



Sustaining and Stabilizing During Covid-19: Effective Management of Bank Financial Behavior through Digital Financial Inclusion

Muhammad Sajid¹, Muhammad Akbar Ali Ansari², Fatima Farooq³, Muhammad Faheem⁴

¹ Ph.D. Scholar, Department of Commerce, The Islamia University of Bahawalpur, Pakistan.
Email: sajid19164@gmail.com

² Assistant professor, Department of Commerce, The Islamia University of Bahawalpur, Pakistan.
Email: makbar.ali@iub.edu.pk

³ Associate Professor, School of Economics, Bahauddin Zakariya University, Multan, Pakistan.
Email: fatimafarooq@bzu.edu.pk

⁴ Assistant Professor, School of Economics, Bahauddin Zakariya University, Multan Pakistan.
Email: faheem@bzu.edu.pk

ARTICLE INFO

Article History:

Received: April 16, 2024
Revised: May 16, 2024
Accepted: May 17, 2024
Available Online: May 18, 2024

Keywords:

Digital Financial Inclusion
Bank Financial Stability
Islamic Banking System
GMM
COVID-19

Funding:

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ABSTRACT

Digital financial inclusion is critical for achieving higher economic growth, sustainable development, and a more financially inclusive nation. Additionally, digital financial inclusion is vital for stabilizing the Islamic banking industry during the COVID-19 epidemic, leveraging its resistance to financial shocks, and fostering financial inclusiveness. Islamic banks are usually considered because of their significant ability to counter financial crises and their prominent contribution to financial landscape. This study investigated the digital financial inclusion and Islamic banking stability nexus using unbalanced panel data from 65 Islamic banks from six countries from 2010 to 2021. This study uses a GMM approach and a Z score. The finding implies that the default risk of the banks in the analyzed area is reduced due to the increased stability of Islamic banking brought about by the broader application of digital financial inclusion. Digital financial inclusion is more strongly correlated with banks' financial soundness. Access to banking services, made possible by digital financial inclusion, also dramatically improves banking stability and makes banks more resilient. Moreover, incorporating digital financial inclusion into Islamic banking promotes inclusive economic development, which may help the industry weather crises like the present COVID-19 epidemic. This study lays out the policy implications that increasing bank stability, bolstering financial literacy, and combining digital financial inclusion with other strategies to keep banks viable.

© 2024 The Authors, Published by iRASD. This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License

Corresponding Author's Email: fatimafarooq@bzu.edu.pk

1. Introduction

Digital financial inclusion is critical for achieving higher financial growth, sustainable development and a more financially inclusive nation (Sajid, Ansari, Tanveer, Faheem, & Waseem, 2023). This concept includes the numerous components of monetary administration that, in the end, make finance a significant portion of the economy. Several scholars have pointed to banks' administrative structure and work processes as the foundation for their risk-taking behaviors; for example, during times of crisis, banks safeguard their assets to ensure lower losses or even profits (Alam, 2012; Sarmiento & Galán, 2017). Consequently, banks are under more compression to boost their presentation and financial security (Anginer, Demirgüç-Kunt, Huizinga, & Ma, 2017; Ansari, Sajid, Khan, & Ahmed, 2021). The financial market and the management of banks are the driving forces behind this (Hughes & Mester, 2012). The global financial crises of 2007–2009 halted economic activity at the international level. To recover from the harmful consequences of global financial problems, banks initiated several policies, including digital financial inclusion, to improve the banks' ability to tackle risks with

robust economic stability (Banna & Alam, 2020). Both economic access and its benefits are marginally overestimated for the fortunate in both high-level and agricultural nations, even though the cutoff points and access problems are significantly more severe in less fortunate economies or localities.

The digital financial inclusion in the financial area aided it in recovering its losses and regaining monetary solidity by expanding the financial business's risk-taking flexibility (Ansari, Sajid, Khan, Antohi, Fortea, & Zlati, 2024; Vo, Van Nguyen, Nguyen, Vo, & Nguyen, 2020). By taking advantage of technological advancement, digitalized financial inclusion is being practiced by banks nowadays, which is an electronic addition to conventional financial inclusion. After the 2019 pandemic, the embracing of digital financial inclusion in the banking system has rapidly increased. It is also worth noting that, as a result of the current pandemic and the persistence of disease spread in various parts of the world, sanctions imposed by governments and health administrative agencies have accelerated banks' adoption of digitalization in order to stay competitive (Vo, Van, Dinh, & Ho, 2020). Executives and decision-makers recognized the prominence of digital financial inclusion in current banking systems due to the strict precautionary measures for the prevention of disease spread that have decreased direct interaction between people (Atkeson, 2020). The sophisticated tech-based systems of digital financial inclusion allow customers to perform their daily banking operations without physical contact with other people by using banking network systems connected via the internet. This use of technology brought profits and ease for consumers, banks, stakeholders, investors, and borrowers (Berger, Klapper, & Turk-Ariss, 2017; Sadiq, Riaz, Sajid, Shafiq, & Pasha, 2022). The current crises caused by the global pandemic have harmed financial markets just as much as the global financial crises of 2007-09; in fact, it is widely believed that this pandemic has harmed economies far more than the global financial crises of 2007-09. Digital financial inclusion is also highly focused and researched in international economic research. To begin, despite the fact that the literature on financial inclusion is extensive, it is perhaps surprising that slight research conducted on the effect of Islamic finance on financial inclusion, given its possible significance as one of the contributing factors that create and shape financial inclusion.

Effective methods to preserve and stabilize financial institutions are urgently needed in light of the tremendous problems the COVID-19 pandemic has presented to the banking industry. The challenge is controlling bank behavior and minimizing the financial disruptions brought on by the pandemic. In addition, digital financial inclusion and its influence on financial stability have generally been overlooked in academic studies in developing Asia. Moreover, the current paper aims to review the previous literature about digital financial inclusion in conventional and Islamic banks, the influence of digital financial inclusion on economic stability and the reduction of risks, with an eye towards the current post-Covid-19 days of global financial crises, and how digital financial inclusion can save the economies of developing countries. A fully digitalized banking industry ensures controllable monetary development, which will most likely aid in maintaining economic stability during global crises like the COVID-19 epidemic. The study aims to provide several ideas to improve management in the financial market aimed at incorporating digital financial inclusion, as well as how digital financial inclusion benefits bank profitability, and thus the organization's or countries economic stability. The rest of the article follows this format: Part 2 focuses on the literature review, Part 3 discusses data and research technique, Part 4 presents the study's findings and discusses them, and Part 5 concludes the work and draws policy implications.

2. Literature Review

According to financial development theory, the expansion of banking services and the emergence of financial markets are crucial to a flourishing economy. According to this view, an expanding financial system and well-developed financial markets are prerequisites for a flourishing economy. According to the theory, as financial institutions and markets continue to expand, more and more resources can be distributed quickly and efficiently, and money can be more easily transferred from savers to investors. Rising investment, economic growth, and quality of life are the results. Theoretically, improving financial institutions and markets should lessen the likelihood of financial crises and make them less vulnerable to instability. Better financial systems and markets mean less likelihood of financial crises and more stability when they do occur. The Islamic banking system and the conventional banking system Islamic banking systems have emerged as a popular banking method during and after financial crises

in several areas where people opposed adopting or using conventional banking systems; in this way, Islamic banking systems have significantly contributed to including so many people into mainstream economic systems as well as helping banking systems stay stable during global crises (Naceur, Barajas, & Massara, 2017). The use of Islamic laws, securities, and credit and debt concepts with minimized risks made Islamic banking a superior option for most people. Islamic banking systems have helped positively strengthen financial inclusion and economic stability during and after financial crises; hence, it is very critical to note that the role of Islamic banking and the incorporation of digital financial inclusion in Islamic banking systems should be evaluated very carefully (Zheng, Sheng, Ghafoor, Ashraf, & Qamri, 2023). According to Ozili (2018) and Gabor and Brooks (2020) digital financial inclusion aims to simplify banking operations by utilizing sophisticated technologies, computer systems, mobile phones, and interconnected gadgets via the internet using traditional and cutting-edge banking techniques and financial inclusions. As the global epidemic halts people's progress, the financial sector can rely on digital financial inclusion to keep things running smoothly. Furthermore, the pandemic's development constraint provides an incredible opportunity for the financial industry to fully execute innovative monetary administrations, as done by numerous institutions worldwide (Faheem, Nousheen, Farooq, & Anwer, 2023; Senyo & Osabutey, 2020). Islamic banking systems enjoy rising popularity due to their exceptional success in mitigating the adverse effects of global financial crises and their pioneering use of digital financial innovation (Ahmed & Malik, 2015; Banna & Alam, 2021). The distinctive features of the Islamic banking system, which include dividing gains and losses among investors and prohibiting potentially disruptive immoral practices (such as sexual display, alcohol, gambling, interest, etc.), have contributed to the system's long-term global popularity (Hussain, Slusarczyk, Kamarudin, Thaker, & Szczepańska-Woszczyna, 2020). As indicated by Imam and Kpodar (2016), it can maintain its competitive advantage and operational control by embracing innovation and expanding into the most socially desirable activities (Hassan & Bashir, 2003). Islamic banking, being resilient, mitigated the economic impact of financial crises, both during and after the 2008 financial meltdown (Naceur, Barajas, & Massara, 2017; Tanveer, Song, Faheem, Daud, & Safdar, 2023). It is also worth mentioning that adopting innovative practices such as financial inclusion made Islamic banking adaptable and hence gave it a competitive edge over conventional banking (Banna, Hassan, & Alam, 2020).

Banks are increasingly improving by merging with digital financial inclusion, strengthening the financial sector. According to Ozili (2018) implementing the appropriate digital financial inclusion with other banks and financial institutions could create a transformative effect that will increase growth and financial strength, thus helping all people, including the oppressed, the nation, and the poor. Full implementation of financial inclusion will be possible through digital financial inclusion (Banna & Alam, 2020). Keeping this in mind, Siddik and Kabiraj (2020) found that digital financial inclusion helps eradicate poverty by expanding financial development institutions, allowing people experiencing poverty to develop and make economic progress. According to Al-Smadi (2023) financial development institutions are a development that eradicates the need for corporeal occurrence in financial institutions. In addition, good digital financial inclusion work and making the team more transparent will add to the community's inclusive development. When registering a non-government business entity, the government can access its services through its records and information settings (Klapper, Miller, & Hess, 2019). Electronic money transfer extends the delivery of traditional financial management to customers through new enhancements such as online banking, mobile phone contracts, electronic payment methods, and money transfer systems (Farooq, Zaib, Faheem, & Gardezi, 2023; Le & Huh, 2021). While ATMs and mobile banking gave birth to high-end banking, internet banking and mobile phones provide fast and powerful travel for traditional financial products while also preparing for innovation. Financial institutions (including new ones such as IT companies) are one of the pioneers of financial management (Farooq et al., 2023) and are currently relying on DFS to develop their management delivery system. Automated teller machines were introduced in the late 1960s, and financial institutions have taken over part of the digital financial system for some time since then. Quantitative and qualitative data have been used in a plethora of research to deduce how digital financial inclusion affects company operations (Al-Smadi, 2023; Feng, Meng, & Li, 2023; Ozturk & Ullah, 2022). A literature review on this topic is not available despite the apparent results of digital financial inclusion and the opposition of companies appearing in

academic journals. These surveys are essential for promoting research institutes by identifying research sites.

Using digital financial inclusion requires a mobile phone with an internet connection, which can only be provided with local credit. Using data from 3071 developing Asian banks from 2010 to 2021 using the GMM method, Vo, Nguyen, and Van (2021) show that high levels of financial inclusion contribute to bank security and provide significant flexibility in banking by reducing costs, increasing inflation, and expanding bread production. Thus, implementing financial inclusion could improve financial stability and increase banking and financial management (Rashid et al., 2017). From 2011 to 2017, Banna and Alam (2020) studied the connection among financial inclusion and Islamic and post-GFC economics, using methods such as the Simar-Wilson dual bootstrap and the DEA. Their research found that the Islamic account and the proper implementation of financial inclusion were well-prepared to overcome the GFC's consequences. Another positive study by Banna and Alam (2020) found that Islamic banks performed well after the GFC. Financial inclusion is considered necessary. The study also showed that the GDP progress of these countries is closely linked to the use of appropriate financial institutions in the Islamic financial sector. Furthermore, Ahamed and Mallick (2019) found unique and significant relationships between bank security and global financial inclusion based on 2635 banks from 86 countries from 2004 to 2012.

Furthermore, Beck, Degryse, and Kneer (2014) found that using financial inclusion effectively works on energy infrastructure, based on bank data from African countries and Mena, correspondingly. Banna and Alam (2021) highlight the affirmative role of digital financial inclusion in the stability of regional finance and their recent study of the ASEAN state. Moufakkir and Mohammed (2020) found that financial institutions and digital financial inclusion are closely linked to Islamic finance. Additionally, digital finance has enabled more effective and efficient resource distribution, allowing for more efficient resource allocation to promote innovation. Finally, digital finance has expanded entrance to financial services, agreeing more people to contribute in the innovation process (Ozturk & Ullah, 2022). The expansion of digital financial services has transformed how people manage their finances and access credit, allowing them to transact and save more efficiently. As a result, many countries, particularly developing countries, now have greater access to financial services. It demonstrates that increased levels of digital financial inclusion can lead to increased levels of innovation and entrepreneurship, both directly and indirectly, via the network of financial institutions, firms, and individuals (Zaidi, Hussain, & Zaman, 2021). Bank branch outreach had a positive impact on entrée to banking facilities and financial inclusion in the study area. The study also discovered that bank branch outreach had a positive effect on customer satisfaction, which resulted in an increase in customer loyalty (Sahu & Maity, 2023). The study on financial cycle reveals that a greater economic growth is allied with a higher risk of financial cycle spillover, while policy uncertainty is associated with a lower risk of financial cycle spillover (Danisman & Tarazi, 2020).

Furthermore, the study finds that stock market volatility is positively related to the risk of financial cycle spillover, and that the effects of these three factors are greater when the economy is in a recession (Y. Liu, Li, & Xu, 2020). Mobile banking is a relatively new banking model that has been increasingly adopted in recent years. The results show that customers are motivated by convenience, cost savings, and better access to services. Mobile banking has a affirmative effect on customer gratification and loyalty, though there are some concerns about security and privacy (Sahu & Maity, 2023). COVID-19 has promoted every aspect of human development, motivating scholars and predictors worldwide to seek effective ways to reduce its impact. Although the epidemic affects the entire financial sector, the global financial industry is the most affected, leading to overcrowding (Baldwin & Di Mauro, 2020). Due to the enormous (immediate and unusual) impact on the regional body and human day-to-day life (Banna & Alam, 2021). The closing results can be seen in various companies, including travel, conventions, sports and entertainment, banking, etc. The financial sector seems to be the utmost pretentious, as it also handles the channel for most of the global financial markets (Banna & Alam, 2020). Literature on digital financial inclusion's role in managing bank financial behavior during COVID-19 shows that it kept banks stable despite unprecedented disruptions. Digital platforms have made financial systems more robust by keeping firms functioning and consumers engaged amid lockdowns. Digital technology lets banks manage risk using real-time data and analytics, allowing them to react quickly to the pandemic's

economic effects. The paper notes that digital gaps, regulatory issues, and increased cybersecurity risks may hinder these digital efforts. Digital financial inclusion for bank stability and crisis management has numerous benefits, but it also has many risks and challenges that must be overcome.

3. Methodology

Islamic banks substantially impact national economies and are resilient during financial crises; thus, this study focuses on Islamic banks in six countries: Bangladesh, Pakistan, Malaysia, Sudan, Azerbaijan, and Indonesia. Data on digital financial inclusion limited the scope to these six countries from an initial consideration of 133 countries offering Islamic banking services. The research aimed to investigate the connection between data from 65 banks covering the years 2010–2021, digital financial inclusion, and banking stability. Reputable databases, such as the World Bank's Global Findex database and the International Monetary Fund's economic evaluations, were used to gather data. The World Development Indicators also contributed to the data set, including information on the banking sector and macroeconomics. We begin our regression analysis by constructing the model, which shows that stable financial markets are associated with financial inclusion:

$$Z \text{ score } it = f(\text{Bank characteristics}) it + f(\text{Macroeconomics}) it + f(\text{Financial inclusion}) it + e it$$

A bank's return on assets and revenue at time t can be influenced by variables f (bank characteristics) and f (macroeconomics). The financial inclusion index is comprised of four sub-indices, which are as follows: the number of bank branches per 100,000 adults, the number of ATMs per 100,000 adults, the number of credit cards per 1,000 people, and the number of debit cards per 1,000 adults. Lastly, e represents external variables that could affect a bank's z-score. As a simple indication of a bank's financial health and risk history, the Z score is a commonly used statistical metric in examining bank stability. It provides a transparent measure of a bank's insolvency buffer by determining the standard deviations between the anticipated loss and its profits. The Z score is vital for tracking bank stability and helping with sector-wide comparison evaluations due to its simplicity and effectiveness.

3.1. Index of Digital financial inclusion

To generate the financial inclusion index, we use data from the International Monetary Fund (IMF) for developing Asian nations in the sample from 2010 to 2021. A thorough inventory of digital financial inclusion was created to study the connection between stable banks and this indicator. Data scarcity makes creating the digital financial inclusion index and proxy complex. Each of the four dimensions represents a different facet of complete economic integration. To create the required data lists, researchers consulted the central banks of the selected countries and FAS data. This paper examined the supply (access/outreach) variables based on demographic and geographic data for a comprehensive measurement of indexes. The need to prepare an inclusive digital financial inclusion index is there in the literature. However, various researchers, such as Banna and Alam (2021) and Ahamed and Mallick (2019) tried to create an index of financial inclusion or a standalone digital financial inclusion proxy. To create an index for digital financial inclusion, the current study collected data on No. of Bank Branches-100000 adults, No. of ATM- 100000 adults, No. of Credit cards- 1000 adults, No. of Debit cards- 1000 adults, No. of Debit cards- 1000 adults which is different from previous studies (Banna & Alam, 2020). Demand indices were analyzed through the PCA model, and later data sets were combined to formulate an inclusive digital financial inclusion index. Principal component analysis is an appropriate and widely used technique to investigate the relationship between data and conventional tests for investigating the relationship between data and conventional tests. The general component analysis method gives the most weight to the first component since it is the one that explains the broadest range of data points.

Table 1: Principal Component Analysis Results

Name	Components	Eigenvalue	Proportion	Difference
No. of Bank Branches-100000 adults	1	2.43652	0.7195	2.1537
No. of ATM- 100000 adults	2	0.617419	0.1747	0.38861
No. of Credit cards- 1000 adults	3	0.381281	0.083	215510
No. of Debit cards- 1000 adults	4	0.136135	0.0246	-

According to Table 1, the specifics of the PCA are displayed. It is possible to account for as much as 71% of the variation in the sample using the first components with Eigenvalues > 1. We can calculate our digital financial index by comparing the three other Eigenvalues, all less than one, and using their relative probabilities.

3.2. Estimation Techniques

The following baseline regression study was carried out to ascertain the effects of digital financial inclusion on the stability of banks:

$$Y_{i,j,t} = \alpha + \beta DFI_{jt} + \phi B_{ijt} + \omega M_{jt} + \epsilon_{ijt} \tag{1}$$

In the abovementioned equation, the Y_{ijt} depicts the dependent variable for bank stability at a given period (year) in terms of Z-score and sharp ratio, which is represented by t . DFI_{jt} represents the digital financial inclusion whereas j represents the respective country and within specified time t (year). B_{ijt} can be explained as B as bank, i for related factors, j for country and t for time. Factors include LR, Size, RD, MQ, Cap, HHI etc. in M_{jt} M is for macroeconomic factors of a contrary (j) within a time (t). In the above equation the variables' error terms and coefficients were represented through the characters β , ϕ , and ω are each variable's coefficients; the error term is denoted as ϵ_{ijt} . Following Banna and Alam (2020) and Alfadli and Rjoub (2020) in their studies, which were presented by Beck and Katz in 1995, we used the PCSE technique to establish a baseline link between bank stability and digital financial inclusion. To avoid the endogeneity problems and side effects related to breakage and time constraints, the current study used the 2SLS-IV model by following Kim, Lee, Yang, Kim, Kim, and Chang (2020); Malik, bin Md Isa, bin Jais, Rehman, and Khan (2022) to strengthen the results.

4. Results and Discussions

All of the study's variables have descriptive statistics shown in Table 2. Given the varied nature of the results, it is clear that each country generally has room for improvement in digital financial services and financial inclusion. Each country on the list has room to grow in this area. On the other hand, digital financial inclusion is relatively high in Malaysia and Indonesia. Regardless, Sudan ranks worst among all nations. As a result, digital financial inclusion has room for improvement based on the total number of sampled nations. With a score of 0.14, Indonesia's digital financial inclusion index was the highest over the period Malaysia examined. The index for Malaysia was about 0.20.

Table 2: Descriptive Statistics

	<i>Mean</i>	<i>SD</i>	<i>Skewness</i>	<i>Kurtosis</i>
Z score value	5.788	11.3168	8.4352	111.65
Bank size	14.3455	2.52476	-0.2553	3.148
Return on Assets	0.86405	5.52344	-17.918	602.4
K Index	21.598	33.5032	10.3484	145.14
Operational Revenue	591356	3081310	23.9888	979.09
Loan provisions	0.05671	0.09533	6.8149	70.9567
Market value	58.0396	333.347	22.989	1432.82
GDP per capita	19926.6	21635.5	0.60891	1.59607
GDP growth	3.87126	2.85805	-0.6321	3.28097
DFI index	0.25938	0.17101	0.46822	1.4694
Financial market index	6.37188	0.73301	0.11229	2.85544

The baseline model is the analytical jumping-off point using the standard OLS regression approach. The banking characteristics, financial inclusion t , and macro conditions jt regression model are used in our study. Bank i , country j , and year t are represented by the subscripts i , j , and t , respectively, in the equation above. We utilize four sub-indicators for distribution and economic usage to make predictions on digital financial inclusion. For this baseline regression, we accounted for bank size, operational revenue, market value, K index, loan provision, and bank characteristics. We used the Wooldridge, modified Wald, and Breusch-Pagan tests to ensure no autocorrelation or heteroskedasticity. In Table 3, you can see the outcomes of the Wooldridge, Modified Wald, and Breusch-Pagan tests. This result verifies that the model has autocorrelation and heteroskedasticity. So, we use robust standard errors and the variance-covariance matrix estimator to explain the outcomes.

Table 3: Wooldridge, Modified Wald Test, and Breusch-pagan test

Wooldridge test		Modified Wald test		Breusch-Pagan test	
F-test	Existence of autocorrelation	Chi ²	Existence of heteroskedasticity	Chi ²	Existence of heteroskedasticity
81.809*** (0.0000)	Yes	6.4e+33*** (0.0000)	Yes	954.20*** (0.0000)	Yes

Our research model also takes GDP per capita and GDP growth rate into account. These two elements need to be considered due to the possibility of multicollinearity. We used these two metrics in tandem in the sample of countries with exceptional GDP growth and per capita income.

4.1. The GMM Model Estimation Technique

Using panel data sets of conventional macroeconomic variables, we tackle the problems of endogeneity and heteroskedasticity. Variables like national income and the financial system are impacted by several simultaneous elements in such datasets, which might bias the conclusions if not adequately accounted for. We use the GMM to reduce the impact of these problems. This technique produces consistent and unbiased estimators for endogenous variables with heteroscedastic errors. Based on our study, GMM can address these statistical obstacles and shed light on the strong connection between digital financial soundness and financial inclusion. Our empirical results further support this link; this approach is consistent with other empirical investigations such as P. Liu, Zhao, Zhu, and Yang (2022); Usman, Alola, and Saint Akadiri (2022); Vo, Van, et al. (2020). The GMM estimation method's instrumental variables are valid using Sargan, Hansen, and Arellano-Bond statistics.

Table 4: GMM Estimation results

	OLS Model	GMM Model 1	GMM Model 2(excluding GDP Growth)	GMM Model 3(excluding GDP per capita)	GMM Model 4 Dummy variable for COVID- 19 crises
Financial inclusion index	12.80*** (-6.33)	7.512** (2.05)	10.40** (-2.20)	13.16* (-1.88)	-10.85* (-1.71)
Loan Provision	13.40*** (-5.06)	-9.81 (-0.87)	2.441 (-0.32)	0.514 (-.02)	-4.382 (-0.66)
Bank Size	0.488*** (-3.97)	0.3752 (0.48)	-0.896* (-1.72)	0.617 (-0.56)	0.0531 (-.10)
Operational Revenue	0.007163 (-2.90)	0.00000047 (0.35)	0.000000190 (1.25)	-0.000000447 (-0.31)	0.000000670 (0.81)
K Index	0.0315* (-2.13)	0.0873 (1.17)	0.076 (-0.98)	0.0521 (-.41)	0.00722 (0.14)
ROA	0.693*** (-5.3)	1.374*** (2.76)	0.966** (-2.00)	0.305 (0.65)	0.152 (-0.8)
Market Value	-0.00109 (-0.19)	0.00460 (0.98)	0.000161 (-0.05)	-0.00049 (-0.31)	0.00069 (0.36)
GDP per capita	-0.189 (-1.57)	0.0000775 (-1.75)	0.000107* (1.88)	-	0.000186*** (3.90)
GDP Growth	0.593*** (-4.91)	0.0456 (0.30)	-	0.138 (1.52)	0.081 (-1.59)
Financial Market development	-	1.753** (2.61)	1.948*** (-2.66)	2.040** (2.33)	1.680*** (4.5)

Digital financial inclusion is positively correlated with bank financial stability, according to the empirical results of the ordinary least squares regression (Table 4). However, we'll be looking closely at the results of the GMM estimation technique. According to the data, our target model, 1, has a positive and substantial effect on financial inclusion stability. This includes both the increase of GDP and GDP per capita. Models 2, 3, and 4 consider several situations to bolster their findings. First, we exclude GDP growth from Model 2 to address concerns about possible multicollinearity with GDP per capita. As a precaution against multicollinearity with GDP growth, we excluded GDP per capita from Model 3 while it was being built. Lastly, to consider the 2019 COVID financial crisis, we include a dummy variable in Model 4. Using the dynamic GMM method to run models 1, 2, and 3, we discovered that digital financial inclusion has a substantial and positive effect on the economic stability of banks in developing Asian countries. When the specific effects of crises are considered, however, digital

financial inclusion has a detrimental and statistically significant impact on the stability of the banking sectors of the selected countries. Nevertheless, Model 4's results may provide more substantial evidence. In light of this, digital financial inclusion subs potentially impacted the selected countries' macroeconomic stability from 2010–2021 under different circumstances.

4.2. Banking stability and digital financial inclusion

The regression model was used to investigate the connection between digital financial inclusion and the stability of banks. There was a two-dimensional approach to the data analysis. In the initial level of analysis, three datasets about digital financial inclusion were created, coupled with a set of Z-scores and a sharp value for bank soundness. The findings indicate a favorable and statistically significant relationship between digital financial inclusion and stable banks. In this case, the Z-score and the Sharp ratio were indicators of a bank's stability. According to the findings, banks are more secure when digital financial inclusion is enhanced. These results corroborate those of the earlier investigations, which agree with them. Researchers Ansari et al. (2024); Banna and Alam (2020); Machdar (2020) mentioned in their studies that a higher level of financial inclusion and the adoption of digital financial inclusion improve the stability of banks' economic conditions. This is also noteworthy because the spread of using digital and internet based banking services by clients through their mobile phones, computers, and other digital gadgets decreases the in-person contact of consumers with the banking staff, which is beneficial in two ways: first, it decreases the risk of disease spread, thereby reducing the bank's risks; and second, it helps to continue the banking operations, which is beneficial for keeping banks running and stable even in times of financial crises such as a global pandemic. These restrictions on person-to-person contact during pandemics present an opportunity for banks to expand their digital financial inclusion in order to provide better services to their clients while reducing risk. This also brings up the fact that it is a good opportunity for all financial organizations, conventional and Islamic, to incorporate complete digital financial inclusion and convert to using digital services by giving full access to financial services to everyone, including those who dislike using digital services for banking and prefer in person banking methods. It is also worth mentioning that consumers can get better financial services through digital banking, and transactions through mobile banking are less costly than conventional methods, as indicated by Banna and Alam (2021) and also mentioned by Ahmad (2018).

5. Conclusion

The study attempted to investigate the significance of digital financial inclusion for banking organizations in emerging Asian nations, as well as the connection between this trend and the financial soundness of individual banks. The sixty-five banks included in the research were primarily Islamic and came from six different nations. The study found a stronger correlation between digital financial inclusion and banking system stability, likely due to the Islamic banking system's dependability during and after financial crises like 2007–2009 and COVID-19 and their role in enhancing and stabilizing the global economy during and after these events. Banks can achieve a higher level of strength through digital financial inclusion because it considerably reduces the risk factor for banks in various terms. It was also proved via this study that the goal of sustainable development can be achieved by integrating digital financial inclusion into banking systems. This can be beneficial during the recent global pandemic of COVID-19. The study recommended that banks also work on further digital banking services such as account opening, document verification, sending digital cheques, and other day-to-day banking services so that people who are afraid of going to banks can also use banking facilities without putting themselves in danger during COVID-19 global health crises.

5.1. Contribution of Study and policy implication

This paper contributes to an emerging literature on financial inclusion in at least three ways. For starters, it is timely in light of the broader issue of how financial inclusion can improve bank financial stability, particularly in developing Asian countries. Second, this study is based on a large enough dataset to draw reliable conclusions. A lack of appropriate data frequently stymies rigorous analysis. The data compilations used in this study provide a one-of-a-kind opportunity to investigate account penetration. Third, the findings could spark new policies. If there is clear evidence that weak institutions impede financial inclusion, policymakers should propose measures to strengthen institutions in order to improve financial intermediation and foster long-term provision of formal financial services. Financial inclusion

has been shown in practise to benefit both individual and macroeconomic stability. The results of our analysis have many essential policy implications. To maintain their suitability for enhancing the stability of the banking system in emerging Asian nations, they include financial inclusion. Therefore, improving the regulations governing financial inclusion in Pakistan and other emerging economies is necessary to encourage the expansion of banking services to underprivileged populations, particularly small and medium-sized enterprises (SMEs) and residents in rural regions.

5.2. Limitation of Study

Although this article used a range of tools and procedures to generate robust findings that have wide-ranging implications for policymakers, regulators, bank management, and the public, it has certain limitations. First, with Islamic banking as a framework, our study investigates the connection between financial inclusion and the stability of banks. Additionally, the demand side of the financial inclusion index is the only side examined in this article. Finally, the developing Asian nations are the only ones included in this list.

5.3. Future Direction

Our study suggest the following future direction: Firstly, policymakers would benefit significantly from additional data on the effects of financial inclusion on the stability of banks before they could make educated judgments about this pressing problem in development. Secondly, to make future analyses more credible, the financial inclusion index should include as many elements as feasible when new data on supply and demand becomes available. Thirdly, a research agenda that focuses on the influence of new laws and regulations on the lending behavior of developing-country banks is being considered. This is because developing nations are slowly but surely passing rules and regulations to encourage inclusive financial activity. The same concept can be employed in other nations that face financial stability and resilience.

References

- Ahamed, M. M., & Mallick, S. K. (2019). Is financial inclusion good for bank stability? International evidence. *Journal of Economic Behavior & Organization*, 157, 403-427. doi:<https://doi.org/10.1016/j.jebo.2017.07.027>
- Ahmad, D. (2018). Financial inclusion and financial stability: Survey of the Nigeria's financial system. *International Journal of Research in Finance and Management*, 1(2), 47-54.
- Ahmed, S. F., & Malik, Q. A. (2015). Credit risk management and loan performance: Empirical investigation of micro finance banks of Pakistan. *International journal of economics and financial issues*, 5(2), 574-579.
- Al-Smadi, M. O. (2023). Examining the relationship between digital finance and financial inclusion: Evidence from MENA countries. *Borsa Istanbul Review*, 23(2), 464-472. doi:<https://doi.org/10.1016/j.bir.2022.11.016>
- Alam, N. (2012). Efficiency and risk-taking in dual banking system: Evidence from emerging markets. *International Review of Business Research Papers*, 8(4), 94-111.
- Alfadli, A., & Rjoub, H. (2020). The impacts of bank-specific, industry-specific and macroeconomic variables on commercial bank financial performance: evidence from the Gulf cooperation council countries. *Applied Economics Letters*, 27(15), 1284-1288. doi:<https://doi.org/10.1080/13504851.2019.1676870>
- Anginer, D., Demirgüç-Kunt, A., Huizinga, H., & Ma, K. (2017). Corporate governance of banks and financial stability. *European Banking Center Discussion Paper Series(2014-010)*, 2014-2053.
- Ansari, M. A. A., Sajid, M., Khan, A. J., & Ahmed, T. (2021). Factors of Customer Satisfaction in Service Sector: Does Quality of Service Matter? *Journal of Accounting and Finance in Emerging Economies*, 7(4), 897-911. doi:<https://doi.org/10.26710/jafee.v7i4.2068>
- Ansari, M. A. A., Sajid, M., Khan, S. N., Antohi, V. M., Fortea, C., & Zlati, M. L. (2024). Unveiling the effect of Renewable Energy and Financial Inclusion towards sustainable environment: Does Interaction of Digital Finance and Institutional Quality Matter? *Sustainable Futures*, 100196. doi:<https://doi.org/10.1016/j.sftr.2024.100196>
- Atkeson, A. (2020). *What will be the economic impact of COVID-19 in the US? Rough estimates of disease scenarios*. Retrieved from
- Baldwin, R., & Di Mauro, B. W. (2020). Economics in the time of COVID-19: A new eBook. *Vox CEPR Policy Portal*, 2(3).

- Banna, H., & Alam, M. R. (2020). Islamic banking efficiency and inclusive sustainable growth: The role of financial inclusion. *Journal of Islamic Monetary Economics and Finance*, 6(1), 213-242. doi:<https://doi.org/10.21098/jimf.v6i1.1089>
- Banna, H., & Alam, M. R. (2021). Impact of digital financial inclusion on ASEAN banking stability: implications for the post-Covid-19 era. *Studies in Economics and Finance*, 38(2), 504-523.
- Banna, H., Hassan, M. K., & Alam, M. R. (2020). Digital financial inclusion, Islamic banking stability and sustainable economic growth. *ISLAMIC PERSPECTIVE FOR SUSTAINABLE FINANCIAL SYSTEM*, 131-152. doi:<https://doi.org/10.26650/B/SS10.2020.017.07>
- Beck, T., Degryse, H., & Kneer, C. (2014). Is more finance better? Disentangling intermediation and size effects of financial systems. *Journal of financial stability*, 10, 50-64. doi:<https://doi.org/10.1016/j.jfs.2013.03.005>
- Berger, A. N., Klapper, L. F., & Turk-Ariss, R. (2017). Bank competition and financial stability. In *Handbook of competition in banking and finance* (pp. 185-204): Edward Elgar Publishing.
- Danisman, G. O., & Tarazi, A. (2020). Financial inclusion and bank stability: Evidence from Europe. *The European Journal of Finance*, 26(18), 1842-1855. doi:<https://doi.org/10.1080/1351847X.2020.1782958>
- Faheem, M., Nousheen, A., Farooq, F., & Anwer, M. A. (2023). Bridging the Gap: Financial Inclusion's Role in Environmental Sustainability in Pakistan. *Journal of Accounting and Finance in Emerging Economies*, 9(3), 369-382. doi:<https://doi.org/10.26710/jafee.v9i3.2781>
- Farooq, F., Zaib, A., Faheem, M., & Gardezi, M. A. (2023). Public debt and environment degradation in OIC countries: the moderating role of institutional quality. *Environmental Science and Pollution Research*, 30(19), 55354-55371. doi:<https://doi.org/10.1007/s11356-023-26061-x>
- Feng, Y., Meng, M., & Li, G. (2023). Impact of digital finance on the asset allocation of small- and medium-sized enterprises in China: Mediating role of financing constraints. *Journal of Innovation & Knowledge*, 8(3), 100405. doi:<https://doi.org/10.1016/j.jik.2023.100405>
- Gabor, D., & Brooks, S. (2020). The digital revolution in financial inclusion: international development in the fintech era. In *Material Cultures of Financialisation* (pp. 69-82): Routledge.
- Hassan, M. K., & Bashir, A.-H. M. (2003). *Determinants of Islamic banking profitability*. Paper presented at the 10th ERF annual conference, Morocco.
- Hughes, J. P., & Mester, L. J. (2012). Efficiency in banking: Theory, practice, and evidence. doi:<https://doi.org/10.1093/oxfordhb/9780199640935.013.0018>
- Hussain, H. I., Slusarczyk, B., Kamarudin, F., Thaker, H. M. T., & Szczepańska-Woszczyzna, K. (2020). An investigation of an adaptive neuro-fuzzy inference system to predict the relationship among energy intensity, globalization, and financial development in major ASEAN economies. *Energies*, 13(4), 850. doi:<https://doi.org/10.3390/en13040850>
- Imam, P., & Kpodar, K. (2016). Islamic banking: good for growth? *Economic Modelling*, 59, 387-401. doi:<https://doi.org/10.1016/j.econmod.2016.08.004>
- Kim, D., Lee, J.-Y., Yang, J.-S., Kim, J. W., Kim, V. N., & Chang, H. (2020). The architecture of SARS-CoV-2 transcriptome. *Cell*, 181(4), 914-921. e910. doi:<https://doi.org/10.1016/j.cell.2020.04.011>
- Klapper, L., Miller, M., & Hess, J. (2019). Leveraging digital financial solutions to promote formal business participation.
- Le, N.-B.-V., & Huh, J.-H. (2021). Applying sentiment product reviews and visualization for bi systems in vietnamese e-commerce website: Focusing on vietnamese context. *Electronics*, 10(20), 2481. doi:<https://doi.org/10.3390/electronics10202481>
- Liu, P., Zhao, Y., Zhu, J., & Yang, C. (2022). Technological industry agglomeration, green innovation efficiency, and development quality of city cluster. *Green Finance*, 4(4), 411-435.
- Liu, Y., Li, Z., & Xu, M. (2020). The influential factors of financial cycle spillover: evidence from China. *Emerging Markets Finance and Trade*, 56(6), 1336-1350. doi:<https://doi.org/10.1080/1540496X.2019.1658076>
- Machdar, N. M. (2020). Financial inclusion, financial stability and sustainability in the banking sector: The case of Indonesia.

- Malik, A. H., bin Md Isa, A. H., bin Jais, M., Rehman, A. U., & Khan, M. A. (2022). Financial stability of Asian Nations: Governance quality and financial inclusion. *Borsa Istanbul Review*, 22(2), 377-387. doi:<https://doi.org/10.1016/j.bir.2021.05.005>
- Moufakkir, M., & Mohammed, Q. (2020). The nexus between FinTech adoption and financial inclusion. In *Impact of financial technology (FinTech) on Islamic finance and financial stability* (pp. 193-209): IGI Global.
- Naceur, S. B., Barajas, A., & Massara, A. (2017). Can Islamic banking increase financial inclusion? In *Handbook of empirical research on Islam and economic life* (pp. 213-252): Edward Elgar Publishing.
- Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review*, 18(4), 329-340. doi:<https://doi.org/10.1016/j.bir.2017.12.003>
- Ozturk, I., & Ullah, S. (2022). Does digital financial inclusion matter for economic growth and environmental sustainability in OBRI economies? An empirical analysis. *Resources, Conservation and Recycling*, 185, 106489. doi:<https://doi.org/10.1016/j.resconrec.2022.106489>
- Sadiq, M., Riaz, A., Sajid, M., Shafiq, R., & Pasha, A. T. (2022). IMPACT OF DUAL ORIENTED HR PRACTICES ON EMPLOYEE PERFORMANCE: MEDIATION ROLE OF JOB COMPETENCE AND JOB INSECURITY. *PalArch's Journal of Archaeology of Egypt/Egyptology*, 19(2), 655-675.
- Sahu, T. N., & Maity, S. (2023). Mobile banking a new banking model: an empirical investigation of financial innovation. *International Journal of Business Innovation and Research*, 32(2), 188-206. doi:<https://doi.org/10.1504/IJBIR.2023.134652>
- Sajid, M., Ansari, M. A. A., Tanveer, A., Faheem, M., & Waseem, A. (2023). Evaluating the influence of green growth, institutional quality and financial inclusion on financial stability: evidence by sustainable finance theory. *Environmental Science and Pollution Research*, 30(54), 115965-115983. doi:<https://doi.org/10.1007/s11356-023-30362-6>
- Sarmiento, M., & Galán, J. E. (2017). The influence of risk-taking on bank efficiency: Evidence from Colombia. *Emerging Markets Review*, 32, 52-73. doi:<https://doi.org/10.1016/j.ememar.2017.05.007>
- Senyo, P. K., & Osabutey, E. L. (2020). Unearthing antecedents to financial inclusion through FinTech innovations. *Technovation*, 98, 102155. doi:<https://doi.org/10.1016/j.technovation.2020.102155>
- Siddik, M. N. A., & Kabiraj, S. (2020). Digital finance for financial inclusion and inclusive growth. *Digital transformation in business and society: Theory and cases*, 155-168. doi:https://doi.org/10.1007/978-3-030-08277-2_10
- Tanveer, A., Song, H., Faheem, M., Daud, A., & Safdar, N. (2023). Navigating the asymmetric influence of financial inclusion on environmental sustainability: Dynamic role of energy consumption and human capital. *Energy & Environment*, 0958305X231159439. doi:<https://doi.org/10.1177/0958305X231159439>
- Usman, O., Alola, A. A., & Saint Akadiri, S. (2022). Effects of domestic material consumption, renewable energy, and financial development on environmental sustainability in the EU-28: Evidence from a GMM panel-VAR. *Renewable Energy*, 184, 239-251. doi:<https://doi.org/10.1016/j.renene.2021.11.086>
- Vo, D. H., Nguyen, N. T., & Van, L. T.-H. (2021). Financial inclusion and stability in the Asian region using bank-level data. *Borsa Istanbul Review*, 21(1), 36-43. doi:<https://doi.org/10.1016/j.bir.2020.06.003>
- Vo, D. H., Van, L. T.-H., Dinh, L. T.-H., & Ho, C. M. (2020). Financial inclusion, corporate social responsibility and customer loyalty in the banking sector in Vietnam. *Journal of International Studies (2071-8330)*, 13(4).
- Vo, D. H., Van Nguyen, P., Nguyen, H. M., Vo, A. T., & Nguyen, T. C. (2020). Derivatives market and economic growth nexus: Policy implications for emerging markets. *The North American Journal of Economics and Finance*, 54, 100866. doi:<https://doi.org/10.1016/j.najef.2018.10.014>
- Zaidi, S. A. H., Hussain, M., & Zaman, Q. U. (2021). Dynamic linkages between financial inclusion and carbon emissions: evidence from selected OECD countries. *Resources, Environment and Sustainability*, 4, 100022. doi:<https://doi.org/10.1016/j.resenv.2021.100022>
- Zheng, S., Sheng, B., Ghafoor, A., Ashraf, A. A., & Qamri, G. M. (2023). Investigating the environmental externalities of digital financial inclusion and the COVID-19 pandemic:

an environmental sustainability perspective. *Environmental Science and Pollution Research*, 30(33), 80758-80767. doi:<https://doi.org/10.1007/s11356-023-27433-z>