EVALUATING FINTECH'S TRANSFORMATIVE IMPACT ON BANKING PERFORMANCE - PRE- AND POST-COVID-19

Ghulam Farooq[1], Israr Ahmed[2]*, and Sanam Baber[3]

ABSTRACT

This study aims to explore and assess the impact of fintech on banking performance, particularly in the context of the COVID-19 pandemic. Utilizing quantitative methods, specifically regression analysis through Microsoft Excel and E-Views software, the research evaluates the relationship between fintech and banking performance metrics. The findings reveal a positive and significant influence of fintech on banking performance, as measured by Return on Assets (RoA) and Return on Equity (RoE) in the post-COVID-19 landscape. Furthermore, the study identifies that the correlation between fintech and banking performance is amplified by the moderating effect of the COVID-19 pandemic. These results underscore the critical importance of integrating fintech solutions into banking operations to bolster economic activity within the sector, particularly amid the ongoing challenges posed by the pandemic. This study contributes to the understanding of fintech's role in enhancing banking performance, particularly during the unprecedented challenges of the COVID-19 pandemic, highlighting the need for innovation in financial services.

Keywords: *Fintech; Bank Performance; COVID-19; Return on Assets; Return on Equity.*

INTRODUCTION

Fintech, a blend of "financial" and "technology," represents a transformative force in the financial sector, offering innovative products and services that enhance traditional banking. It encompasses a variety of functionalities, including payment processing, digital currencies, and investment platforms, particularly within Pakistan's banking landscape. This convergence is crucial as it fosters new business models and enhances financial inclusion, driving economic growth and creating job opportunities (Gomber et al., 2017; Stulz, 2019). The global fintech market was valued at approximately $194.1 billion in 2022, and the State Bank of Pakistan is the principal regulatory body overseeing fintech firms, which may require licenses depending

[1] Independent Research Scholar.
[2] Associate Professor, Ilma University, Karachi, Pakistan. Email: Israr.ja8@gmail.com
[3] Assistant Professor, KASBIT, Karachi, Pakistan.
** Corresponding Author*

on their operational model. However, while the fintech sector holds immense potential—expected to exceed $36 billion in digital financial services in Pakistan by 2025 (Alt et al., 2024)—it also poses significant challenges, particularly regarding regulation, competition, and consumer trust. Despite the growing prevalence of fintech, significant gaps exist in the current literature regarding its impact on banking efficiency and market structure. Notably, while fintech has been recognized for its potential to disrupt traditional banking practices, studies have often overlooked the complexities of this disruption, particularly the interplay between regulation and competition. As new fintech entrants strive to carve out their market share, they must navigate a landscape where regulatory compliance is vital to maintain equitable competition and foster innovation. This becomes increasingly challenging as unregulated fintech firms may contribute to systemic risks reminiscent of the 2007-2009 financial crisis, highlighting the urgency for a well-defined regulatory framework. The primary objective of this study is to investigate the effects of fintech adoption on banking performance in Pakistan, specifically evaluating performance metrics such as return on assets (ROA), return on equity (ROE), and customer satisfaction. Understanding these relationships is critical, as they may inform both practitioners and policymakers on fostering a healthy financial ecosystem. Therefore, this study seeks to address the following research questions:

1. What is the impact of fintech adoption on the financial performance of banks in Pakistan?
2. How do regulatory frameworks influence competition between fintech companies and traditional banks?
3. What challenges related to legitimacy do fintech solutions face, and how do these affect consumer trust?

These questions are grounded in the existing literature, which highlights that fintech solutions often struggle with legitimacy issues due to their reliance on online platforms and complex data management (Shin & Choi, 2019; Schueffel, 2016). Additionally, various studies indicate that effective regulatory oversight is essential for mitigating risks associated with fintech innovations (Feyen et al., 2021). By exploring these dimensions, this research aims to contribute to a deeper understanding of the multifaceted impact of fintech on the banking sector and to identify pathways for ensuring stability and growth within this evolving landscape.

PROBLEM STATEMENT

Financial institutions assess their operational performance and success through productivity, profitability, and efficiency metrics in service delivery. The COVID-19 pandemic has

profoundly impacted traditional banking, prompting a significant shift toward fintech solutions (Al Nawayseh, 2020; Chen et al., 2021). Factors influencing fintech adoption include user challenges in both rural and urban settings, exacerbated by the pandemic. This study aims to evaluate the severity of these challenges in the banking sector, considering pre- and post-COVID-19 contexts as moderating factors. By adopting an explanatory approach, the research scrutinizes fintech's impact on banking performance. Hence, the primary objective of this study is to identify the impact of fintech on the financial performance of banks before and after the COVID-19 pandemic.

RESEARCH GAP

Several studies have underscored the influence of fintech on banking performance (J. Bousrih, 2023), highlighting challenges in fintech adoption and user reluctance to embrace fintech solutions. However, the existing literature lacks a comprehensive analysis of the pre- and post-COVID-19 impact on banking profitability in Pakistan.

LITERATURE REVIEW

Fintech

Fintech, a convergence of finance and technology, has catalyzed substantial capital investments in the banking sector, driving a redesign of services and products to enhance competitiveness (Bömer, 2020). Digital financial services, facilitated through the internet, significantly improve operational efficiency and customer engagement (Taherdoost, 2023). In Pakistan, the government's regulatory efforts aim to foster a collaborative relationship between traditional banks and fintech firms, promoting sustainable performance rather than competition based solely on Sharia law and Islamic banking standards (Al-Binali et al., 2023; Naz et al., 2023). The COVID-19 pandemic has further amplified the importance of fintech, as evidenced by the dramatic increase in online transactions, which has transformed consumer behavior but also introduced challenges such as rising bad debts and operational adaptability issues (Mckibbin et al., 2020). While it is well-documented that the adoption of financial technology enhances competitiveness and efficiency within banks (Dwivedi et al., 2021), the literature lacks a critical analysis of the mechanisms that substantiate these assertions. For instance, how does fintech specifically influence performance metrics such as Return on Assets (RoA) and Return on Equity (RoE)? Additionally, while recent studies classify fintech developments into stages (Fintech 1.0 to 4.0), linking these advancements to competitiveness (Arner et al., 2022), the review would benefit from a broader range of sources that explore the global implications of fintech on traditional banking practices. Furthermore, it is essential to address the potential

drawbacks associated with fintech integration. While fintech solutions improve operational performance and customer relationship management (Mainardes & Freitas, 2023), they also pose risks, particularly concerning cybersecurity and regulatory compliance. As fintech continues to evolve, ongoing monitoring and adaptation will be necessary to mitigate these risks (Hasan, 2023). In the context of Pakistan, the fintech landscape is rapidly evolving, with a significant proportion of the population lacking access to traditional banking services. This gap presents an opportunity for fintech to enhance financial inclusion and stimulate economic growth. Various fintech initiatives, including digital payments, peer-to-peer lending, and personal finance management, have emerged to address these needs (Bokhari, 2022). The State Bank of Pakistan (SBP) has actively facilitated this growth by establishing a regulatory sandbox for fintech startups, allowing them to innovate within a controlled environment. Thus, fintech is perceived as a developing sector with the potential to transform Pakistan's financial landscape by promoting the inclusion of the unbanked population into formal financial systems (Asad & Shah, 2023). A quantitative research approach will be employed to investigate various fintech initiatives that can further financial inclusion in Pakistan. It is anticipated that fintech will stabilize Pakistan's fiscal position, particularly in underserved areas and sectors such as small and medium enterprises (SMEs). By enhancing access to financial services, fintech has the potential to drive overall economic growth and improve the financial landscape of the country.

Banking Performance

The banking performance landscape in Pakistan is characterized by a persistent challenge of financial inclusion, with the current ratio at only 21%, significantly below the average of 33% for other middle-income countries (World Bank, 2021). This scenario reflects the unmet demand for financial services, especially in rural and underserved urban areas, highlighting an opportunity for fintech solutions to transform the traditional banking model. The rise of fintech has been accompanied by a proliferation of mobile internet services, with over 160 million biometrically verified mobile connections in Pakistan. This technological advancement presents a significant opportunity for banks to enhance their performance through improved service delivery, operational efficiency, and customer engagement. Mobile banking has emerged as a critical channel for facilitating access to financial services, allowing banks to reach previously unbanked populations.

Several performance metrics are employed to assess the effectiveness of banking institutions, including Return on Assets (RoA), Return on Equity (RoE), operational efficiency, customer

satisfaction, and risk management. RoA and RoE are particularly relevant as they indicate how effectively a bank is utilizing its assets and equity to generate profits. The integration of fintech solutions has been shown to positively influence these metrics by streamlining operations and reducing costs associated with traditional banking processes. Banks that adopt fintech innovations report enhanced operational performance, leading to improved financial returns. This correlation suggests that fintech not only enhances efficiency but also strengthens the financial sustainability of banking institutions. In addition to improving financial performance, fintech can enhance customer relationship management (CRM) and brand loyalty, which are critical components of banking success. By leveraging data analytics, banks can offer personalized services that cater to the unique needs of individual customers, thus fostering greater customer satisfaction and loyalty (Mainardes & Freitas, 2023). Enhanced CRM capabilities also enable banks to attract new clientele, driving further growth and profitability.

The regulatory environment plays a crucial role in shaping banking performance, particularly concerning the integration of fintech solutions. The State Bank of Pakistan (SBP) has taken proactive measures to create a conducive regulatory framework that encourages innovation while ensuring consumer protection and financial stability. For instance, the SBP's regulatory sandbox allows fintech startups to test their solutions in a controlled environment, mitigating risks while promoting the growth of innovative financial services. However, regulatory challenges persist, particularly in balancing the need for innovation with the imperative of maintaining systemic stability within the financial system. While the integration of fintech presents numerous opportunities for enhancing banking performance, it is imperative to recognize the potential risks associated with these innovations. Cybersecurity threats and data privacy concerns are paramount as banks increasingly rely on digital platforms to deliver their services. Regulatory bodies must, therefore, develop robust frameworks to address these challenges and safeguard against potential vulnerabilities that could undermine consumer trust and financial stability.

Recent empirical studies underscore the positive impact of fintech on banking performance metrics. For example, research by Gomber et al. (2017) highlights that fintech adoption can lead to improved operational efficiency and cost reductions, thereby enhancing profitability. Furthermore, fintech solutions can facilitate more effective risk management practices, enabling banks to better assess and mitigate risks associated with lending and investment activities. The ongoing evolution of fintech necessitates continuous observation and adaptation by banks to harness its full potential while navigating the associated risks. The performance of

banks in Pakistan is increasingly influenced by the integration of fintech solutions. By enhancing operational efficiency, customer engagement, and financial sustainability, fintech has the potential to revolutionize traditional banking practices. However, banks must also remain vigilant in addressing the inherent risks and challenges posed by these innovations to ensure long-term success and stability in the financial sector.

H1: *Fintech adoption has a positive and significant impact on Return on Assets (ROA) and Return on Equity (ROE) for banks in the post-COVID-19 period.*

H2: *The influence of fintech adoption on ROA and ROE is more significant in the post-COVID-19 period compared to the pre-COVID-19 period.*

RESEARCH METHODOLOGY

This study adopts a quantitative research design to examine the impact of fintech adoption on banking performance, with a specific focus on Return on Assets (ROA) and Return on Equity (ROE). The quantitative approach is appropriate for analyzing measurable financial metrics, allowing for an objective assessment of fintech's influence on bank profitability and operational efficiency. While a mixed-method approach could offer additional insights, the quantitative method aligns with the study's objective of evaluating the statistical relationship between fintech and banking performance (Elgi & Karnasi, 2024).

CONCEPTUAL FRAMEWORK

The study's conceptual framework explores fintech adoption as the independent variable and banking performance, represented by ROA and ROE, as the dependent variable. Fintech adoption is operationalized through indicators such as the use of digital banking channels, mobile payments, and other technology-driven banking innovations. ROA and ROE serve as measures of banking performance, reflecting profitability and the efficient use of assets. Additionally, the COVID-19 pandemic is considered a moderating factor, as it potentially amplifies fintech's role in supporting banking operations under challenging conditions (Fahmi, Yustika, & Shabur, 2024).

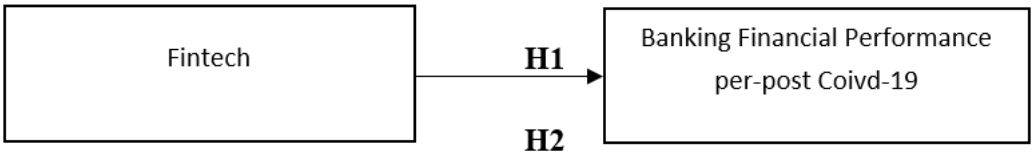

Figure 1. *Conceptual Framework*

Data Collection Approach

Secondary data was obtained from the financial reports of selected banks. These reports provide standardized, reliable data on financial metrics, ensuring consistency in measuring ROA and ROE across institutions and time periods. By leveraging publicly available financial statements, the study captures objective measures of bank performance, particularly across pre- and post-COVID-19 periods. The use of secondary data also allows for a broader analysis of trends in fintech adoption and banking performance over time (Fortuna & Wiraputra, 2024).

Sample and Sampling Technique

Data were collected from a sample of financial reports from multiple banks. To ensure that the sample reflects a variety of banking operations, reports from both large and mid-sized banks were included, providing a more comprehensive view of fintech's impact on different types of financial institutions. While the sample is limited by the availability of detailed financial data, future research could expand this by incorporating reports from a larger number of banks and including various financial sectors (Kadhim & Rafis, 2024).

Data Analysis Techniques

The study employs regression analysis using EViews 13 software to examine the relationship between fintech adoption and banking performance metrics, specifically Return on Assets (ROA) and Return on Equity (ROE). Linear regression models are utilized to quantify fintech's impact on these performance metrics. EViews provides a robust platform to validate key statistical assumptions that ensure the reliability of regression results. To confirm the validity of the regression model, the study first tests for normality, linearity, and homoscedasticity of residuals. The Jarque-Bera test is used to check the normality of residuals, which supports the application of inferential statistics if a normal distribution is confirmed. The linearity between fintech adoption and banking performance is assessed through scatter plots and other diagnostic tools available in EViews, confirming that a linear relationship exists as required for linear regression. To detect heteroscedasticity, the Breusch-Pagan test is applied; consistent variance across observations strengthens the reliability of the regression estimates. The Breusch-Godfrey Serial Correlation LM test is then conducted to check for autocorrelation in residuals. This test verifies that residuals are independent of one another, which is essential for accurate regression modeling. Additionally, multicollinearity diagnostics were performed to assess the degree of correlation among predictor variables. Low multicollinearity ensures that the regression coefficients remain interpretable and that the results are not distorted by highly correlated predictors. These diagnostic checks, conducted through EViews 13, enhance the

credibility of the regression analysis by confirming that the statistical assumptions are met. As a result, the study produces reliable insights into the influence of fintech adoption on ROA and ROE across different periods, providing a sound basis for interpreting fintech's impact on banking performance (Kharrat, Trichilli, & Abbes, 2024).

RESULTS AND ANALYSIS

Analysis of pre covid-19 by ROA

Heteroskedasticity

To verify the normality and consistency of the data, the Breusch-Godfrey Heteroskedasticity Test was conducted. In this test, P-values above 0.05 indicate that heteroskedasticity (variance inconsistency across the data) is not present, allowing us to accept the null hypothesis of homoscedasticity (constant variance). The results of this test suggest that there is no significant variability in the residuals, meaning the data does not violate the homoscedasticity assumption. This supports the reliability of the regression model in predicting Return on Assets (ROA) without biased or skewed variance. The data thus remains consistent and valid for further statistical testing in pre-COVID analysis (Fernando & Dharmastuti, 2021; MBAGWU, Onyinyechi Nneka & OBONOFIEMRO, Godwin, 2023). Here is the editable table with all four columns, as in the image:

Table 1. Pre-COVID Heteroskedasticity Test of ROA

Test	Statistic	DF/Type	Probability
F-statistic	18.72346	F (1,2)	0.0495
Obs*R-squared	3.613964	Chi-Square (1)	0.0573
Scaled explained SS	0.451879	Chi-Square (1)	0.5014

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

Autocorrelation

The Breusch-Godfrey Serial Correlation LM Test was employed to examine the presence of autocorrelation, where data residuals may be correlated across observations. A P-value above 0.05 in this test signifies that the residuals are not serially correlated, thereby upholding the null hypothesis that no autocorrelation is present. Autocorrelation would indicate that residuals follow a pattern, which could have biased results. In this case, the P-value of 0.93 confirms no serial correlation, allowing us to conclude that the model for ROA in the pre-COVID period does not suffer from autocorrelation issues (Fernando & Dharmastuti, 2021; MBAGWU, Onyinyechi Nneka & OBONOFIEMRO, Godwin, 2023).

Table 2. Pre-COVID Breusch-Godfrey Serial Correlation LM test of ROA

Test	Statistic	DF/Type	Probability
F-statistic	0.001544	F (1,1)	0.9750
Obs*R-squared	0.006167	Chi-Square (1)	0.9374

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 1 lag

Regression Analysis

The regression analysis in Tables 3 and 4 provides statistical insights into the relationship between fintech adoption (measured through mobile banking usage) and ROA for banks in the pre-COVID period. Key metrics such as the R-squared value and standard deviation are included. The R-squared value of 0.37 indicates that around 37% of the variance in ROA can be explained by fintech adoption, while the remaining variance may be due to other factors. Following conventional statistical standards, the t-statistic should ideally exceed 2, and the p-value should be below 0.05 to suggest significance (Ahmed & Khoso, 2020; Hair et al., 2019). Although the association with ROA is limited, mobile banking appears to have had some influence, albeit negative, in the pre-COVID period.

Table 3. Regression Analysis of Pre-COVID ROA- Regression Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	-3164539.	11271553	-8.280754	0.0088
C	25185567	24650167	1.021720	0.0037

Table 4. Regression Results - Model Fit Statistics

R-squared	0.379172	Mean dependent var	18343570
Adjusted R-squared	-0.443124	S.D. dependent var	6169431
S.E. of regression	7411344	Akaike info criterion	34.78177
Sum squared resid	1.10E+14	Schwarz criterion	34.47492
Log likelihood	-67.56355	Hannan-Quinn criteria.	34.10841
F-statistic	24.07882	Durbin-Watson stat	2.049479
Prob(F-statistic)	0.008053		

Analysis of Post Covid-19 by RoA

Heteroskedasticity

In the post-COVID period, the Breusch-Godfrey Heteroskedasticity Test was again used to check for consistent variance across the data. A p-value exceeding 0.05 allows for the acceptance of the null hypothesis, indicating that homoscedasticity is maintained. This means that, post-COVID, the variance remains stable across different observations in the data, suggesting that the residuals are not affected by heteroskedasticity. The stability of the residual variance in the post-COVID period further supports the validity of this data for statistical

analysis. (Fernando & Dharmastuti, 2021; MBAGWU, Onyinyechi Nneka & OBONOFIEMRO, Godwin, 2023).

Table 5. Post-COVID Heteroskedasticity of ROA

Test	Statistic	DF/Type	Probability
F-statistic	2.648809	Prob. F (1,2)	0.2452
Obs*R-squared	2.279129	Prob. Chi-Square (1)	0.1311
Scaled explained SS	0.308146	Prob. Chi-Square (1)	0.5788

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

Autocorrelation

To ensure the reliability of the regression model, the Breusch-Godfrey Serial Correlation LM Test was conducted again in the post-COVID context to detect any possible autocorrelation. Here, a P-value greater than 0.05 suggests that the residuals are not serially correlated, thus allowing the null hypothesis to be accepted. The P-value of 0.30 supports this lack of serial correlation, indicating that the model remains valid in capturing the independent effects of fintech adoption on ROA without interference from residual dependencies (Fernando & Dharmastuti, 2021; MBAGWU, Onyinyechi Nneka & OBONOFIEMRO, Godwin, 2023).

Table 6. Post-COVID Breusch-Godfrey Serial Correlation LM test of ROA

Test	Statistic	DF/Type	Probability
F-statistic	0.351638	Prob. F (1,1)	0.6592
Obs*R-squared	1.040627	Prob. Chi-Square (1)	0.3077

Null hypothesis: No serial correlation at up to 1 lag

Regression

The regression analysis presented in Table 6 reveals the relationship between mobile banking (as a proxy for fintech adoption) and ROA post-COVID. Here, the R-squared value has increased to 0.66, indicating that 66% of the variance in ROA can be explained by fintech variables. This suggests that the impact of fintech on ROA has strengthened in the post-COVID period. According to the statistical standards set by academic literature, T-statistics above 2 and P-values below 0.05 confirm the significance of these findings (Ahmed & Khoso 2020; Hair et al., 2019). This enhanced association shows the positive influence of mobile banking on ROA in the post-COVID scenario, pointing towards a shift in fintech's role in banking profitability.

Table 7. Regression Analysis of Post-COVID ROA - Regression Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	336410.2	4118394.	13.08168	0.0023

C	40833539	11077456	3.686184	0.0464

Table 8. Regression Results - Model Fit Statistics

Statistic	Value	Statistic	Value
R-squared	0.660493	Mean dependent var	41722923
Adjusted R-squared	0.595012	S.D. dependent var	3336781.
S.E. of regression	4079906.	Akaike info criterion	33.58790
Sum squared resid	3.33E+13	Schwarz criterion	33.28105
Log likelihood	65.17580	Hannan-Quinn criteria.	32.91453
F-statistic	66.72408	Durbin-Watson stat	2.124701
Prob(F-statistic)	0.002336		

Analysis of Pre-COVID by RoE

Heteroskedasticity

In analyzing the Return on Equity (ROE) for the pre-COVID period, the Breusch-Godfrey Heteroskedasticity Test was utilized to ensure variance stability across data observations. With a p-value above 0.05, the results confirm homoscedasticity, which implies no variance inconsistency in the residuals. This supports the validity of using ROE as a measure in the pre-COVID context, allowing us to rely on the model without adjustments for heteroskedasticity. (Fernando & Dharmastuti, 2021; MBAGWU, Onyinyechi Nneka & OBONOFIEMRO, Godwin, 2023).

Table 9. Pre-COVID Heteroskedasticity Test of ROE

Statistic	Value	Statistic	Value
F-statistic	0.099521	Prob. F (1,2)	0.7823
Obs*R-squared	0.189608	Prob. Chi-Square (1)	0.6632
Scaled explained SS	0.028165	Prob. Chi-Square (1)	0.8667

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

DISCUSSION

The integration of fintech into the banking sector has significant implications for performance metrics such as Return on Assets (RoA) and Return on Equity (RoE). Banks that embrace fintech solutions can enhance their operational efficiency, leading to improved financial outcomes. This assertion is supported by the growing body of literature that underscores the transformative effects of fintech on traditional banking practices. For instance, technological advancements allow banks to reduce costs associated with service delivery, thereby improving profit margins. The shift towards digital services also enables banks to tap into previously underserved markets, fostering financial inclusion and driving economic growth (Qambrani, 2024). However, while the advantages of fintech integration are evident, the potential risks

cannot be overlooked. Cybersecurity concerns and data privacy issues pose significant threats to the integrity of banking operations. As fintech solutions rely heavily on digital platforms, banks must invest in robust cybersecurity measures to protect customer data and maintain trust. Furthermore, the regulatory landscape plays a crucial role in shaping the effectiveness of fintech integration. The proactive approach of the State Bank of Pakistan (SBP) in establishing a regulatory sandbox is commendable, as it encourages innovation while ensuring consumer protection. Nonetheless, a continuous dialogue between fintech companies, banks, and regulators is essential to address the evolving challenges and risks associated with fintech adoption. The literature also reveals a lack of critical analysis regarding the implications of fintech on traditional banking practices beyond Pakistan. The global landscape of fintech adoption provides valuable insights into the mechanisms through which fintech enhances operational performance and competition. Future research should explore comparative studies across different regions to identify best practices and draw lessons that can be applied within the Pakistani context. Moreover, while fintech has the potential to enhance customer relationship management and brand loyalty, it is crucial to understand that not all customers view these innovations positively. The perception of fintech solutions varies among different demographics, and banks must tailor their strategies to address the concerns and preferences of their diverse customer base.

CONCLUSION

This study has explored the impact of fintech on the banking sector in Pakistan, emphasizing its potential to enhance operational performance and financial metrics such as Return on Assets (RoA) and Return on Equity (RoE). However, the study is not without its limitations. First, the focus on a limited geographic context—primarily Pakistan—restricts the generalizability of the findings. While the insights provided are relevant to the local banking landscape, the dynamic nature of fintech adoption necessitates a broader exploration that includes comparative analyses across different countries and regions. Furthermore, the reliance on secondary data sources may lead to biases or inaccuracies inherent in the available literature. Policymakers should consider incorporating primary data collection methods, such as surveys or interviews with banking professionals and fintech stakeholders (Qambrani, 2024), to gain more nuanced insights into the practical implications of fintech integration. In terms of future research recommendations, scholars should aim to identify specific unanswered questions that emerge from this study. For example, what specific mechanisms drive the relationship between fintech adoption and improvements in banking performance metrics? A mixed-methods approach

could be valuable here, combining quantitative analysis of financial performance with qualitative insights from industry experts. Additionally, research should explore the long-term impacts of fintech on customer behavior and trust in banking institutions, particularly concerning the rise of digital-only banks. Moreover, the study should have elaborated on the regulatory implications surrounding fintech adoption. Investigating how regulatory frameworks impact the operational practices of banks adopting fintech solutions could provide valuable insights. Research could also focus on the effects of fintech on various demographic groups, particularly underserved populations, to assess how these innovations can promote inclusive financial practices.

Finally, it is important to reiterate the significant effects of fintech on ROA and ROE while avoiding redundancy in discourse. Each mention should build upon previous insights, linking fintech's impact to broader economic and social changes within the banking sector.

FUTURE RESEARCH

Future research on fintech's impact on the banking sector should focus on several key areas. Comparative studies analyzing fintech integration across different regulatory environments, both regionally and globally, can provide insights into varying impacts on banking performance. Investigating the specific mechanisms through which fintech affects metrics like Return on Assets (RoA) and Return on Equity (RoE) would benefit from mixed methods approaches that combine quantitative data with qualitative case studies. Additionally, examining consumer behavior, trust, and security perceptions related to fintech adoption can uncover critical factors influencing usage patterns, especially among underserved populations in Pakistan. Longitudinal studies tracking banking performance before and after fintech integration can illuminate long-term effects, while research into the regulatory frameworks guiding fintech adoption can identify barriers to and facilitators of innovation. Finally, exploring the potential risks associated with fintech integration—such as cybersecurity threats and operational vulnerabilities—will provide a balanced perspective on its transformative role in banking. By addressing these areas, future studies can deepen our understanding of fintech's implications for the financial landscape.

REFERENCES

Ahn, K., & Cho, J. S. (2019). Major concerns of FinTech (Financial Technology) services in the Korean market. *Journal of Business and Retail Management Research*, *14*(01).

Al Nawayseh, M. K. (2020). Fintech in COVID-19 and beyond: What factors are affecting customers' choice of fintech applications?. *Journal of Open Innovation: Technology, Markets, and Complexity*, *6*(4), 153. https://doi.org/10.3390/joitmc6040153

Al-Binali, T., Aysan, A. F., Dinçer, H., Unal, I. M., & Yüksel, S. (2023). New horizons in bank mergers: A quantum spherical fuzzy decision-making framework for analyzing Islamic and conventional bank mergers and enhancing resilience. *Sustainability*, *15*(10), 7822. https://doi.org/10.3390/su15107822

Alt, R., Fridgen, G., & Chang, Y. (2024). The future of fintech—Towards ubiquitous financial services. *Electronic Markets*, *34*(1), 3. https://doi.org/10.1007/s12525-023-00687-8

Arner, D., Buckley, R., Charamba, K., Sergeev, A., & Zetzsche, D. (2022). Governing FinTech 4.0: BigTech, platform finance, and sustainable development. *Fordham J. Corp. & Fin. L.*, *27*, 1. https://ssrn.com/abstract=3915275

Baig, U., Zehra, S., Anjum, S., & Hussain, M. (2022). FinTech Past and Future: Ecosystem, Business Model and its Proximate Challenges. *Pakistan Business Review*, *24*(1), 40-61. https://doi.org/10.22555/pbr.v24i1.645

Bömer, M. (2020). Competitiveness of Fintech: An Investigation into Different Levels of Competitiveness Using Young Enterprises from the Financial Technology Industry. *Heinrich Heine University Duesseldorf*.

Carletti, E., Oliviero, T., Pagano, M., Pelizzon, L., & Subrahmanyam, M. G. (2020). The COVID-19 shock and equity shortfall: Firm-level evidence from Italy. *The Review of Corporate Finance Studies*, *9*(3), 534-568. https://ssrn.com/abstract=3671396

Chen, X., You, X., & Chang, V. (2021). FinTech and Commercial Banks' Performance in China: The Current Status and Lessons Learned from Our Data Analysis. *FEMIB*, 33-44. https://doi.org/10.5220/0010483500330044

Demirgüç-Kunt, A., Pedraza, A., & Ruiz-Ortega, C. (2021). Banking sector performance during the COVID-19 crisis. *Journal of Banking & Finance*, *133*, 106305. https://doi.org/10.1016/j.jbankfin.2021.106305

Dwivedi, P., Alabdooli, J. I., & Dwivedi, R. (2021). Role of FinTech adoption for competitiveness and performance of the bank: a study of banking industry in UAE. *International Journal of Global Business and Competitiveness*, *16*(2), 130-138. https://doi.org/10.1007/s42943-021-00033-9

Elgi, A., & Karnasi, R. (2024). Determinants of Banking Performance for Commercial Banks on Indonesia Stock Exchange. *Dinasti International Journal of Economics, Finance & Accounting (DIJEFA)*, *5*(1).

Farida, I., & Setiawan, D. (2022). Business strategies and competitive advantage: the role of performance and innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(3), 163. https://doi.org/10.3390/joitmc8030163

Fernando, F., & Dharmastuti, C. F. (2021). Fintech: The impact of technological innovation on the performance of banking companies. In *Proceedings of the Second Asia Pacific International Conference on Industrial Engineering and Operations Management Surakarta* (pp. 1031-1040).

Feyen, E., Frost, J., Gambacorta, L., Natarajan, H., & Saal, M. (2021). Fintech and the digital transformation of financial services: implications for market structure and public policy. *BIS papers*.

Fortuna, S. M., & Wiraputra, J. W. (2024). Effect of Financing to Deposit Ratio, Net Operating Margin, and Current Ratio on Financial Performance of Sharia Commercial Bank in Indonesia and Malaysia Listed on The Stock Exchange in 2018–2023. *Mutanaqishah: Journal of Islamic Banking*, *4*(2), 153-166.

Gladden, M. (2020, December). Authority of Asosiasi Fintech Pendanaan Bersama Indonesia (AFPI) in Determining the Amount of Loan Interest Rates Limit in Peer to Peer Lending (P2P Lending) Business Activities. In *The 2nd Tarumanagara International Conference on the Applications of Social Sciences and Humanities (TICASH 2020)* (pp. 742-747). Atlantis Press.

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

Hasan, M. (2023). The impact of financial technology (Fintech) on the financial and banking services sector and its applications in the Islamic financial industry. *Available at SSRN 4369683*.

Kadhim, F. A., & Hussein Rafis, K. A. (2024). Measuring the Impact of Financial Liberalization Indicators on the Performance of the Banking Sector in Iraq for the period 2005-2022). *Library of Progress-Library Science, Information Technology & Computer*, *44*(3).

Kharrat, H., Trichilli, Y., & Abbes, B. (2024). Relationship between FinTech index and bank's performance: a comparative study between Islamic and conventional banks in the MENA region. *Journal of Islamic Accounting and Business Research*, *15*(1), 172-195.

Klöckner, M., Kurpjuweit, S., Velu, C., & Wagner, S. M. (2020). Does blockchain for 3D printing offer opportunities for business model innovation?. *Research-Technology Management*, *63*(4), 18-27. https://doi.org/10.1080/08956308.2020.1762444

Kozak, S. (2021). The impact of COVID-19 on bank equity and performance: The case of central eastern south European countries. *Sustainability*, *13*(19), 11036. https://doi.org/10.3390/su131911036

Malhotra, P., & Singh, B. (2010). Experience in internet banking and performance of banks. *International Journal of Electronic Finance*, *4*(1), 64-83. https://doi.org/10.1504/IJEF.2010.030786

Mbagwu, O. N., & Obonofiemro, G. (2023). Technological disruption and deposit money banks' financial performance in the pre and post-COVID-19 pandemic in Nigeria. *International Journal of Management & Entrepreneurship Research*, *5*(4), 218-232. https://doi.org/10.51594/ijmer.v5i4.468

McKibbin, W., & Fernando, R. (2021). The global macroeconomic impacts of COVID-19: Seven scenarios. *Asian Economic Papers*, *20*(2), 1-30.

Mirzaei, A., Saad, M., & Emrouznejad, A. (2024). Bank stock performance during the COVID-19 crisis: Does efficiency explain why Islamic banks fared relatively better?. *Annals of Operations Research*, *334*(1), 317-355. https://doi.org/10.1007/s10479-022-04600-y

Naz, S., Asif, M., & Hameed, S. (2023). Fintech's Role in Sustainable Banking Performance: Are Green Banking Policies Driving Sustainability in Pakistan's Banking System?. *Gomal University Journal of Research*, *39*(3), 294-312. https://doi.org/10.51380/gujr-39-03-04

Nkiru, N., Sidi, C. P., & Abomeh, S. (2018). Impact of information and communication technology on the performance of deposit money banks in Nigeria. *International Journal of Management*, *7*(4), 225-239.Nkiru, N., Sidi, C. P., & Abomeh, S. (2018). Impact of information and communication technology on the performance of deposit money banks in Nigeria. *International Journal of Management*, *7*(4), 225-239. https://doi.org/10.184

Nwakoby, N. P., Okoye, J. N., Ezejiofor, R. A., Anukwu, C. C., & Ihediwa, A. (2020). Electronic banking and profitability: Empirical evidence from selected banks in Nigeria. *Journal of Economics and Business*, *3*(2). https://doi.org/10.31014/aior.1992.03.02.227

Qambrani, S. A. (2024). Exploring the Adoption of Fintech and Its Difficulties in Pakistan's Emerging Economy Concerning Financial Inclusion. *Indonesian Journal of Innovation and Applied Sciences (IJIAS)*, *4*(2), 180-187.

Zaidi, S. A. M., & Shah, S. A. A. (2023). Fintech's contribution towards economic prosperity in Pakistan. *Pakistan Review of Social Sciences (PRSS)*, *4*(1), 1-14.