses on examining and describing important characteristics of datasets. Descriptive statistics are crucial in data analysis as they provide a clear overview and description of the key features of datasets. These tools serve as a basis for analyzing, visualizing, comparing, and evaluating data, helping to comprehend and interpret the data and successfully communicate the discoveries.

3.6.2 Correlation

Correlation techniques serve for measuring and analyzing the association between variables. Correlation pertains to the statistical relationship or dependency between two or more variables, reflecting the extent to which changes in one variable are connected with changes in another one. The sign associated with the correlation variable indicates the direction of the relationship between the two variables. A negative sign indicates the negative correlation between the variables and likewise positive sign shows direct relationship between the variables.

3.6.3 Fixed Effect Model

The fixed effects model is alternatively referred to as a within estimator or the individual-specific effects model. It presupposes that the effects peculiar to each individual are stable and unchanging across time. To account for individual differences, this method incorporates individual-specific dummy variables into the regression equation. The dummy variables are used to represent the time-invariant characteristics of each individual and remove the individual-specific effects from the model. The fixed effects model enables the estimation of the variation within groups and can be regarded as calculating the average effect within each individual or group.

$$Y_{i,t} = \alpha + \beta X_{i,t} + \gamma D_i + \mu_{i,t}$$

Di is the individual-specific dummy variable for individual i.

3.6.4 Random effect Model

The random effects model is alternatively referred to as the between estimator or the individual-specific effects model. It is assumed that the effects peculiar to each individual are random and not associated with the independent factors. The approach considers the individual-specific effects as stochastic variables and estimates them using the method of moments. The random effects model enables the estimation of the overall variation among individuals and can be viewed as estimating the average effect among people.

$$Y_{i,t} = \alpha + \beta X_{i,t} + C_i + \mu_{i,t}$$

Ci is the individual-specific random effect. It is assumed that the random effect Ci is not associated with the independent variable Xit.

3.6.5 Hausman test

Hausman test is used to choose between random and fixed effect model. It helps in identifying which test amongst the two is better for our study. The Hausman test is based on the assumption that if there is no relationship between the explanatory variables and the estimators of random and fixed effects, then both estimators are reliable and accurate. If both estimators are consistent, the fixed effects and random effects estimates should be comparable in large samples. The fixed effect model is retained if the H statistic is statistically significant and is rejected. The decision between the fixed effects model and the random effects model is made using Hausman's test. In order to determine the most suitable model for panel data analysis, this study has utilized the Hausman test to compare fixed effects versus random effects. The Hausman test provides information on the most appropriate model for the investigation.

So the Hypothesis of Hausman test are;

H0: *Random-effect (RE) is preferred.*

H1: *Fixed-effect (FE) is preferred.*

Table 3. 2 shows the Hausman test criteria

: Hausman Test Criterion		
	H_o is true	H_1 is true
β_1 (RE estimator)	Consistent Efficient	Inconsistent
β_o (FE estimator)	Consistent Inefficient	Consistent
If results show; H_o: Select RE (p > 0.05) H_1: Select FE (p < 0.05)		

Table 3.2 shows the Hausman test criteria for our study. It shows that if value of p is greater than 0.05 then select Random effect and if its less than 0.05 then select Fixed effect

3.7 Data Collection

This study combines data from difference sources. Bank level data are collected from different bank`s financial reports and annual reports. Similarly, country related data are obtained by different Pakistan's government institutions such as state bank of Pakistan and other international institutions such as world development indicators and World Bank. The sample period of this study comprises of 13 years from 2012 to 2022. The primary sources of data collecting include the State Bank of Pakistan (SBP), study of annual balance sheets and income statements, bank profiles, official company websites, and the PSX website. Under the recent regulations imposed by the Securities and Exchange Commission of Pakistan (SECP), it is mandatory for all companies listed in Pakistan to provide detailed information about their financial status, annual reports, and governance framework. Furthermore, we choose the 6 Islamic banks (IB) schools and 16 Conventional banks (CB). The list of banks is as following:

Table 3. 3 shows the list of banks

List of Banks		
Islamic Banks		
Meezan Bank Limited	Al-Baraka Bank (Pakistan) Limited	Bank Islami Pakistan Limited

MCB Islamic Bank Limited	Dubai Islamic Bank Pakistan	Faysal Bank Limited
Conventional Banks		
Bank AL Habib Limited	Summit bank	Bank of Khyber
Askari bank	National bank of Pakistan	Habib Metro
The bank of Punjab	Allied Bank	Silk bank
Standard Chartered	United Bank Limited (UBL)	Bank Al-Falah
JS bank	Habib Bank Limited (HBL)	Samba Bank Limited
Soneri Bank		

Table 3.3 shows all the banks which have been used in this study. It shows a combination of conventional and Islamic banks which were used.

CHAPTER 4

EMPIRICAL RESULTS

4.1 Introduction

In this chapter of the study we will present the empirical study of the impact of digital payments on banking stability in Pakistan. The 4.2 section will discuss the descriptive statistics of the study in which all variables will be discussed. Furthermore, in sections 4.3 we will discuss the correlation matrix of the variables, which will tell us the dependency of variables on each other to investigate the well-known issue of multi collinearity among the variables. We will discuss the empirical findings based on the regression analysis particularly for the digital transactions and its impact on banking stability.

4.2 Descriptive Statistics for Digital Transactions

The descriptive statistics gives the summary statistics which includes the observations, mean, standard deviation, minimum and maximum of the dependent vatable and independent variables. In our case the variables are divided into two categories bank specific variables and country specific variables.

Table 4. 1 shows descriptive statistics for DT

Variable	Obs	Mean	Std. Dev.	Min	Max
Z-score	286	2.434	.172	1.976	2.619
DT	286	10.64	.649	9.684	11.965
Inflation	286	2.037	.551	.928	2.989
GDP	286	1.347	.465	.242	1.87
Liquidity	286	-.918	.539	-3.374	1.25
NPL	286	11.913	.911	9.425	13.74
CAR	286	2.718	.262	.049	3.227
Covid	286	.231	.422	0	1

Table 4.1 shows the result of descriptive statistics of our study. It shows the observation, mean, standard deviation and minimum/maximum value

Table 4.1 illustrates the descriptive statistics of the full sample as a whole for Digital transactions as a whole. Starting from the dependent variable which is Z-score which shows the banking stability for a country shows the total observation are 286 with a mean value of 2.43. the standard

deviation of our dependent variable is .172 and we can clearly see the minimum value is of 1.97 and maximum value touches 2.619. In case for our independent variable our main variable is DT which is digital transactions as a whole, it mean value is 10.64 with a standard deviation od .649 the minimum and maximum values are 9.68 and 11.96 respectively. After that we will look at the country specific variables which are Inflation and Gdp Growth rate. As inflation is general hike in prices of goods in an economy it shows the mean value as 2.037 with a standard deviation of .551 the minimum value is .928 and maximum value is 2.98. Another country specific variable is gdp growth rate whose mean value is 1.347 and has a standard deviation of .465 the minimum and maximum values are .242 and 1.87 respectively. Now we come to the bank specific variables which are liquidity, non-performing loans and Capital adequacy ratio. Firstly, lets discuss the descriptive statistics of liquidity it has a mean value of -.918 with a standard deviation of .539 the minimum value is -3.374 and maximum value is 1.25. Another bank specific variable is Non performing loans whose mean value is 11.913 and standard deviation of .911 the minimum and maximum values are 9.425 and 13,74. Last bank specific variable is capital adequacy ratio whose mean value is 2.71 and has a standard deviation of .262 the minimum value is .049 and maximum value is 3.227. Last but not the least is our dummy variable which is covid. We have use 1 for years when there was covid and 0 for non-covid years to find the impact of covid. This variable shows mean value as .231 with standard deviation of .422 and minimum and maximum values are 0 and 1 respectively.

4.3 Summary Statistics for channels of DT
In this part of the study we will illustrate the summary statistics of different means or channels of digital transactions in Pakistan. Table 4.2 will show the results of descriptive statistics for the means of digital transactions separately. As few of the variables mean, standard deviation, minimum and maximum values are already explaining in 4.2 we will not explain them again here. Those variables were dependent variable Z-score and independent variables such as digital transactions, inflation, gdp growth rate, non-performing loans, liquidity, capital adequacy ratio and covid as dummy. Rest of the summary statistics variables will be explained.

Table 4. 2 **shows descriptive statistics for channels of digital transactions**

Variable	Obs	Mean	Std. Dev.	Min	Max
Z-score	286	2.434	.172	1.976	2.619

Inflation	286	2.037	.551	.928	2.989
GDP	286	1.347	.465	.242	1.87
liquidity	286	-.918	.539	-3.374	1.25
NPL	286	11.913	.911	9.425	13.74
CAR	286	2.718	.262	.049	3.227
internet banking	286	5.585	2.895	1.872	9.514
ATM	286	8.249	.685	6.995	9.28
Mobile phone	286	5.406	2.423	1.637	9.7
POS	286	5.352	.777	4.241	6.767
E-commerce	286	27.865	35.379	1.39	124.643
real time	286	10.479	.583	9.607	11.657
call center	286	2.118	.115	1.872	2.28
covid	286	.231	.422	0	1

Table 4.2 shows the descriptive statistics for the channels of digital transactions it shows the observation, mean, standard deviation

The first channel of digital transactions is Internet banking which shows the means value of 5.585 and has a standard deviation of 2.895 the minimum value is 1.872 and maximum value is 9.514, Second channel for digital transactions is ATM transactions whose mean value is 8.249 with a standard deviation of .685 and minimum and values are 6.995 and 9.28 respectively. Another channel is mobile phone banking transactions which possess mean value as 5.406 with a standard deviation of 2,423 and minimum value is 1.637 and maximum value is of 9.7 another important channel for digital transactions is Point of sale (POS) whose mean value is 5.352 and has a standard deviation of .777 the minimum value is 4.241 and maximum value is 6.767. E-commerce is also an important variable in digital transactions which has a mean value of 27.865 with a standard deviation of 35.37 and has minimum value of 1.39 and maximum value of 124.5. Call center transactions are also considered as channel for digital transactions which has mean value of 2.11 and standard deviation of .115 the minimum and maximum values are 1.872 and 2.28 respectively. Last channel for digital transactions is real time online branch which has a mean value of 10.47 and standard deviation of .115 and possess minimum and maximum value of 9.607 and 11.65 respectively.

4.4 Correlation matrix for Digital transactions

The correlation matrix is a technique through which we can find the dependency amongst the variables. It examines the correlation of variables by observing relationship between the variables and also indicates the problem of multicollinearity (Allison, 2012; Gujarati & Porter, 2009). That why the first thing which we should be looking for is no issue of multicollinearity in our study. With the help of reasoning given by (Gujarati & Porter, 2009) the matrix the existence no longer lead to be concern. If there exist an issue of multicollinearity in our study, we may find biased result what's why it's important to solve this issue first.

By looking at the table 4.3 we can understand that there is no multicollinearity exists amongst the variable. It is determined by looking at the correlation between the variable that no issue of multicollinearity exist in this study. As it can be seen in the table 4.3 that the values are not high so there exists no multi collinearity issue in this. According to studies if there is a dependency of 90 percent amongst the variable then the value will be 0.9 and that is considered as multicollinearity issue (Shrestha, 2020). If multi collinearity exists in the study the we had to modify the variables or eliminate the variables in order for better and unbiased results. But as no results is more than 0.9 so we can say that there is no multicollinearity issue in this study.

Table 4. 3 shows matrix of correlation

Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Z-score	1.000							
DT	0.409	1.000						
Inflation	-0.455	0.210	1.000					
liquidity	-0.210	-0.371	-0.133	1.000				
NPL	-0.017	-0.055	-0.030	0.100	1.000			
CAR	0.155	0.256	0.015	-0.179	-0.101	1.000		
GDP	0.534	0.256	-0.324	-0.215	0.011	0.008	1.000	
Covid	0.175	0.794	0.466	-0.369	-0.053	0.199	-0.042	1.000

4.5 correlation matrix for channels of digital transactions

We can see in table 4.4 that it shows the correlation matrix for the channels of digital or cashless transactions. The correlation relation between the variables found to be poor as the variables value is less than 0.5. The correlation matrix shows value above 0.5 for different channels of transactions but as they are regressed and examined separately they will not cause issue of multicollinearity. Other variables show poor correlation amongst themselves and can be used. So the fact that the values are less than 0.5 shows there is no multicollinearity amongst the variables (Ayed & Zouari, 2014). Based on the (Woolridge, 2000) as far as correlation may not always imply causation, as the causal relationship is examining by the regression analysis. Therefore, panel regression is applied.

Table 4. 4 shows correlation matrix for channels of DT

Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Log Z-Score	1														
Log DT	0.40	1													
Log inf	-0.45	0.210	1.000												
Log liquidity	-0.21	-0.371	-0.133	1.000											
Log npl	-0.017	-0.055	-0.030	0.100	1.000										
Log CAR	0.155	0.256	0.015	-0.179	-0.101	1.000									
Log Gdp	0.534	0.256	-0.324	-0.215	0.011	0.008	1.000								
Log IB	0.410	0.916	-0.102	-0.290	-0.037	0.246	0.222	1.00							
Log ATM	0.525	0.956	-0.010	-0.315	-0.055	0.268	0.303	0.93	1.00						
Log MP	0.423	0.988	0.176	-0.353	-0.060	0.265	0.218	0.90	0.97	1.000					
Log POS	0.441	0.975	0.080	-0.333	-0.051	0.256	0.298	0.94	0.98	0.978	1.000				
Log E-Com	0.259	0.909	0.487	-0.415	-0.048	0.194	0.280	0.72	0.77	0.870	0.837	1.000			
Log RTOB	0.408	1.000	0.210	-0.368	-0.055	0.257	0.251	0.91	0.95	0.987	0.973	0.904	1.000		
Log CC	0.698	0.214	-0.588	0.023	-0.029	0.123	0.198	0.31	0.44	0.301	0.346	-0.062	0.212	1.000	
covid	0.175	0.794	0.466	-0.369	-0.053	0.199	-0.042	0.63	0.65	0.793	0.695	0.864	0.787	-0.102	1.00

Table 4.4 shows the correlation between all the variables and the channels in the study.

4.6 Empirical Findings

This study investigates the relationship between the digital transactions and banking stability in Pakistan. We have further divided this study in to two parts. The first part shows the effect of digital transactions or E-banking on banking stability in Pakistan. The second is more complex and it shows the effect of different channels of digital transactions and its effect on the banking stability in case of Pakistan. We utilize the random effect model. The Hausman test is utilized to choose the appropriate model between the random effects model and the fixed effects model (Farag et al., 2018).

4.7 Digital Transactions on Banking Stability

As we have explained early this study investigates the effect of digital transactions on banking stability. Therefore, in the following subsections we will explain the results of our full sample. This table presents an estimation of the overall performance of models. We utilize a Z-score proxy for the financial stability (FS), which is determined by the stability of the institutions. All regressions include year fixed effects, although the coefficients for these effects are not reported. We utilized the random effects technique with robust standard errors for our estimation. The Robust standard errors are presented in parenthesis, indicating their robustness. The symbols ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4. 5 Empirical results of DT, ATM, IB & MP on BS

VARIABLES	Log Z-score	Log Z-score	Log Z-score	Log Z-score
Log DT	0.067***	-	-	-
	(0.003)			
Log ATM	-	0.071***	-	-
		(0.003)		
Log IB	-	-	0.0217***	-
			(0.000554)	
Log MP	-	-	-	0.0201***
				(0.000792)
log_gdp	0.113***	0.112***	0.139***	0.116***
	(0.002)	(0.002)	(0.00248)	(0.00209)

log_inf	-0.159***	-0.139***	-0.171***	-0.152***
	(0.004)	(0.008)	(0.00124)	(0.00115)
log_liq	0.011**	0.012**	0.011**	0.0120**
	(0.008)	(0.008)	(0.00933)	(0.00855)
log_NPL	-0.0628*	-0.020**	-0.0961	-0.0271**
	(0.003)	(0.003)	(0.0023)	(0.00325)
log_ CAR	0.031**	0.0253*	0.0487***	0.0291**
	(0.014)	(0.014)	(0.0113)	(0.0144)
Covid	0.081***	0.0757***	0.180***	0.0685***
	(0.002)	(0.002)	(0.0031)	(0.00304)
Constant	1.781***	1.882***	2.435***	2.376***
	(0.05)	(0.055)	(0.06)	(0.0673)
Observations	286	286	286	286
Number of id	22	22	22	22
R-squared	0.54	0.56	0.53	0.55
F-statistics	879	102	570	911
Prob(F-statistics)	0.00	0.00	0.00	0.00

Note: Z-score is our dependent variable which shows banking stability, DT is digital transactions, Atm shows Automated teller machine transactions, IB is internet banking and MP stands for mobile phone transactions, gdp shows gross domestic product, inf is inflation, liq shows liquidity, NPL shows the non-performing loans, CAR stands for capital adequacy ratio and covid as dummy. ***, **, * are the 1%, 5%, and 10% level of significance respectively.

4.7.1 Base Model

Table 4.5 shows the empirical results of our base model which is digital transactions as a whole and its effect on banking stability. It also shows empirical results for three of our channels which are ATM transactions, Internet banking transactions and Mobile phone transitions Therefore, in this following table it shows the empirical results of our main objective of the study with is to examine the effect of digital transactions on banking stability. Digital transactions are an important aspect in modern age. Many developed countries have already adopted digital transactions as their main source of transactions. The incorporation of digital technologies has greatly enhanced financial progress, client assistance, and operational effectiveness, while contributing to the general stability of the financial sector (Jameaba, 2022). Likewise, in our analysis the digital

transactions show a positive and significant result. The coefficient value is 0.067 and is significant on 1 percent significant level. According to this result we can interpret that a 1 percent increase in digital transactions can positively affect banking stability by 0.06 %. Our results are according to the literature and as different countries have shown the impact of digital transactions on the banking stability. Research has shown that the growth of digital financial services, such as e-banking and mobile transactions, is directly linked to an increase in banks' Return on Assets (ROA) which increase the banking stability (Syed et al., 2022). Other studies have even showed the significance effect of financial inclusion on the z-score of the banking sector which shows banking stability (Chinoda & Kapingura, 2023). The effect of digital transactions on banking stability in our study is minor as its effect is only 0.06% the reason for that is also shown in literature as well. As digital transaction is a new concept for a country like pakistan studies shows that in developing countries the effect was negative in the short run and gradually increases and have a positive effect on banking stability in the long run (Syed et al., 2022).

The empirical results shown in table 4.5 are also according to the existing theories. The innovation diffusion theory and financial intermediate theory supports the results. According to IDT The implementation of digital transactions might be regarded as a disruptive innovation that affects the financial industry. This use improves operating efficiency, decreases costs, and boosts service delivery, hence contributing to increased banking stability (Zheng & Ma, 2023). So our positive results evidence from digital transactions, it can be inferred that banks that embrace digital advances are more financially secure which helps in increasing banking stability as well. Secondly the financial intermediate theory digital transactions can enhance the efficiency of financial intermediation by decreasing transaction costs and broadening the availability of financial services. Digital innovations have a beneficial effect on banking stability, indicating that they improve the efficiency of financial intermediation (Allen & Santomero, 1997). Therefore, our positive results support these results.

The other variables of this study shows the empirical results according to the literature and existing theories as well. The coefficient for gdp growth rate is 0.113 which shows that a 1% increase in gdp growth rate is associated with 0.11% increase in digital transactions of a country. Studies have shown similar results as economic growth is positively impacted by financial stability, with GDP

growth rates being strongly impacted by variables including capital adequacy, liquidity, and asset quality (Manu et al., 2011). Inflation results are according to past studies as well as inflation can squeeze the profitability of banks, High inflation can reduce depositors' purchasing power and cause them to withdraw money or switch to other assets, which can put banks under pressure to maintain a sufficient level of liquidity which will eventually decrease the banking stability in a country. Empirical results show a 1% increase in inflation is associated with a 0.159% decrease in the Z-score which shows banking stability, indicating that higher inflation negatively affects banking stability statistically significant at the 1% level.

As our studies incorporates bank specific variables too. The first bank specific variable is liquidity. According to our empirical results liquidity has a significant and positive effect on banking stability. The Z-score increases by 0.011% for every 1% rise in liquidity, indicating a favorable effect on financial stability at the 5% level, the outcome is statistically significant. Capital adequacy ratio is also an important variable for bank. There is a positive and significant effect of capital adequacy ratio and banking stability as empirical results shows the Z-score increases by 0.031% for every 1% increase in the capital adequacy ratio, suggesting that greater capital adequacy enhances banking stability. At the 5% level, the outcome is statistically significant. Another important bank specific variable is Non-performing loans which can affect the banking stability. In order to lower the risk of non-performing loans (NPLs), improve commercial banks' financial conditions, and increase their financial stability, effective non-performing credit policies are essential (yanti Elda, 2023). According to table 4.5 the non-performing loans the Z-score decreases by 0.0628% for every 1% increase in non-performing loans, suggesting a detrimental impact on the stability of banks. At the 10% level, this outcome is statistically significant. Last but not the least variable is Covid which is incorporated as dummy variable to check the effect of covid on banking stability. A study conducted in Indonesia revealed that the pandemic's credit relaxation policies had an impact on banks' stability, particularly those of smaller banks, but had no discernible effect on non-performing loans (Pamungkas et al., 2023). Results shown in table 4.5 shows the Z-score increases by 0.081 in the presence of the COVID-19 pandemic, indicating a favorable effect on banking stability during the pandemic. At the 1% level, this outcome is statistically significant.

Channels of digital transactions and banking stability

This section of the study will explain the empirical results of different channels of digital transactions and its effect on banking stability. We will look at how different channels are influencing the banking stability in case of Pakistan. We Will explain the first three types of channels which are ATM, internet banking and Mobile phone banking in this section. We will also know what amongst the 7 channels which channel is influencing the banking stability the most.

4.7.2 ATM transactions and banking stability

In this section we will explain the empirical results of one of the channel of digital transactions which is ATM transactions. ATM transactions refer to a specific type of digital transactions in which clients utilize Automated Teller Machines (ATMs) to carry out various banking activities, including cash withdrawals, account balance inquiries, fund deposits, and inter-account money transfers. Although ATMs have been around for a long time, they are still seen as a crucial component of the digital banking system, despite the emergence of newer digital transaction methods such as mobile banking and online banking. ATM transactions are important for a number of reasons as they provide security and enhance customers visibility and control over banking activities (Popoola et al., 2021) . Empirical results of ATM transactions are shown in table 4.5

According to table 4.5 which shows the empirical results of effect of ATM transactions on banking stability the atm transactions have a positive and significant effect on banking stability. The coefficient value of atm transactions is 0.071 which shows an increase of 1% in ATM transactions has an association with a 0.071% increase in the Z-score, suggesting a favorable effect on the stability of the banking system. This outcome exhibits statistical significance at the 1% significance level. With the global shift towards cashless transactions, the growing reliance on plastic cards and ATMs requires strong security measures to protect financial transactions and ensure the stability of the banking system (Srinivasan et al., 2019). Rest of the control variables shows similar results which were shown in the base model. According to table 5.6 a rise of 1% in GDP is linked to a 0.112% increase in the Z-score, indicating that economic expansion improves the stability of the banking sector. likewise, an increase of 1% in liquidity is correlated with a 0.012% increase in the Z-score, indicating a favorable effect on the stability of the banking sector. Capital adequacy ratio and covid both also show positive and significant results with 0.02 and 0.07 % respectively. Other than this inflation and non-performing loans shows negative relation with

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banking stability which means an increase in inflation and non-performing loans will lower the banking stability.

4.7.3 Internet banking and banking stability

Internet banking is another important channel of digital transactions. An online banking system allows users of a financial organization to carry out a range of financial transactions using the institution's website. This service enables consumers to efficiently oversee their bank accounts, conduct transactions, and avail themselves of diverse banking services using the internet, obviating the necessity of in-person visits to a bank branch. Research has indicated that the growth of digital financial services, such as internet banking, can initially cause a decline in the effectiveness and reliability of banking systems in countries like India. However, in the long term, it improves stability and efficiency, particularly in developed nations like the United States (Syed et al., 2022). Table 4.5 shows the empirical results of the test for internet banking and its effect on banking stability.

According to the table 4.5 internet banking has a positive and significant effect on banking stability. The coeffient value of internet banking is 0.027 which shows a rise of 1% in Internet banking transactions is linked to a 0.0217% increase in the Z-score, suggesting a beneficial effect on the stability of the banking sector. This outcome exhibits statistical significance at the 1% significance level. Other variable also shows similar results that were shown in base paper. Other empirical results which were shown in table 4.5 were a rise of 1% in GDP is correlated with a 0.139% increase in the Z-score, indicating that economic expansion improves the stability of the banking sector. A rise of 1% in inflation is correlated with a fall of 0.171% in the Z-score, suggesting that higher inflation has a detrimental impact on banking stability. An increase of 1% in liquidity is correlated with a 0.011% improvement in the Z-score, indicating a favorable effect on the stability of the banking sector. An increase of 1% in non-performing loans is linked to a fall of 0.0961% in the logarithm of the Z-score, showing a detrimental impact on the stability of the banking sector. However, this finding lacks statistical significance, indicating that this variable may not have a substantial impact on banking stability in our model. Capital adequacy ratio and covid shows positive effect on banking stability with 0.04 and 0.18 percent respectively.

4.7.4 Mobile phone transactions

Mobile phone transactions are a channel of digital transactions. The prevalence of mobile banking services is increasing, providing users with easy and user-friendly methods to remotely perform a range of financial transactions (Prasad, 2010). Even though mobile phone banking is an important aspect in digital word but it also need some restrictions and surveillance. For the durability of mobile banking services, it is crucial to consider assuring legal clarity, data security, and customer trust (Weber & Darbellay, 2010). Table 4.5 shows the empirical results of mobile phone banking on banking stability.

The regression analysis provides valuable insights into the variables that have a substantial impact on banking stability, as assessed by the Z-score. Mobile phone transactions have a favorable effect on the stability of banking. A 1% increase in mobile phone transactions is connected with a 0.0201% increase in the log Z-score. This highlights the significance of mobile banking in improving operational efficiency and consumer convenience. The relationship between GDP growth and stability is demonstrated by the fact that a 1% increase in GDP is associated with a 0.116% increase in the log Z-score. This supports the notion that economic growth enhances the financial well-being of borrowers and the broader economic climate. On the other hand, inflation has a negative influence on stability. Specifically, a 1% increase in inflation results in a 0.152% fall in the log Z-score. This demonstrates how inflation destabilizes asset values and increases uncertainty. Enhanced liquidity has a beneficial impact on stability, as a 1% increase in liquidity leads to a 0.012% gain in the log Z-score. This highlights the need of having sufficient liquidity to fulfill short-term obligations. Increased non-performing loans (NPLs) have a negative impact, as a 1% rise in NPLs results in a 0.0271% decline in the log Z-score, indicating that poor asset quality reduces stability. The capital adequacy ratio (CAR) improves stability, as a 1% increase is linked to a 0.0291% improvement in the log Z-score. This suggests that having higher capital adequacy serves as a safeguard against potential losses. Surprisingly, the COVID-19 pandemic, represented by a dummy variable, has a positive effect on stability. It leads to a 0.0685% increase in the log Z-score, indicating that successful regulatory and fiscal measures implemented during the pandemic have helped stabilize the banking industry. These findings are consistent with theories such as Innovation Diffusion Theory and Financial Intermediation Theory, which highlight the importance of technological adoption and financial intermediation in supporting stability in the banking sector.

4.8 POS, E-COM, RTOB & CC on BS

In this section of the study we will examine and explain the empirical results of the remaining 4 channels of digital transactions. These four channels include Point of sale transactions, E-commerce transactions, Real time online branches transitions and Call center transactions. Table 4.6 will illustrate the empirical results of all these channels.

Table 4. 6 Empirical results of point of POS, E-COM, RTOB & CC on BS

VARIABLES	Log Z-score	Log Z-score	Log Z-score	Log Z-score
POS	0.0130***	-	-	-
	(0.00064)			
E-com	-	0.0569***	-	-
		(0.00246)		
RTOB	-	-	0.0744***	-
			(0.0223)	
CC	-	-	-	0.856***
				(0.00591)
Log gdp	0.113***	0.0948***	0.114***	0.140***
	(0.00249)	(0.00285)	(0.0179)	(0.00160)
Log inf	-0.174***	-0.143***	-0.159***	-0.0435***
	(0.00240)	(0.00163)	(0.0154)	(0.000543)
Log liquidity	0.0113**	0.0187**	0.0112**	0.0162***
	(0.00920)	(0.0110)	(0.0145)	(0.00553)
Log NPL	-0.0886	0.00272**	-0.0623**	-0.0252**
	(0.00360)	(0.0124)	(0.00769)	(0.00253)
Log CAR	0.0388***	0.0426**	0.0315	0.0118**
	(0.0139)	(0.0278)	(0.0278)	(0.0130)
Covid	0.119***	0.0189***	0.0831**	0.119***
	(0.00334)	(0.00363)	(0.0323)	(0.00265)
Constant	2.466***	2.281***	1.717***	0.418***
	(0.0742)	(0.194)	(0.249)	(0.0457)
Observations	286	286	286	286
Number of id	22	22	22	22
R-squared	0.53	0.54	0.54	0.72
F-statistics	757	818	818	215
Prob(F-statistics)	0.00	0.00	0.00	0.00

Note: z-score is dependent variable which shows banking stability, POS stand for point of sale, E-com is E-commerce, RTOB is real time online banks and CC is call centers transactions, gdp shows gross domestic product, inf is inflation,

liq shows liquidity, NPL shows the non-performing loans, CAR stands for capital adequacy ratio and covid as dummy. ***, **, * are the 1%, 5%, and 10% level of significance respectively.

4.8.1 Point of Sale Transactions and Banking Stability

Point of sale is considered as one of the important channel of banking stability in Pakistan. Point-of-sale (POS) transactions are vital for maintaining banking stability as they improve the security of information and the resilience of the financial system. Table 4.6 shows the empirical results of effect of point of sale transactions on banking stability.

Table 4.6 illustrates the results of point of sale transactions on z-score. The regression study examines the factors that affect banking stability, as assessed by the Z-score. The analysis specifically focuses on Point of Sale (POS) transactions, as well as several country-specific and bank-specific variables. Point of sale (POS) transactions exhibit a notable and favorable correlation with the stability of the banking sector. Specifically, a 1% increase in POS transactions is associated with a 0.0130% improvement in the Z-score, highlighting their contribution to enhancing the strength and resilience of the financial system. The increase in economic growth, as measured by GDP, has a favorable impact on stability. Specifically, a 1% increase in GDP is associated with a 0.113% increase in the log Z-score. This indicates that the overall health of the economy has a supportive effect on banking institutions. In contrast, inflation has a negative impact, as shown by a 0.174% reduction in the log Z-score for each 1% rise in inflation. This emphasizes how inflation erodes financial stability. Banking stability is positively influenced by sufficient liquidity, as evidenced by a 0.0113% increase in the log Z-score for every 1% increase in liquidity, and a strong capital adequacy ratio (CAR), which leads to a 0.0388% increase in the log Z-score for every 1% increase. The COVID-19 pandemic, represented by a binary variable, unexpectedly demonstrates a notable and favorable influence, resulting in a 0.119% rise in the logarithmic Z-score. This indicates that the implementation of effective crisis management procedures during the pandemic has contributed to the maintenance of stability in the financial sector. These findings highlight the many and diverse elements that affect the stability of the banking sector. They support the theories of economic resilience and financial regulation, which aim to create a stable banking environment.

4.8.2 E-commerce transactions and banking stability

Another channel for digital transaction is e-commerce in digital transactions. E-commerce, often known as electronic commerce, is the process of purchasing and selling products and services through electronic systems, with the internet being the main platform for these transactions (Jain et al., 2021). E-commerce and financial stability are closely interconnected through elements such as supply chain social capital, digitization, internet banking, and e-payments (He et al., 2022). Table 4.6 shows the empirical results of effect of e-commerce on banking stability

The regression analysis provides valuable insights into the determinants of banking stability, as assessed by the Z-score. The findings imply that a 1% increase in e-commerce transactions leads to a 0.0569% improvement in the log Z-score, indicating that the implementation of e-commerce has a favorable effect on banking stability. Furthermore, there is a direct correlation between a 1% increase in GDP and a 0.0948% increase in the log Z-score. This emphasizes the significance of economic growth in improving the stability of the banking sector. On the other hand, when inflation increases by 1%, the log Z-score decreases by 0.143%, highlighting the adverse impact of increased inflation on the stability of the banking sector. Enhanced liquidity yields a favorable effect, as a 1% boost in liquidity leads to a 0.0187% escalation in the log Z-score. Remarkably, a mere 1% rise in non-performing loans (NPLs) is linked to a marginal favorable impact, resulting in a 0.00272% upturn in the log Z-score. This finding warrants additional scrutiny to determine its practical implications. Increased capital adequacy is also associated with stability, as a 1% increase in the capital adequacy ratio results in a 0.0426% increase in the log Z-score. The presence of the COVID-19 pandemic, represented by a binary variable, is associated with a 0.0189% rise in the logarithmic Z-score, suggesting a favorable effect on the stability of the banking sector during the pandemic. These findings highlight the complex and diverse aspects that contribute to banking stability. They support theories that emphasize the significance of adopting technology, achieving economic development, and having sufficient financial buffers to sustain a stable banking system.

4.8.3 RTOB and banking stability

Real time online banking is a channel of digital transactions. These transactions involve the immediate execution of financial activities through online banking platforms, enabling users to carry out a range of banking operations, including transfers, bill payments, and account

management, in real-time. Table 4.6 shows the empirical results of effect of RTOB on banking stability

Table 4.6 provides invaluable knowledge into the determinants of banking stability, as assessed by the Z-score. Real-Time Online Banking (RTOB) transactions have a significant and favorable effect on banking stability. Specifically, a 1% increase in RTOB transactions is connected with a 0.0744% increase in the   Z-score. This discovery emphasizes the significance of digital banking in improving the stability of financial institutions. The stability of the financial environment is favorably influenced by economic growth, as measured by GDP. Specifically, a 1% increase in GDP corresponds to a 0.114% increase in the log Z-score. This highlights the important importance of a strong economy in ensuring a stable banking system. On the other hand, inflation has a negative impact. Specifically, a 1% rise in inflation leads to a 0.159% decline in the log Z-score, showing that higher inflation weakens the stability of the banking sector. Enhanced liquidity is advantageous, as a 1% increase in liquidity results in a 0.0112% rise in the log Z-score, underscoring the significance of adequate liquidity in maintaining financial stability. Increased levels of non-performing loans (NPLs) have a detrimental effect on stability, as seen by a 1% rise in NPLs resulting in a 0.0623% reduction in the log Z-score. The capital adequacy ratio (CAR), while not statistically significant, indicates a potential beneficial impact on stability. Specifically, a 1% increase in CAR is linked to a 0.0315% increase in the log Z-score. The COVID-19 pandemic, indicated by a dummy variable, has had an unexpected positive effect on financial stability, resulting in a 0.0831% rise in the log Z-score.

4.8.4 Call Center transactions and Banking Stability

Call center transactions are also a main channel of digital transactions according to state bank of Pakistan. Table 4.6 shows the empirical results of effect of digital transactions on banking stability.The regression analysis reveals that there are several factors that have a significant impact on banking stability, as measured by the log Z-score. Call center transactions significantly contribute to financial stability, as a 1% increase in call center transactions results in a 0.856% increase in the Z-score. An increase in GDP has a favorable effect on stability, with a 1% increase in GDP corresponding to a 0.140% increase in the Z-score. On the other hand, inflation has a detrimental impact on banking stability. Specifically, a 1% increase in inflation leads to a 0.0435% reduction in the Z-score. Increased liquidity has a beneficial effect, as seen by a 1% rise in liquidity

resulting in a 0.0162% improvement in the Z-score. Non-performing loans (NPL) have a detrimental impact on stability, as a 1% rise in NPL results in a 0.0252% decline in the Z-score. An increase of 1% in the capital adequacy ratio (CAR) leads to a 0.0118% improvement in the Z-score, which in turn adds to the stability of the banking system. The inclusion of the COVID-19 dummy variable demonstrates a favorable influence on banking stability, indicating the advantageous outcomes resulting from the implementation of regulatory and financial actions undertaken amongst the pandemic. In summary, these findings highlight the crucial importance of digital transactions, economic growth, controlled inflation, sufficient liquidity, little non-performing loans, and robust capital buffers in ensuring and improving banking stability in Pakistan.

CHAPTER 5

QUANTITATIVE RESEARCH

This section of the study relies on the quantities research. This study conducts qualitative studies to assess the impact of digital transactions on banking stability by examining the perspectives of policymakers and relevant specialists. In addition to their impact on the bank's performance, this refers to the constraints that these enterprises encounter when utilizing digital transactions. It is based on interviews that were conducted form relevant policy makers and from scholars who have specialization on this topic. The responded answered the questions which were asked and also provided few policy recommendations which will be discussed later in this section.

A questionnaire was prepared for the interview to get their opinion on digital transactions and banking stability and also its implication on an economy as a whole. The first question which was asked from them was what is your opinion on the influence of digital transactions on the stability of the banking industry? The crust of their answer was they view the influence of digital transactions on the stability of the banking industry as mainly beneficial, although with certain inherent risks. Digitized transactions optimize effectiveness, diminish transaction expenses, and enhance client convenience, resulting in enhanced financial inclusivity and potentially increased economic activity. These advantages can enhance the overall stability of the financial system by boosting the number of transactions and deposits, thereby giving banks greater liquidity.

Nevertheless, the exponential expansion of digital transactions also brings along potential hazards such as cybersecurity vulnerabilities, fraudulent activities, and operational interruptions. Insufficient management of these risks has the potential to compromise the stability of the financial sector. Hence, it is imperative to maintain an ideal balance between encouraging digital advancement and implementing strong risk management procedures in banks.

Another question which was asked from them was what regulatory measures are now implemented to guarantee the stability of the banking system with the increasing prevalence of digital transactions in Pakistan? The responded answered this question by their best knowledge about this concern and told you about the three main implementations are The State Bank of Pakistan (SBP) has established comprehensive regulations for digital banking and payments systems. These rules

aim to ensure that banks and financial institutions implement secure and efficient procedures. These encompass rules related to electronic cash transfers, mobile banking, internet banking, and the utilization of digital wallets. The State Bank of Pakistan (SBP) has required all banks to adopt strong cybersecurity measures in order to safeguard against risks related to digital transactions. These criteria encompass data encryption, secure authentication procedures, regular security audits, and incident response mechanisms. The State Bank of Pakistan (SBP) has implemented distinct laws for providers of Digital Financial Services (DFS), which encompass detailed requirements for branchless banking agents, electronic money institutions, and fintech enterprises. The purpose of these regulations is to foster innovation while also safeguarding the integrity and stability of the financial system.

Another question which was asked from them was how do they think macroeconomic factors such as GDP growth and inflation influence the impact of the increase in digital transactions on banking stability in Pakistan? According to them macroeconomic variables such as the growth of Gross Domestic Product (GDP) and the rate of inflation have substantial effects on the increase in digital transactions, which in turn affect the stability of the banking sector in multiple ways. When the Gross Domestic Product (GDP) expands, there is a corresponding rise in economic activity, resulting in increased disposable incomes and a greater volume of financial transactions. Increased digital transactions during periods of economic growth can bolster financial stability through the augmentation of deposits, enhancement of liquidity, and expansion of the client base. They also consider digital transactions as a catalyst for the economic growth which means it speed ups the rate. By enhancing accessibility to financial services, promoting entrepreneurship, and streamlining corporate processes, digital transactions can effectively bolster economic growth. The interdependent process of expansion and integration of digital technology can enhance the ability of the banking industry to withstand and recover from challenges. Secondly about inflation there thought were significant inflation diminishes the ability of customers to buy goods and services and can result in elevated interest rates. This might lead to a decrease in the number of digital transactions as customers lower their spending and borrowing prices increase. As a result, banks could experience a decrease in available funds and an increase in the number of borrowers failing to repay their loans, which could potentially cause instability in the banking industry.

To summarize, whereas GDP growth often has a favorable effect on financial stability by promoting more digital transactions, the presence of significant inflation presents obstacles that require cautious handling. To guarantee that digital transactions contribute positively to financial stability in Pakistan, it is crucial to establish strong regulatory frameworks and implement smart macroeconomic policies. This will help mitigate the risks and take advantage of the opportunities presented by the rise of digital transactions.

Lastly we asked the respondent for a few policy recommendation as the question was Considering the present trends, what specific policy suggestions would you propose to guarantee that the expansion of digital transactions has a beneficial impact on the stability of the banking sector in Pakistan? The respondent gave insights on how policies can enhance the banking stability and economic growth as well, few of the policy recommendations which regarding enhancing cyber security as Implement compulsory cybersecurity regulations for all financial institutions to safeguard against digital vulnerabilities. Frequently revise these guidelines to tackle evolving dangers. Likewise Promote cooperation among the government, financial institutions, and technology companies to exchange information on potential risks and adopt effective strategies. Another policy recommendation was regarding the financial inclusion, as the responded told us the importance of including more population in technology and get used to it. Implement extensive nationwide initiatives aimed at enhancing digital financial literacy, with a focus on raising consumer awareness of the advantages and potential hazards linked to digital transactions. The responders emphasized on giving knowledge and awareness to people of Pakistan regarding this new concept as most of the people still don`t have ethics of using such instruments

To summarize all that has been said above the digital transactions system is new concept for the people of a developing nation such as Pakistan. These digital transactions can provide useful and important effect on the banking stability as well as economy of Pakistan. But with powers comes responsibilities as well and with these positive aspects of digital transactions it brings some negative aspects for an economy. Such as cybercrime, online fraud and etc. if these issues are tackled correctly then these transitions can be very beneficial for an economy like Pakistan.

CHAPTER 6

CONCLUSION AND POLICY RECOMMENDATION

6.1 Conclusion

This study aimed to examine the relationship between digital transactions and banking stability, not just that this study also examines the relationship of each of the channels of digital transactions with banking stability to know the effect of each channel of banking stability. Unlike previous literature that has just showed the relation of digital transactions on banking stability. This study explored a positive relationship between the Z-score which shows banking stability and the digital transactions by using panel data analysis, specifically random and fixed data analysis.

Firstly, various Channels of digital transactions, such as ATM transactions, internet banking, mobile phone transactions, point of sale (POS) transactions, e-commerce, call center and real-time online banking (RTOB), often have a beneficial and significant impact on the stability of the banking sector. This suggests that when banks use digital transaction channels, their general stability tends to enhance. The coefficients associated with these digital transaction variables exhibited a positive and statistically significant relationship, indicating that a rise in digitalization results in enhanced banking stability.

Furthermore, macroeconomic factors such as the rate of GDP expansion and the level of inflation also have significant impacts. The expansion of GDP has a favorable impact on the stability of the banking sector, highlighting the significance of a strong economy in strengthening the banking industry. Conversely, inflation has a detrimental impact on stability, emphasizing the adverse effects of increasing prices on the financial well-being of the banking sector.

Lastly the bank specific variables, factors that impact banking stability include liquidity and CAR, both of which have a favorable influence. Increased liquidity guarantees that banks can fulfill their financial responsibilities, while a strong Capital Adequacy Ratio (CAR) signifies sufficient capital reserves to make up for potential losses. On the other hand, non-performing loans (NPLs) have a negative impact, as increased levels of Non-performing loans weaken the soundness of the banking sector. The COVID-19 dummy variable exhibited a strong and positive effect, indicating the impact of regulatory and financial interventions implemented during the pandemic to stabilize the banking sector.

To sum up, the research highlights the crucial importance of digital financial inclusion in improving the stability of the banking sector. To fully leverage the advantages of digital transactions, policymakers and regulatory authorities in Pakistan should priorities the promotion of digital financial technologies and the establishment of legal frameworks that are conducive to their growth. This study establishes a basis for future investigations into the lasting impacts of digital transactions on the stability of the banking industry. It also encourages the examination of other developing digital financial tools that can enhance the resilience of the banking system.

6.2 Policy recommendation

Based on the findings we have come up with a few policy recommendations which might help policy makers for the betterment in this regard field.

Encourage people to use digital transactions and other means of transfer of funds while managing risk as well. Which means Implement a regulatory strategy that promotes innovation in digital financial services while effectively mitigating associated risks. Invest in research and development of fintech and instruments for digital transactions with the help of grants and subsidies which will make it easier for people to use it.

Ensure customer protection by promoting transparency in the pricing of digital transactions, guaranteeing that customers have complete and accurate information on fees and taxes. Furthermore, implement effective systems for resolving consumer disputes arising from digital transactions in a timely and fair manner. Which will help in building trust on financial institutions. Allocate resources to improve the digital infrastructure, such as upgrading high-speed internet access and ensuring a dependable power supply, in order to facilitate smooth digital transactions. Facilitate the advancement of interoperability standards to guarantee the smooth integration of diverse digital payment systems.

6.3 Limitation and Future Directions

It is essential to openly acknowledge and address any limitations in research and to carefully consider future study directions in order to advance knowledge and make meaningful contributions to the academic or practical understanding of the subject. This paper's findings contribute to the

current literature of information regarding the relationship between digital transactions and banking stability, as it shows positive relationship between the digital transactions and banking stability. Therefore, these findings of this study are expected to provide insights regarding future polies regarding financial sector of Pakistan.

This research has some limitations too. Further researchers can add more variables in to this research and by adding other channels of digital transactions except that 7 types which we have already mentioned in this study.

REFERENCES

A glossary of terms used in payments and settlement systems. (2003).

Abedifar, P., Molyneux, P., & Tarazi, A. (2013). Risk in Islamic banking. *Review of Finance*, *17*(6), 2035–2096.

Akbar, M., Masyita, D., Febrian, E., & Buchory, H. A. (2018). The Impact of Macroeconomics Factor, Capital Structure and Liquidity on the Foreign Bank's Performance in Indonesia. *Academy of Strategic Management Journal*, *17*(2), 1–17.

Al Sharif, B. M. M. (2023). The impact of macroeconomic variables on the performance of Islamic banks: An empirical study. *International Journal of Professional Business Review: Int. J. Prof. Bus. Rev.*, *8*(4), 22.

Aladwani, A. M. (2001). Online banking: A field study of drivers, development challenges, and expectations. *International Journal of Information Management*, *21*(3), 213–225.

Allison, P. D. (2012). *Logistic regression using SAS: Theory and application*. SAS institute. https://books.google.com/books?hl=en&lr=&id=Xye2BQAAQBAJ&oi=fnd&pg=PR3&dq=Allison,+P.+D.+(2012).+Logistic+regression+using+SAS:+theory+and+application.+SAS+Institute.&ots=_ecnlKcClA&sig=GmzWb8Z6EWd5OHmQyUO8XR1q-jE

Apau, R., Sibindi, A., & Jeke, L. (2023). Effect of Macroeconomic Dynamics on Bank Asset Quality under Different Market Conditions: Evidence from Ghana. *Risks*, *11*(9), 158.

AROGHENE, K. G., & IKEORA, J. J. E. (2022). EFFECT OF NON-PERFORMING LOANS (NPLS), CAPITAL ADEQUACY (CA) AND CORPORATE GOVERNANCE (CG) ON BANK STABILITY IN NIGERIA. *Finance & Accounting Research Journal*, *4*(4), 180–192.

Ayed, W. H. B., & Zouari, S. G. (2014). Capital structure and financing of SMEs: The Tunisian case. *International Journal of Economics and Finance*, *6*(5), 96.

Banna, H. (2020). The role of digital financial inclusion on promoting sustainable economic

    growth through banking stability: Evidence from Bangladesh. *Development Review*,

    29(2020), 19–36.

Banna, H., Hassan, M. K., Ahmad, R., & Alam, M. R. (2022). Islamic banking stability amidst

    the COVID-19 pandemic: The role of digital financial inclusion. *International Journal of

    Islamic and Middle Eastern Finance and Management*, *15*(2), 310–330.

Bikker, J. A., & Hu, H. (2002). Cyclical patterns in profits, provisioning and lending of banks

    and procyclicality of the new Basel capital requirements. *PSL Quarterly Review*, *55*(221).

    https://rosa.uniroma1.it/rosa04/psl_quarterly_review/article/view/9907

Boachie, R., Aawaar, G., & Domeher, D. (2023). Relationship between financial inclusion,

    banking stability and economic growth: A dynamic panel approach. *Journal of Economic

    and Administrative Sciences*, *39*(3), 655–670.

Booth, W. C., Colomb, G. G., & Williams, J. M. (2003). *The craft of research*. University of

    Chicago press.

Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North

    America and Australia. *Journal of Banking & Finance*, *13*(1), 65–79.

Bousrih, J. (2023). The impact of digitalization on the banking sector: Evidence from fintech

    countries. *Asian Economic and Financial Review*, *13*(4), 269–278.

Chinoda, T., & Kapingura, F. M. (2023). The impact of digital financial inclusion and bank

    competition on bank stability in sub-Saharan Africa. *Economies*, *11*(1), 15.

Chong, A. Y.-L. (2013). Predicting m-commerce adoption determinants: A neural network

    approach. *Expert Systems with Applications*, *40*(2), 523–530.

Claessens, S., Ghosh, S. R., & Mihet, R. (2013). Macro-prudential policies to mitigate financial
system vulnerabilities. *Journal of International Money and Finance*, *39*, 153–185.

Crockett, A. (1996). The theory and practice of financial stability. *De Economist*, *144*(4), 531–
568. https://doi.org/10.1007/BF01371939

Farag, H., Mallin, C., & Ow-Yong, K. (2018). Corporate governance in Islamic banks: New
insights for dual board structure and agency relationships. *Journal of International
Financial Markets, Institutions and Money*, *54*, 59–77.

FEDERAL RESERVE BANK of NEW YORK - Serving the Second District and the Nation—
FEDERAL RESERVE BANK of NEW YORK. (n.d.). Retrieved July 4, 2024, from
https://www.newyorkfed.org/

Fernando, J. M. R., & Disanayaka, K. (2024). The Impact of Digital Financial Inclusion on
Banking Sector Stability: Evidence from Developing Countries. *Sri Lankan Journal of
Banking and Finance*, *7*(1), 51–66. https://doi.org/10.4038/sljbf.v7i1.53

Giscard, M., Ibrahim, N., & FranÃ, K. (2015). Effect of financial intermediation on economic
growth in Cameroon. *International Journal of Management Sciences*, *5*(9), 639–649.

Gomber, P., Koch, J.-A., & Siering, M. (2017). Digital Finance and FinTech: Current research
and future research directions. *Journal of Business Economics*, *87*(5), 537–580.
https://doi.org/10.1007/s11573-017-0852-x

Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics*. McGraw-hill.
https://thuvienso.hoasen.edu.vn/handle/123456789/8914

Hamza, H., & Jedidia, K. B. (2020). Central bank digital currency and financial stability in a
dual banking system. In *Impact of Financial Technology (FinTech) on Islamic Finance
and Financial Stability* (pp. 233–252). IGI Global. https://www.igi-

global.com/chapter/central-bank-digital-currency-and-financial-stability-in-a-dual-banking-system/236808

Haralayya, B. (2021). How Digital Banking has brought innovative products and services to India. *Journal of Advanced Research in Quality Control and Management*, *6*(1), 16–18.

He, J., Liang, K., & Wu, P. (2022). Stability Governance of E-commerce Supply Chain: Social Capital and Governance Mechanism Design Perspective. *Sustainability*, *14*(20), 13320.

Hussain, B., Tahir, M. N., & Khan, B. (2022). Impact of Financial Development, Financial Liberalization and Economic Growth on Financial Instability: Evidence from Panel Data. *Journal of Economic Impact*, *4*(2), 142–151.

Huu Vu, T., & Thanh Ngo, T. (2023). Bank capital and bank stability: The mediating role of liquidity creation and moderating role of asset diversification. *Cogent Business & Management*, *10*(2), 2208425.

Ismail, S., & Ahmed, E. (2023). The impact of liquidity risk, credit risk, and operational risk on financial stability in conventional banks in Jordan. *Uncertain Supply Chain Management*, *11*(2), 433–442.

Jain, V., Malviya, B., & Arya, S. (2021). An overview of electronic commerce (e-Commerce). *The Journal of Contemporary Issues in Business and Government*, *27*(3), 665–670.

Jameaba, M. (2022). *Digitalization, emerging technologies, and financial stability: Challenges and opportunities for the banking industry*. https://www.academia.edu/download/97608378/pdf.pdf

Jamel, L., & Mansour, S. (2018). Determinants of Tunisian banks profitability. *International Journal of Business and Risk Management*, *1*(1), 17–27.

Kaliyev, K., & Nurmakhanova, M. (2020). Bank risk evaluation through z-score measure and its effect on financial health of the industry of transitional economy of Kazakhstan. *Вестник КазНУ. Серия Экономическая*, *133*(3), 40–50.

Kamela, H., Alam, R. S., & Nugroho, A. P. (2022). PENGARUH PENGADOPSIAN INTERNET BANKING DAN DOMPET DIGITAL TERHADAP TRANSAKSI KEUANGAN PANDEMI COVID-19. *Jurnal Ilmiah Ekonomi Dan Bisnis*, *19*(1), 39–45.

Kannabiran, G., & Narayan, P. C. (2005). Deploying Internet banking and e-commerce—Case study of a private-sector bank in India. *Information Technology for Development*, *11*(4), 363–379. https://doi.org/10.1002/itdj.20025

Kartal, M. T., Ayhan, F., & Altaylar, M. (2023). The impacts of financial and macroeconomic factors on financial stability in emerging countries: Evidence from Turkey's nonperforming loans. *Journal of Risk*, *25*(3).

Kasri, R. A., Indrastomo, B. S., Hendranastiti, N. D., & Prasetyo, M. B. (2022). Digital payment and banking stability in emerging economy with dual banking system. *Heliyon*, *8*(11).

Katuka, B., Mudzingiri, C., & Vengesai, E. (2023). The effects of non-performing loans on bank stability and economic performance in Zimbabwe. *Asian Economic and Financial Review*, *13*(6), 393–405.

Kiganda, E. O. (2014). Effect of macroeconomic factors on commercial banks profitability in Kenya: Case of equity bank limited. *Journal of Economics and Sustainable Development*, *5*(2), 46–56.

Kulu, E., Opoku, A., Gbolonyo, E., & Kodwo, M. A. T. (2022). Mobile money transactions and banking sector performance in Ghana. *Heliyon*, *8*(10). https://www.cell.com/heliyon/fulltext/S2405-8440(22)02049-7

Laker, J. (1999). Monitoring financial system stability. *Reserve Bank of Australia Bulletin*, *10*, 40–46.

Latinovic, M., Dmitrovic, V., & Benkovic, S. (2022). *THE ENVIRONMENTAL IMPACT OF THE DIGITAL FINANCIAL INCLUSION: THE CASE OF THE REPUBLIC OF SERBIA*. https://repository.ukim.mk/handle/20.500.12188/24436

Laukkanen, T., & Kiviniemi, V. (2010). The role of information in mobile banking resistance. *International Journal of Bank Marketing*, *28*(5), 372–388.

Ma, Q., & Liu, L. (2004). The technology acceptance model: A meta-analysis of empirical findings. *Journal of Organizational and End User Computing (JOEUC)*, *16*(1), 59–72.

Maksimova, S. Y., Murzageldieva, E. B., Solodova, S. V., & Chub, M. V. (2022). Evolution of Payment Systems in Digital Economy. *Regionalnaya Ekonomika. Yug Rossii*, 29–39.

Manu, L. P., Adjasi, C. K. D., Abor, J., & Harvey, S. K. (2011). Financial stability and economic growth: A cross-country study. *International Journal of Financial Services Management*, *5*(2), 121. https://doi.org/10.1504/IJFSM.2011.041920

Messai, A. S., & Jouini, F. (2013). Micro and macro determinants of non-performing loans. *International Journal of Economics and Financial Issues*, *3*(4), 852–860.

Mirović, V., Kalaš, B., Milenković, N., Andrašić, J., & \DJaković, M. (2024). Modelling Profitability Determinants in the Banking Sector: The Case of the Eurozone. *Mathematics*, *12*(6), 897.

Mirusmonov, M., Zhang, G., Ali, J., Lee, S. H., Kim, D. W., & Kim, J. (2023). Effects of Users' Motivation on Their Usage of Mobile Cloud Computing. *International Journal of Human–Computer Interaction*, 1–18. https://doi.org/10.1080/10447318.2023.2247612

Molyneux, P., & Thornton, J. (1992). Determinants of European bank profitability: A note. *Journal of Banking & Finance*, *16*(6), 1173–1178.

Moussa, M. A. B. (2015). The determinants of bank liquidity: Case of Tunisia. *International Journal of Economics and Financial Issues*, *5*(1), 249–259.

Nasir, M. S., Oktaviani, Y., & Andriyani, N. (2022). *OF NON-PERFORMING LOANS AND NON-PERFORMING FINANCING LEVEL: EVIDENCE IN INDONESIA 2008-2021*.

Nath, R. (2008). Determinants of mobile payments:• an empirical analysis. *Journal of International Technology and Information Management*, *17*(1), 9–20.

Neely, M. C., & Wheelock, D. C. (1997). Why does bank performance vary across states? *Federal Reserve Bank of St. Louis Review*, *Mar*, 27–40.

Nkusu, M. M. (2011). *Nonperforming loans and macrofinancial vulnerabilities in advanced economies*. International Monetary Fund. https://books.google.com/books?hl=en&lr=&id=TE4ZEAAAQBAJ&oi=fnd&pg=PA3&dq=Nkusu,+M.+M.+(2011).+Nonperforming+loans+and+macrofinancial+vulnerabilities+in+advanced+economies.+International+Monetary+Fund.&ots=tlTmiEbz9T&sig=a3CuMImocg6PzSRrLcsWZDvlMHs

Nugroho, I. S., & Endri, E. (2022). Determinants of Non-Performing Bank Loans Listed on The Indonesia Stock Exchange For The 2016-2020 Period. *Journal of Social Science*, *3*(6), 1214–1232.

Okibo, B. W., & Wario, A. Y. (2014). Effects of e-banking on growth of customer base in Kenyan banks. *The International Journal of Management Science and Information Technology (IJMSIT)*, *11-(Jan-Mar)*, 48–64.

Ozili, P. K. (2024). *Vulnerable Group Theory of Financial Inclusion*.
    https://www.academia.edu/download/115124406/Vulnerable_group_theory_of_financial
    _inclusion_peterson_ozili.pdf

Pamungkas, P., Arifin, T., Trinugroho, I., Lau, E., & Sergi, B. S. (2023). COVID-19, stability
    and regulation: Evidence from Indonesian banks. *Studies in Economics and Finance*.
    https://www.emerald.com/insight/content/doi/10.1108/SEF-12-2022-
    0569/full/html?casa_token=ygWkwVkKjAAAAAAA:FxBi4U6PXhjfg5AwpMw3fofSg9
    lxXdzHaUvEk2YWhI5WiA1zslpslEhDEpII18A4-EYSfrJkwiWwm84fZwrSm7Ev-
    Iy9gZJM4n2ouNdiEhmdQmcsuXfD

Perry, P. (1992). Do banks gain or lose from inflation? *Journal of Retail Banking*, *14*(2), 25–31.

Pham, M. H., & Doan, T. P. L. (2020). The impact of financial inclusion on financial stability in
    Asian countries. *The Journal of Asian Finance, Economics and Business*, *7*(6), 47–59.

Popoola, O. S., Adetunmbi, A. O., Ugwu, C. C., Jimoh, I. T., & Alese, K. B. (2021). Design of a
    customer-centric surveillance system for ATM banking transactions using remote
    certification technique. *2020 IEEE 2nd International Conference on Cyberspac (CYBER
    NIGERIA)*, 104–111. https://ieeexplore.ieee.org/abstract/document/9428795/

Prasad, E. S. (2010). *Financial sector regulation and reforms in emerging markets: An overview*.

Prastiwi, I. E., & Anik, A. (2021). Financing diversification and profitability of islamic banking
    in Indonesia. *Jurnal Akuntansi Dan Pajak*, *21*(2). https://www.jurnal.stie-
    aas.ac.id/index.php/jap/article/view/1817

Pratama, G. B. L. (2019). *PENGARUH INFLASI, NILAI TUKAR, CAR DAN NPF TERHADAP
    STABILITAS BANK UMUM SYARIAH DI INDONESIA TAHUN 2015-2019*. Universitas
    Pendidikan Indonesia.

Rahman, H. U., Khan, S., & Zahid, M. (2021). Do directors' compensation, education and experience affect firm financial performance? An evidence from the textile industry of Pakistan. *Journal of Managerial Sciences*, *15*(1), 101–114.

Rasheed, R., & Ishaq, M. N. (2022). Impact Of Inflation Rate And Exchange Rate On The Profitability Of Financial Institutions: A Panel Data Analysis From Pakistan. *Pakistan Journal of Social Research*, *4*(03), 132–139.

Revell, J. (1979). *Inflation & financial institutions*. Financial Times Limited.

Rouibah, K. (2007). Does mobile payment technology Mnet attract potential consumers? The case of Kuwait. *ACIS 2007 Proceedings*, 24.

Rouibah, K. (2009). The failure of mobile payment: Evidence from quasi-experimentations. *Proceedings of the 2009 Euro American Conference on Telematics and Information Systems: New Opportunities to Increase Digital Citizenship*, 1–7. https://doi.org/10.1145/1551722.1551751

Rukmana, C., Reinita, L., Toyiba, N., Hidayat, F., & Panorama, M. (2023). Pengaruh Digital Payment Terhadap Minat Masyarakat Dalam Membayar Zakat. *Al-Kharaj: Jurnal Ekonomi, Keuangan & Bisnis Syariah*, *5*(5), 2607–2615.

Sadi, A. H. M. S. (2010). The prospects and user perceptions of m-banking in the Sultanate of Oman. *Journal of Internet Banking and Commerce*, *15*(2), 1–11.

Sardana, V., & Singhania, S. (2018). Digital technology in the realm of banking: A review of literature. *International Journal of Research in Finance and Management*, *1*(2), 28–32.

Schmitz, M. S. W., Sigmund, M., & Valderrama, M. L. (2017). *Bank solvency and funding cost: New data and new results*. International Monetary Fund.

Sebayang, P. (2020). The impact of the capital adequacy ratio, non-performing loan against to

> return on equity (Case study private bank in Indonesia). *SHS Web of Conferences*, *76*,

> 01035.

Sethi, D., & Acharya, D. (2020). Monetary policy and financial stability: The role of inflation

> targeting. *Australian Economic Review*, *53*(1), 50–75.

Shaikh, I., & Anwar, M. (2023). Digital bank transactions and performance of the Indian banking

> sector. *Applied Economics*, *55*(8), 839–852.

> https://doi.org/10.1080/00036846.2022.2094880

Sharma, S. K. (2019). Integrating cognitive antecedents into TAM to explain mobile banking

> behavioral intention: A SEM-neural network modeling. *Information Systems Frontiers*,

> *21*(4), 815–827. https://doi.org/10.1007/s10796-017-9775-x

Shrestha, N. (2020). Detecting multicollinearity in regression analysis. *American Journal of

> Applied Mathematics and Statistics*, *8*(2), 39–42.

Siddik, Md. N. A., Sun, G., Kabira, S., Shanmugan, J., & Yanjuan, C. (2016). IMPACTS OF E-

> BANKING ON PERFORMANCE OF BANKS IN A DEVELOPING ECONOMY:

> EMPIRICAL EVIDENCE FROM BANGLADESH. *Journal of Business Economics and

> Management*, *17*(6), 1066–1080. https://doi.org/10.3846/16111699.2015.1068219

Silva, P. (2015). Davis' technology acceptance model (TAM)(1989). *Information Seeking

> Behavior and Technology Adoption: Theories and Trends*, 205–219.

Simpson, J. (2002). The impact of the Internet in banking: Observations and evidence from

> developed and emerging markets. *Telematics and Informatics*, *19*(4), 315–330.

Singh, K., Goundar, S., Chandran, P., Agrawal, A. K., Singh, N., & Kolar, P. (2023). Digital
Banking through the Uncertain COVID Period: A Panel Data Study. *Journal of Risk and
Financial Management*, *16*(5), 260.

Sirait, H., Rosalina, S. S., & Sari, E. (2023). The impact of digital innovation on economic
growth. *International Journal of Professional Business Review: Int. J. Prof. Bus. Rev.*,
8(6), 12.

Sokolov, D. (2007). E-banking: Risk management practices of the Estonian banks. *Institute of
Economics at Tallinn University of Technology*, *101*.
https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=8d5235272b5a44a5fc
6ab3cb4a38df9fbc21569e

Srinivasan, S., Krishnamoorthy, P., & Koteeswaran, R. (2019). Safeguarding of ATM. In
Advanced Methodologies and Technologies in Business Operations and Management
(pp. 94–105). IGI Global. https://www.igi-global.com/chapter/safeguarding-of-
atm/212101

Stewart, R., & Chowdhury, M. (2021). Banking sector distress and economic growth resilience:
Asymmetric effects. *The Journal of Economic Asymmetries*, *24*, e00218.

Sufian, F., & Habibullah, M. S. (2009). Bank specific and macroeconomic determinants of bank
profitability: Empirical evidence from the China banking sector. *Frontiers of Economics
in China*, *4*(2), 274–291.

Sumaylo, A. M. G., Babon, C. M. S., Bayaras, M. L., Pedrigal, E. M. E., Pening, A. K. S.,
Teodosio, M. J. C., & Susada, J. S. (2022). Digital Finance on Stability among Philippine
Banks. *Recoletos Multidisciplinary Research Journal*, *10*(2), 63–73.

Syed, A. A., Özen, E., & Kamal, M. A. (2022). Do digital financial services influence banking stability and efficiency: An ARDL analysis of a developed and a developing economy. In *The New Digital Era: Digitalisation, Emerging Risks and Opportunities* (pp. 13–30). Emerald Publishing Limited.

Tan, M., & Teo, T. S. (2000). Factors influencing the adoption of Internet banking. *Journal of the Association for Information Systems*, *1*(1), 5.

Tudose, M. B., Georgescu, A., & Avasilcăi, S. (2023). Global Analysis Regarding the Impact of Digital Transformation on Macroeconomic Outcomes. *Sustainability*, *15*(5), 4583.

Turhan, G. T. (2023). The Impact of Digital Transformation on Personnel Number in the Banking Sector. In *Economic and Social Implications of Information and Communication Technologies* (pp. 171–180). IGI Global. https://www.igi-global.com/chapter/the-impact-of-digital-transformation-on-personnel-number-in-the-banking-sector/316046

Vodova, P. (2011). Liquidity of Czech commercial banks and its determinants. *International Journal of Mathematical Models and Methods in Applied Sciences*, *5*(6), 1060–1067.

Weber, R. H., & Darbellay, A. (2010). Legal issues in mobile banking. *Journal of Banking Regulation*, *11*(2), 129–145. https://doi.org/10.1057/jbr.2009.16

Woolridge, D. K. (2000). *Formal modelling in an introductory college physics course* [PhD Thesis, Memorial University of Newfoundland]. http://research.library.mun.ca/1160/

yanti Elda, E. (2023). ANALYSIS OF THE INFLUENCE OF NON-PERFORMING CREDIT POLICIES ON CONVENTIONAL BANK FINANCIAL STABILITY IN INDONESIA. *Indonesian Journal of Multidisciplinary Sciences (IJoMS)*, *2*(1), 45–55.

Zhang, X., & Daly, K. (2014). The impact of bank-specific and macroeconomic factors on China's bank performance ok. *Chinese Economy*, *47*(5–6), 5–28.

Zheng, Z., & Ma, H. (2023). Customized Intelligent Vehicle Based on Innovation Diffusion Theory—Research on Modification Service Design. In H. Krömker (Ed.), *HCI in Mobility, Transport, and Automotive Systems* (Vol. 14048, pp. 225–235). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-35678-0_14

Katuka, B., Mudzingiri, C., & Vengesai, E. (2023). The Effects Of Non-Performing Loans On Bank Stability And Economic Performance In Zimbabwe. *Asian Economic And Financial Review*, *13*(6), 393–405.

Yanti Elda, E. (2023). Analysis Of The Influence Of Non-Performing Credit Policies On Conventional Bank Financial Stability In Indonesia. *Indonesian Journal Of Multidisciplinary Sciences (Ijoms)*, *2*(1), 45–55.

Aroghene, K. G., & Ikeora, J. J. E. (2022). Effect Of Non-Performing Loans (Npls), Capital Adequacy (Ca) And Corporate Governance (Cg) On Bank Stability In Nigeria. *Finance & Accounting Research Journal*, *4*(4), 180–192.

Nasir, M. S., Oktaviani, Y., & Andriyani, N. (2022). *Of Non-Performing Loans And Non-Performing Financing Level: Evidence In Indonesia 2008-2021*.

Ismail, S., & Ahmed, E. (2023). The Impact Of Liquidity Risk, Credit Risk, And Operational Risk On Financial Stability In Conventional Banks In Jordan. *Uncertain Supply Chain Management*, *11*(2), 433–442.

And Financial Stability (Pp. 233–252). Igi Global.

Huu Vu, T., & Thanh Ngo, T. (2023). Bank Capital And Bank Stability: The Mediating Role Of Liquidity Creation And Moderating Role Of Asset Diversification. *Cogent Business & Management*, *10*(2), 2208425.

Schmitz, M. S. W., Sigmund, M., & Valderrama, M. L. (2017). *Bank Solvency And Funding Cost: New Data And New Results*. International Monetary Fund.

Booth, W. C., Colomb, G. G., & Williams, J. M. (2003). *The Craft Of Research*. University Of Chicago Press.