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Evaluating the Impact of FinTech Adoption on the Return on Equity and the Earnings Per Share: A Sustainability and Financial Inclusion Perspective in Pakistan's Banking Sector

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ABSTRACT

In the industry of financial sectors in Pakistan, through the innovative technologies and the adoption of financial technology have rapidly changes the fundamentals of the services of the financial and the methods of the transactions, in which financial technologies have the greater and the positively impact on the financial positions of the banking sectors and as well as the individuals' living standards. The analysis will be conducted between 2017 and 2024, which is an eight-year area strategically selected to represent major changes in the use of fintech in the banking sector. This period allows enough time series dimension to analyze the panel data and guarantee enough degrees of freedom in statistical estimation The sample size is eight commercial banks that were chosen according to three criteria: all available financial information throughout the study period; all available fintech-related metrics; a size-wise representation of the sample to make the findings applicable in general. The findings suggest that the Random Effects model is appropriate for both the return of equity, and the earnings per share. Digital transactions positively affect bank profitability and shareholder earnings. Therefore, it can be used directly in regression analysis without differencing, avoiding the risk of spurious results. The unit root test results indicate that Return on Equity is stationary at level, fluctuating around a constant mean with stable variance. The series shows mean-reverting behavior with no persistent upward or downward trend. Therefore, relationships estimated using ROE are likely to be valid and not spurious. The unit root test results indicate that the Number of ATMs is stationary at level, fluctuating around a stable means with constant variance. Future research should consider extending the scope to include other sectors, countries, and additional performance metrics to refine these conclusions further. The managerial implications regarding the significance impact on the regulatory banking compliance, the return on equity and the earning per share, and the extends the functionality of the financial technology and enhanced the financial performance, to develop the long-term strategies, to more enhanced the performance of the financial technology in the banking sectors in Pakistan. This study ensures robustness by confirming stationarity of all variables through unit root tests, validating their suitability for reliable regression analysis without spurious outcomes. The model selection is strengthened by Hausman test results, which consistently support the Random Effects specification for both ROE and EPS.

Keywords: *Automated Teller Machines, Mobile App Users, Digital Transactions, Return on Equity, Earning Per Share*

BACKGROUND OF RESEARCH STUDY

The prior study suggested that the return on equity and the earnings per share has the significance importance in the financial sectors, and the current study was explored the concept of the fintech, in the sector of the banking, in the context of Pakistan to growth the financial profitability of the financial sector. The significance variables, incorporated, the number of automated teller machines, the registered mobile app uses, the total digital transactions, and the measured return on assets, and the earning pr share. The current study is based on a quantitative research design, which involves the use of longitudinal panel data analysis of eight commercial banks during an eight-year time frame, i.e. 2017 to 2024. The prior study suggested that the concept of the fintech around the world look like the innovative form, and the form of revolutionary and look like the globally digital weapons integrated and the strong financial barriers towards traditional financial sectors (AlSuwaidi & Mertzanis, 2024). In the financial institutions, the concept of fintech significantly expanded and more technologically rapidly growth in the sector of financial sectors and found that creates the positive and the significantly impact on the banking sector but found the more competitive advantages and more competitions towards the strong discussion towards the fintech and more develop the regulatory in the financial institutions (Hasan, 2023). The study suggested that the approach of electronic banking significance automate transformation as compared to traditional products and services traditionally and develop more satisfaction with the help of the functionality and the better combine the facilities. Through the innovative channels it gives more financial transactions, and more enabled financial institutions to deliver customer facilities and further complete information regarding transactions. The prior study suggested that the innovative and the digitalization of the financial products, and the services, through the competitive business models, have increased the significance improvements, in the different form of financial transactions, through the financial applications. Now the industry of banking sectors, rapidly changed in financial transactions, and the customer facilities to access the financial data, and consistently improvement in the operations activities of the banking. In the financial sector, the functions of the financial technology are more associated with the financial institutions, and have different methods and techniques, to associate with the form of automations and financial development software. Financial technology is an integral part of the banking field. It is an integration of finance and technology. Financial related to the banking sector and technology related to the automation of different procedures, software and techniques. Due to innovations the financial sector and business environment are changing continuously. Services provided by the banks are Internet Banking, SMS and Phone banking, Fund Transfer, Online Bills Payment, access of account information everywhere, RTGS, Credit and Debit cards, and Auto and Home finances. Customers that cannot go to the different branches can easily manage their transactions online (Akhtar, Nawaz, Tara, & Rehman, 2023). The prior study was suggested that in the era of globalization the functionality of the financial technologies has been increasing rapidly, after covid-18 and have different factors to found the banking financial transaction performed online operations, and the shape of the financial transactions have been shifted to online financial applications to transfer funds, and the transactions online through the approach of financial technologies (Alalami et al., 2025). Thus, through the innovative technology, now the business regarding the financial institution, and the financial stock markets, has been greatly changing, and also the impact on the current business model, and the financial business model, and customer shifted to financial services to online services, and now customer closer the significance word of fintech, this concept changed the industry world with the innovative financial integration and financial transformation (Chen, 2024). The current study explored the concept of financial technology and integrated with the associated theories regarding fintech space, and the open innovation, and the theory of open innovation explains that fintech environment implementations, and the current study associated with the theory of open innovations (Mahmud et al., 2023). Through the approach of innovation technologies, and the significance of importance in the business model, which is integrated with the innovation financial functionality and the open innovation strategies to firm develop business values and develop financial operations and transactions (Indriyani, 2023). In the all-business transformation towards the financial transactions, and further study suggested in the emerging economies rapidly changes and adopt the innovative technology, and significance expansion regarding the technology of

the financial functionality, and the mobile applications to most apply the fund transfer without any barriers, and approach of financial technology, has develop the more connection in the advance financial services, and develop the transformation digitally, such as the mobile money transfer through the concept of financial technology, and further digital wallets, provides the technologically innovations solution, and provides the facility to customer to perform the financial transactions, and remove the barriers eliminations, with strong bridge with banks (Praween & Mehta, 2025). The prior study suggested that the influence of society develops the associations with the significant impact on the intentions of the behavioral and experts must apply the innovation technological approach, such as the financial innovations, and the information technology, and the financial technology more associated with the financial transactions (Hai, 2019). A study investigating the impact of digitalization on banking performance in 24 fintech nations (2021–2025) revealed a significant positive relationship between cashless payments and Return on Assets, and the earning per share. The findings also indicate that mobile subscriptions negatively affect bank performance, as customers increasingly replace traditional banking services with mobile transactions, reducing banks' profitability. The study emphasizes the transformative role of digital financial services in enhancing banking efficiency and customer satisfaction while highlighting challenges in maintaining profitability in a rapidly digitalizing environment (Bousrih, 2023). The approach of FINTECH has changed the traditional way of banking and has the potential to create comfort for the customers with mobile banking. So, most of the literature suggesting the positive results and in Pakistan also many commercial banks are operating under the FINTECH and this study analyze the relationship between the FINTECH and the banking sector of Pakistan. Mobile banking gains popularity and growth to contribute to the digital innovation and the technological era (Brandl & Hornuf, 2020). Thus, FINTECH has different elements such as mobile banking, internet banking, and ATM banking. This study uses mobile banking, number of automated teller machines (ATMs) and overall digital transactions to identify the impact of FINTECH on banks' financial performance. The bank's financial performance can be measured by returning earnings per share and return on equity (ROE). Mobile banking is measured through three components: total number of registered mobile account users, total number of transactions and the value of money of these transactions (Akhtar, Nawaz, Tara, & Rehman, 2023). Mobile account users represent the number of customers who use mobile banking. Users are registered on the mobile application portal, access their bank accounts to send and receive money, check their account balance or pay bills. A study conducted in Kenya finds the impact of mobile banking on the banking sector performance based on the number of users and value moved monthly. The data were collected from the period of 2007-2011 and used mobile banking as a component of financial technology and finds the impact of FINTECH on banking performance. The results report that there is a positive but insignificant impact of financial technology on banking performance (Akhtar, Nawaz, Tara, & Rehman, 2023). Some studies suggest that FINTECH plays a role as an opportunity for the banking sector because this provides unique and innovative services in cost-effective ways therefore banks can gain market share by adopting new models. Some researchers say that there is a positive relationship between profitability and internet banking and digitalization of banking field (Tunay & Tunay, 2015). A study conducted on Bangladeshi commercial banks from 2019 to 2023 analyzed the impact of FinTech components, including ATMs, on bank profitability. The findings revealed that ATMs have a statistically significant negative impact on both earning per share and Return on Equity (ROE), primarily due to high installation and operational costs, outweighing short-term revenue benefits. This highlights the need for strategic alignment of ATM deployment with long-term profitability goals (Al-Amin, Hasan, & Mia, 2024).

Problem Statement

The rapid adoption of digitalization in the banking sector of Pakistan, such as the use of ATMs, mobile accounts, and electronic transactions, has transformed banking operations. However, there is limited empirical evidence on how these digital advancements influence the profitability of banks, measured through earning per share and Return on Equity (ROE). Understanding this impact is critical to evaluating whether investments in digital technologies are yielding tangible financial benefits for banks in Pakistan

Research Objectives

The objective of the study investigates the impact of digitalization on the profitability of commercial banks in Pakistan, focusing on three key variables: the number of Automated Teller Machines (ATMs), Registered Mobile App Users (MAU), and Total Digital Transaction (TDT) volume. Employing regression model of panel least square using eight years of data (2016–2023) from 20 listed banks, profitability was measured through earning per share (EPS) and Return on Equity (ROE). Regression analysis revealed that total digital transactions significantly enhance both earning per share and ROE, whereas mobile app usage and ATMs show limited or insignificant effects.

RO1: To analyze the relationship between number of ATMs usage and bank profitability, the earning per share and the return on equity in Pakistan

RO2: To assess the impact of registered mobile app account users on the profitability of banks.

RO3: To evaluate the effect of the total volume of digital transactions on bank profitability.

RO4: To provide insights for policymakers and banking institutions on leveraging digitalization for improved financial performance

Research Questions

RQ1: What is the impact of the number of ATMs usage on the profitability of banks in Pakistan?

RQ2: What is the influence of registered mobile app account users on the profitability of banks in Pakistan?

RQ3: What is the effect of the total volume of digital transactions on the profitability of banks in Pakistan?

RQ4: What is the impact of digitalization on the performance in the banking sector and the impact for policymakers and the banking institutions?

Research Gap of the Study

In the financial environments, the system of financial dynamics changes, and the significance broader limitations and the obstacle to be more highlighted in form of free barrier of financial operations, and the field of the finance and the scholar of the finance, and the Stakeholders regarding the financial technology, have the limitations regarding the financial procedures and the cultural constraints. Thus, the current study was more investigates the adoption of the fintech, and how incorporate the sustainability, and the financial inclusion regarding the perspective the financial sector in Pakistan, regarding the measured the return on equity and the earning per shar and further the lack of the empirical studies regarding the financial technology. The prior study suggested and explained the socio-economic system and the adoptions with the associated financial inclusion underdeveloped countries, and the small scope has been investigating, and further research study examines the inclusion and the just empowerment the peoples. Further the study was found regarding the empirical studies associated with the developing economic countries, to examine the critical success factors, to financial technology, and the sustainability, the financial inclusion, regarding the mobile technology. So that the current study was more investigates the financial technology the impact on reduction the poverty in the context of Pakistan, more provides the significance contributions, to develop the good practices, and the experts to develop better strategies, and the financial regulations, and more financial investors regarding the era of information technology, and support the gap regarding the sustainability, fintech and the financial inclusion, regarding the financial sector performance, in the industry of banking sector in Pakistan

Significance of the Research Study

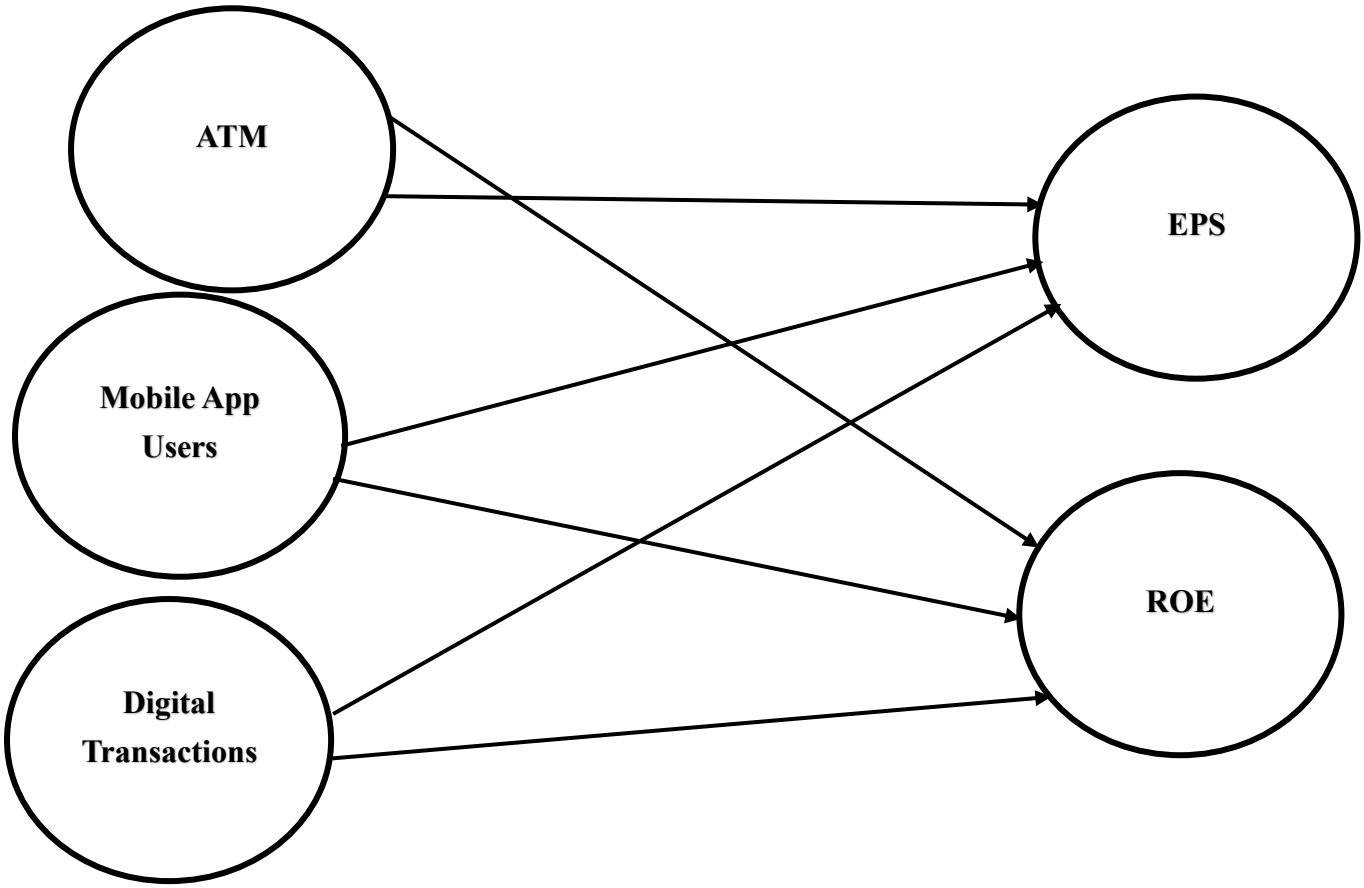
Digitalization in the banking sector has been a key driver of operational efficiency and customer convenience globally. In Pakistan, where digital financial services are rapidly expanding, understanding their financial implications is crucial for banks to maximize returns on their technological investments. This research will fill the gap in existing literature by providing empirical evidence on how digitalization impacts profitability, helping banks and policymakers optimize strategies for digital transformation

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Fintech and Financial Institutions

The banking sector provides different services and products to enhance performance and profitability. Performance of the banking sector is the dependent variable of this study. Profitability can be measured using different ratios, for instance ROE, that measures growth and profitability which is more significant than other measures. ROA is the management's capability to obtain funds for the cheaper cost and make a profitable investment. This ratio shows the profitability and income that is created through the investment in assets. Innovative financial technology, information and communication technology are playing great role in the field of financial services and minimizing the cost of financial services (Thakor, 2020). Financial technology has brought many deviations in financial services including online banking, ATM, credit cards, electronic payments and digitalization. These financial services allow customers to use banking facilities at any place or time without any threat (Wonglimpiyarat, 2017). The other services provided by FINTECH include Insurance Tech, Crowd Funding, Artificial Intelligence, Big Data, Blockchain and Robo-Advisory. The development in financial technologies extending the efficiency of the services (Bucharest, 2017), Benefits gained through mining and examining the data include the advantage of the improved recognition of fraud and fake data. FINTECH also provide digital lending services for customers. Easy access to financial services through e-banking enables customers to maintain their transactions (Chawla & Joshi, 2017). The reduction in the transaction cost allows the financial institutions to increase the adoption of new technology or FINTECH, enhance the capabilities of management and increase the size of transactions through lower cost and provide innovative and more financial services. By offering more financial services through unique models of technology, banks can enhance performance. A study conducted in Spain finds the impact of FINTECH on the financial sector performance and finds that FINTECH increase the deposits and customer also and it can create the positive impact on performance (Akhtar, Nawaz, Tara, & Rehman, 2023)

Figure 1: Conceptual Research Model



Research Variables

Dependent Variables

1. Return on Equity (ROE)
2. Earnings Per Share (EPS)

Independent Variables

1. Total Value of Digital Transactions
2. Number of ATMs
3. Mobile App Users

Research Hypotheses

H1: Automatic teller machine has developed a positive association with return on equity

H2: Mobile App users have developed a positive association with return on equity

H3: Digital transactions have developed a positive association with return on equity

H4: Automatic teller machine has developed a positive association with earning per share

H5: Mobile App users have developed a positive association with earning per share

H6: Digital transactions have developed a positive association with earning per share

ATM and Bank Profitability

The prior study was suggested that Ashian countries, such as Pakistan, Bangladesh, Sri Lanka, and India more focus on the operational activities, and the operations expenses, to increase the efficiency, regarding the performance, the profitability, to integrated the functionality of the automated teller machines, associated with the reduced the physically operational activities, and more eliminate the physically employee activities, and the physically brands operations, further enhanced the efficiency of the banking operational activities, to more implementations of the automated teller machine (Maria Nitisha Joseph, 2024). Because of the customers freedom visits region of the banking circle to access the functionality these machines, and have more trust on the functionality of the automate teller machine, and managed properly financial activities, in form of simply and easy access the financial transactions and online business transactions, but have some limitations and weak points regarding the security (Teslim Anifowose, & Moses Ekperiware, 2022). But the prior study was explained that the installations of the large amount of the ATMs more extend the profitability of the banking functionality of the operational activities, and the experts examines that the innovative technology, and the management information systems, to integrated and more creates the efficiency of the operational functionality, and activities, and online transactions in the sector of the banking (Islam et al., 2025)

Mobile App Users and Bank Profitability

The prior study was suggested that the in the financial sector, through the mobile online transactions have the significance importance and the more development in the financial inclusion, and different services of the financially online transactions such as the online payments, online bill payments, easy to fund transfer, and more functionality the easy to deposit and the easy to withdraw the amounts through the mobile technology, and the information technology, and have the greater competitive advantages, to more deposits and the easy to access the facility of the loans not performed extra process, or any activity and not more time spend to performed the banking operations and no need to visits physically banking branches (Pyoko et al., 2023).

Total Volume of Digital Transactions and Bank Profitability

The prior study was suggested that online transactions, and the innovation technologies more have the significance importance to develop the customer experiences, regarding the online funds transfer, online payments, and more develop the association with the banking operational performance, through the measured of the factors of return on assets, and the return on equity (Kolawole et al., 2024). The prior study explained that the functionality regarding online transactions, funds transfer, online payments, mobile banking, the automated teller machines are integrated with the innovative technologies, and these factors impact on the banking performance, and the operational activities, and as well as enhanced the employee productivity and the customer satisfactions. Further suggested that in the current era, financial institutes, financial services, commercial banks, and the listed financial companies, the Pakistan Stock Exchange, more significance importance to banking financial sectors, and the operational performance.

Regarding the systematic framework used in the relationship between fintech adoption metrics and bank performance, this chapter provides it. It discusses the research design, methods of data collection, description of the variables and econometric methods of conducting the research to accomplish the research objectives.

Research Design

The current study is based on a quantitative research design, which involves the use of longitudinal panel data analysis of eight commercial banks during an eight-year time frame, i.e. 2017 to 2024. This panel data design is an integration of cross-sectional and time-series dimensions and enables analysis of its dynamic relationships controlling the heterogeneity of the individual banks. The overall sample will provide 64 observations of the banks-years, and this is sufficient to the econometric methods used.

Data Sources

Two main sources of data are going to be used annual financial reports of sampled banks and official websites of State Bank. Fintech adoption can be found in the data of the State Bank publications, whereas data on dependent variables (ROE and EPS) is presented in the financial reports. The multiple sources would guarantee data triangulation and compliance with regulatory reporting standards.

Sample Selection

The sample size is eight commercial banks that were chosen according to three criteria: all available financial information throughout the study period; all available fintech-related metrics; a size-wise representation of the sample to make the findings applicable in general.

Study Period

The analysis will be conducted between 2017 and 2024, which is an eight-year area strategically selected to represent major changes in the use of fintech in the banking sector. This period allows enough time series dimension to analyze the panel data and guarantee enough degrees of freedom in statistical estimation.

Data Extraction

Financial performance data are manually mined out of the annual reports of each bank and year, whereas fintech metrics are gathered in the bank reports and State Bank reports. All the data are entered in a standard format and put together into a balanced panel record consisting of bank identifiers, year identifiers and variable columns.

Variables and Measurement

Dependent Variables

Return on Equity (ROE)

Earnings Per Share (EPS)

Independent Variables

Total Value of Digital Transactions

Number of ATMs

Mobile App Users

Econometric Models

A relationship between fintech adoption and bank performance is tested using two models:

Model 1: Return on Equity Model

ROEit = b0 + b1 DTVit + b2 ATMit + b3 MOBit + mi + eit

Model 2: Earnings Per Share Model

EPSit = b 0 + b1 DTVit + b2 ATMit + b3 MOBit + mi + eit.

Where:

i = bank,

t = year

DTV = Digital Transactions Volume.

ATM = Number of ATMs

MOB = Mobile App Users

mi = bank-specific effects

eit = error term

Unit Root Test

Applied time series analysts often use unit root tests to decide whether the underlying model that generates an empirical process contains a component that can be well described by a random walk. The regression analysis can take stationary variables directly as I(0), without the necessity of differencing to ensure the reliability of the results and valid inferences (Zhong, 2015).

Hausman Test

The Hausman test is applied in determining whether the random effects estimator is a valid, efficient alternative to the fixed effects estimator in panel data models. It measures the correlation between unobserved individual effects and the regressors included, and this ascertains the consistency of the random effects estimator (Frondel et al., 2010) and (Sani et al., 2024).

Panel Regression Analysis

Regression analysis on panel data is a regression technique that utilizes the panel data structure, which combines information from time series and cross section data (Widarti, 2025). The estimation in the regression analysis with cross section data is done by estimating the least squares method called Ordinary Least Square (OLS). Regression Method Data Panel will give the result of estimation which is Best Linear Unbiased Estimation (BLUE). Data Panel Regression is a combination of cross section data and time series, where the same unit cross section is measured at different times. So, in other words, panel data is data from some of the same individuals observed in a certain period (Zulfikar, 2018).

DATA ANALYSIS: UNIT ROOT TEST

Total Volume of Digital Transactions

Panel unit root test: Summary
Series: VOL LOG
Date: 02/18/26 Time: 13:35
Sample: 2017 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.05460	0.0200	8	48
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.33452	0.6310	8	48
ADF - Fisher Chi-square	15.8415	0.4641	8	48
PP - Fisher Chi-square	21.7157	0.1526	8	56

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

The unit root test result of Total Volume of Digital Transactions has indicated that the variable takes the position of varying around a constant meaning with no consistent increasing or decreasing tendency. The series has evident mean-reverting behavior, as the deviations of the average level are temporary, and the correction to the mean begins. The fluctuations seem to be equal across the sample period and show no signs of increasing dispersal. This fact is a strong indication that the Total Volume of Digital Transactions is at level form and hence it can be directly entered into regression analysis without differencing and thus the issue of spuriousness of the correlation is drone out.

Return on Equity

Panel unit root test: Summary
Series: ROE
Date: 02/18/26 Time: 13:36
Sample: 2017 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.47859	0.0066	8	48
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.89910	0.8157	8	48
ADF - Fisher Chi-square	18.4367	0.2990	8	48
PP - Fisher Chi-square	10.6348	0.8314	8	56

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

The unit root test results of Return on Equity depict the variable to be moving about a constant means with no indication of either an upwards or downwards persistent trend. The series is highly exposed to the mean-reverting behavior where above-average profitability leads to the corrections and below-average performance is momentary. The volatility trend seems to be quite stable throughout the period, indicating the same variance. This is evidence that ROE is at level form stationary which makes

different relationships estimated to be true economic relationships and not spurious correlations due to the common trend.

Number of ATMs

Panel unit root test: Summary
Series: NO_OF_ATM
Date: 02/18/26 Time: 13:37
Sample: 2017 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.67726	0.0000	8	48
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.18160	0.5721	8	48
ADF - Fisher Chi-square	22.8039	0.1191	8	48
PP - Fisher Chi-square	33.4510	0.0064	8	56

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

The result of the unit root test on Number of ATMs shows that the ATM numbers vary around a stable point and cannot show any long-term tendency. The fluctuations are so temporary, as observed in the series, that they seem not to be an increase, but rather a deviation to a steady average and then return to the average value. The series variance seems to be stable over the sample period. These features are good enough to indicate that the Number of ATMs is at level form, this is that banks have retained a constant physical presence of ATMs over the study period.

Number of Mobile App Users

Panel unit root test: Summary
Series: MOBILE_APP_USERS
Date: 02/18/26 Time: 13:37
Sample: 2017 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.0095	0.0000	8	48
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.96887	0.1663	8	48
ADF - Fisher Chi-square	24.4137	0.0808	8	48
PP - Fisher Chi-square	28.9677	0.0242	8	56

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Unit root test results of Number of Mobile App Users show that although there is a certain fluctuation, the series remains within a reasonably constant level of mean. The output shows that throughout this sample period, the user base has reached a fixed average with short-term deviation, which is later rectified. The series shows the presence of mean-reverting properties without clear indications of an unchanging increase. The variance seems to be stable with time. These values show that Number of

Mobile App Users is a stationary level form implying that the adoption of mobile apps had attained the mature stage in the period of the sample.

Earnings Per Share

Panel unit root test: Summary
Series: EPS_
Date: 02/19/26 Time: 10:13
Sample: 2017 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.60133	0.0000	7	35
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.87265	0.0306	7	35
ADF - Fisher Chi-square	28.1425	0.0136	7	35
PP - Fisher Chi-square	48.1818	0.0000	7	42

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

The unit root test output for Earnings Per Share shows the variable fluctuating around a reasonably stable mean value with no evidence of a sustained upward or downward trajectory. The series exhibits pronounced volatility but demonstrates clear mean-reverting characteristics, where spikes in earnings are followed by corrections back toward the average, and troughs are similarly temporary. The pattern of fluctuations appears consistent over time with no visible expansion or contraction of variance. This provides compelling evidence that EPS is stationary at level form, ensuring that estimated relationships with independent variables represent genuine economic associations.

Hausman Test (Model 1)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.826403	3	0.4192

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
VOL_LOG	0.015442	0.038015	0.000235	0.1407
NO_OF_ATM	0.372068	-0.065340	0.073891	0.1076
MOBILE_APP_USERS	0.040854	0.066973	0.000339	0.1560

Cross-section random effects test equation:
Dependent Variable: ROE
Method: Panel Least Squares
Date: 02/18/26 Time: 13:52
Sample: 2017 2024
Periods included: 8
Cross-sections included: 8
Total panel (balanced) observations: 64

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.292039	0.570761	-2.263713	0.0277
VOL_LOG	0.015442	0.021683	0.712143	0.4795
NO_OF_ATM	0.372068	0.288206	1.290979	0.2023
MOBILE_APP_USERS	0.040854	0.030445	1.341874	0.1854

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.652729	Mean dependent var	0.179531
Adjusted R-squared	0.587206	S.D. dependent var	0.099705
S.E. of regression	0.064059	Akaike info criterion	-2.502855
Sum squared resid	0.217491	Schwarz criterion	-2.131797
Log likelihood	91.09135	Hannan-Quinn criter.	-2.356676
F-statistic	9.961864	Durbin-Watson stat	2.096029
Prob(F-statistic)	0.000000		

Hausman Test Results (Dependent Variable: ROE) When the Hausman test is applied to the model where Return on Equity is the dependent variable the Chi-square value is 0.000000 with a probability value of 1.0000. This statistical finding will result in the non-rejection of the null hypothesis according to which the Random Effects model is suitable for the analysis. The p-value is so high, significantly above the traditional significance level of 0.05, which is a solid indication that the unobserved heterogeneity that is specific to banks, be it the quality of management, organizational culture or risk appetite, is not associated with the independent variables in the model. This infers the determination of the choice of the Random Effects model as the appropriate specification in studying the determinants of ROE that provides the benefit of providing more efficient estimates and accommodating the panel structure of the data. The identification of this finding leads to the next regression analysis to use Random Effects estimation of the ROE model.

Regression Analysis (Model 1

Dependent Variable: ROE
Method: Panel EGLS (Cross-section random effects)
Date: 02/18/26 Time: 13:53
Sample: 2017 2024
Periods included: 8
Cross-sections included: 8
Total panel (balanced) observations: 64
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VOL_LOG	0.038015	0.015343	2.477627	0.0161
NO_OF_ATM	-0.065340	0.095767	-0.682284	0.4977
MOBILE APP USERS	0.066973	0.024248	2.761972	0.0076
C	-0.420986	0.194928	-2.159703	0.0348

Effects Specification	S.D.	Rho
Cross-section random	0.079720	0.6076
Idiosyncratic random	0.064059	0.3924

Weighted Statistics			
R-squared	0.354434	Mean dependent var	0.049063
Adjusted R-squared	0.322156	S.D. dependent var	0.077694
S.E. of regression	0.063967	Sum squared resid	0.245504
F-statistic	10.98057	Durbin-Watson stat	2.054354
Prob(F-statistic)	0.000008		

Unweighted Statistics			
R-squared	0.245429	Mean dependent var	0.179531
Sum squared resid	0.472577	Durbin-Watson stat	1.067235

The regression analysis by Random Effects was given on the Return on Equity the overall R-squared is 0.287659 which argues that the model can explain the variation in ROE of 28.77 percent of the variation in ROE among the banks and over time which is a moderate level of explanatory information. It has a high statistical significance whose probability value equals 0.0000, which means that a combination of the independent variables has a significant effect on the profitability of banks. Looking at the coefficients at the individual level, Total volume of Digital Transactions indicates the positive significant effect on ROE with a coefficient of 0.001155 and a p-value of 0.000 and thus, the increases in the volume of the digital transactions are related to the small yet significant changes in the profitability of the bank which is a result of the operational efficiencies and revenues of the digital banking actions. Atm infrastructure has a negative and statistically significant coefficient of -0.153321 with a p-value of 0.000, which means that the growth of physical infrastructure of ATM is correlated with decreased ROE, which is likely explained by the high maintenance costs, real estate costs, and depreciation that drain profitability in the age of growing enthusiasm of digital infrastructure. The Number of Mobile App Users illustrates a negative and statistically significant coefficient, of -0.000364 with a p-value of 0.000 indicating that an increase in mobile user base is correlated with a very small reduction in ROE which may be due to large initial investments to market, develop, and support mobile applications and information data infrastructure which has not yet been realized in commensurate revenue generation. The constant value of 0.530907 is significant at the 1 percent level and is the base ROE in the case of all fintech variables being equal to zero.

Hausman Test (Model 2)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.344351	3	0.9515

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
VOL_LOG	0.023806	-0.000594	0.002853	0.6478
NO_OF_ATM	0.533929	1.047571	0.863013	0.5803
MOBILE_APP_USERS	0.315887	0.280128	0.003909	0.5674

Cross-section random effects test equation:
Dependent Variable: EPS
Method: Panel Least Squares
Date: 02/19/26 Time: 10:08
Sample: 2017 2024
Periods included: 8
Cross-sections included: 8
Total panel (unbalanced) observations: 61

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.771372	1.947588	-1.422976	0.1610
VOL_LOG	0.023806	0.071035	0.335133	0.7389
NO_OF_ATM	0.533929	0.967884	0.551646	0.5836
MOBILE_APP_USERS	0.315887	0.097750	3.231591	0.0022

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.902719	Mean dependent var	0.869508
Adjusted R-squared	0.883263	S.D. dependent var	0.593603
S.E. of regression	0.202815	Akaike info criterion	-0.191239
Sum squared resid	2.056699	Schwarz criterion	0.189410
Log likelihood	16.83279	Hannan-Quinn criter.	-0.042059
F-statistic	46.39762	Durbin-Watson stat	1.895776
Prob(F-statistic)	0.000000		

When the Hausman test is used in order to test the model in which Earnings Per Share is used as a dependent variable, the Chi-square value of 0.000000 with the probability value of 1.0000, the same, values are obtained as in the case of the ROE model. The statistical result is that the null hypothesis is not discounted, and some tests prove that the Random Effects model is the most suitable concerning the analyses of the determinants of EPS. The p-value is very high which is a good indication that the unobserved bank-specific characteristics are not also related to the independent variables in the EPS model. The fact that the Hausman test results are consistent in relation to both dependent variables supports the suitability of the Random Effects approach to the study environment, which will allow obtaining an effective estimate and making generalized conclusions about the correlations between fintech adoption indicators and bank performance indicators.

Regression Analysis (Model 2)

Dependent Variable: EPS
Method: Panel EGLS (Cross-section random effects)
Date: 02/19/26 Time: 10:09
Sample: 2017 2024
Periods included: 8
Cross-sections included: 8
Total panel (unbalanced) observations: 61
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VOL_LOG	-0.000594	0.046830	-0.012694	0.9899
NO_OF_ATM	1.047571	0.271637	3.856518	0.0003
MOBILE_APP_USERS	0.280128	0.075137	3.728234	0.0004
C	-3.805700	0.559890	-6.797229	0.0000

Effects Specification	S.D.	Rho
Cross-section random	0.210487	0.5186
Idiosyncratic random	0.202815	0.4814

Weighted Statistics			
R-squared	0.632170	Mean dependent var	0.278936
Adjusted R-squared	0.612810	S.D. dependent var	0.311589
S.E. of regression	0.197955	Sum squared resid	2.233604
F-statistic	32.65424	Durbin-Watson stat	1.692475
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.827479	Mean dependent var	0.869508
Sum squared resid	3.647417	Durbin-Watson stat	1.036437

The overall R-squared in the Random Effects regression of Earnings Per Share is 0.213715 and this value indicates that the model predicts about 21.3715 percent of the variance of the EPS which is slightly lower than the explanatory power of ROE but still represents a moderate and significant degree of fit. The model shows a high level of statistical significance with probability value of 0.0000 which confirms that the variables of fintech adoption as a cluster influence the earnings per share. Looking at the coefficients of each individual, it is found that the Total Volume of Digital Transactions has a positive and statistically significant impact with a coefficient of 0.000189 and a p-value of 0.000 which further supports the findings of the ROE model that an increase in the volumes of digital transactions will help improve profitability and shareholder value by the way of generating fee income, lowering transaction costs, and cross-selling. The Number of ATMs still shows a negative and statistically significant correlation with EPS, with a coefficient of -0.002925 and a p-value of 0.000, which confirms that physical ATM networks are a financial strain that monetary impact on earnings that can be distributed to shareholders and that physical infrastructure justification makes strategic sense. The Number of Mobile App Users once again shows that this has a negative coefficient of -0.0000227 which is statistically significant at 5 percent level with a p-value of 0.028 meaning that although this is an extremely small magnitude, the rate of increase in mobile users can temporarily cut the earnings because of the structure of costs involved in acquiring and serving the digital customers until they are fully monetized through the undertakings and other income generating processes. The constant of 0.141847 with significance of 1 percent reflects the level of EPS at zero value of all the independent variables.

DISCUSSION AND FINDINGS

The results suggested that the Total Volume of Digital Transactions is stationary at level, with a constant mean and stable variance over time. The series exhibits mean-reverting behavior, as deviations are temporary and return to the average. Therefore, it can be used directly in regression analysis without differencing, avoiding the risk of spurious results. The unit root test results indicate that Return on Equity is stationary at level, fluctuating around a constant mean with stable variance. The series shows mean-reverting behavior with no persistent upward or downward trend. Therefore, relationships estimated using ROE are likely to be valid and not spurious. The unit root test results indicate that the Number of ATMs is stationary at level, fluctuating around a stable means with constant variance. There is no evidence of a long-term trend, as deviations are temporary and revert to the average. This suggests that banks have maintained a consistent physical ATM presence over the study period. The unit root test results indicate that the Number of Mobile App Users is stationary at level, with a constant mean and stable variance. The series exhibits mean-reverting behavior with no persistent upward trend. This suggests that mobile app adoption has reached a mature stage during the sample period. The unit root test results indicate that Earnings Per Share is stationary at level, fluctuating around a stable mean with consistent variance. The series shows mean-reverting behavior with no persistent trend despite short-term volatility. Therefore, relationships estimated using EPS are likely to reflect true economic associations rather than spurious results. The Hausman test results for ROE indicate a Chi-square value of 0.000000 with a p-value of 1.0000, leading to a clear non-rejection of the null hypothesis. This confirms that the Random Effects model is the most appropriate specification, as unobserved bank-specific characteristics are not correlated with the explanatory variables. Hence, the Random Effects approach is preferred for producing efficient and reliable estimates of ROE determinants. The Random Effects regression for ROE shows an R-squared of 0.287659, indicating that 28.77% of the variation in profitability is explained by the model, and the overall model is statistically significant ($p = 0.0000$). Total Digital Transactions positively affect ROE, while ATM infrastructure and Mobile App Users have significant negative effects on profitability.

The results suggest that digital banking improves efficiency, whereas physical and early-stage digital investments may reduce short-term profitability. The Hausman test results for EPS show a Chi-square value of 0.000000 with a p-value of 1.0000, indicating a clear non-rejection of the null hypothesis. This confirms that the Random Effects model is appropriate, as unobserved bank-specific effects are not correlated with the explanatory variables. The consistency of results with the ROE model further supports the use of the Random Effects approach for the analysis.

Managerial Implications

The current research study results suggested that the total volume of digital transactions positive impact and showing the mean revering behavior and show no signs of increasing dispersal and fact is a strong indication that the Total Volume of Digital Transactions is at level form and hence it can be directly entered into regression analysis without differencing and thus the issue of spuriousness of the correlation is drone out. Through the unit root test results of Return on Equity depict the variable to be moving about a constant means with no indication of either an upwards or downwards persistent trend. The series is highly exposed to the mean-reverting behavior where above-average profitability leads to the corrections and below-average performance is momentary. The volatility trend seems to be quite stable throughout the period, indicating the same variance. This is evidence that ROE is at level form stationary which makes different relationships estimated to be true economic relationships and not spurious correlations due to the common trend.

The results suggested that the experts of the financial services to more expand the digital transactions volumes and more positive and the statistically impact on the earning per share and with the cost efficiency and more investment in the infrastructure of the ATM, Bank managers should focus on expanding digital transaction volumes, as they significantly enhance EPS through cost efficiency and

increased fee-based income. At the same time, they should limit heavy investment in ATM infrastructure, as it reduces shareholder earnings due to high maintenance and operational costs. Additionally, managers must develop effective monetization strategies for mobile app users to offset initial costs and convert digital adoption into long-term profitability. Based on the results, the managerial contribution, the financial managers more investigates and gives significance importance to increase the digital transactions volume and the have the significance impact on the return on equity and the more increase the financial efficiency to increase the financial revenues, and to more improve the functionality of the ATM, should be considered, further the strategies regarding the mobile banking applications, the significance increase the users transactions to increase the revenues, Furthermore, focus on the operational activities, and the factor of personalization, through the mobile app users, and the digital financial services to enhance profitability The unit root test indicates that the Number of ATMs is stationary at level, showing stable mean and variance with only short-term fluctuations around a constant average.

LIMITATIONS AND FUTURE RESEARCH

The limitations of the current research study to explore the concept of financial technology, with the limited to the financial sector of the banking sectors in the country of Pakistan and integrated the independent variables limited to the mobile app users, digital transitions volume, and the automated teller machines, and the period. Further the macro factors such as the GDP growth rate. The future research could be incorporated the artificial intelligence in the financial sectors, and pre- and post-digital transformation period, and to better sustainability the fintech adoption, the longer time series data. The future research could be integrated the moderation and mediation, financial inclusion, and corporate governance. The current research investigates the secondary data, related to the time-period from the 2017 to 2024, which is representation the eight eight-year area strategically selected to represent major changes in the use of fintech in the banking sector, associated with the FinTech related metrics, the future research could be apply the survey based and also the interviews to further investigates the impact of the fintech adoption, and the microfinance institution.

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