Ianna Journal of Interdisciplinary Studies, Volume 7 Issue 1, January 2025
DOI: https://doi.org/ 10.5281/zenodo.13895099 EISSN: 2735-9891

Technological Investment and its Effect on Stock Return and Profitability: A Study of Vietnamese Commercial Banks Amid Fintech Growth

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Abstract

Background: The Fourth Industrial Revolution has significantly influenced nearly every facet of economic and social existence. Digital banking transactions have proven useful during the COVID-19 pandemic. However, they also cause many concerns, especially for banks. To survive in the rapidly changing environment of digital technology, banks have few options to respond except to increase spending on technology investments regardless of the effectiveness of those investments.

Objective: The study was conducted to find the relationship between technology investment factors on stock returns and bank profits in the context of Fintech growth.

Methodology: The study was conducted based on data from 26 joint stock commercial banks in Vietnam from 2010 to 2023; after influencing technical investment on stock returns and profitability can be analysed using several statistical models, such as Ordinary Least Squares (OLS), Fixed Effects Model (FEM), Random Effects Model (REM), Feasible Generalized Least Squares (FGLS), and Generalized Method of Moments (GMM).

Result: The author's research revealed that technological elements substantially influenced stock returns and contributed to increasing profits for banks during the Covid period. However, while technology investment led to higher profits, it also resulted in decreased stock returns for commercial banks.

Conclusion: the author also found a negative correlation between bank size, profit factors, and the stock market.

Unique Contribution: This study examines the impact of technology investment on stock return and profitability of Vietnamese commercial banks in the context of fintech expansion. It explores the benefits of this research in both theoretical and practical aspects.

Key Recommendation: Based on the research findings, the author suggested legislation and policies to enhance technology investment and its impact on stock return and profitability of Vietnamese commercial banks in light of fintech expansion. Furthermore, commercial banks must enhance their investment in technology, seeing it as a pivotal approach in the foreseeable future. Simultaneously, it is crucial to establish a rational benchmark for technology investment. However, this task is complex due to the varying essential attributes of each bank and the diverse economic and technical conditions prevailing in different banks.

Keywords: Technological investment; stock return; profitability; Fintech growth.

DOI: https://doi.org/ 10.5281/zenodo.13895099 EISSN: 2735-9891

Introduction

Traditional commercial banks are under competitive pressure from international financial enterprises and industry rivals due to the continuous development of technology and the need for continuous innovation in the market (Lv & Liu, 2022). Therefore, the banking system will tend to develop based on the platform of technology to provide services to customers, and traditional financial services of commercial banks such as deposits and loans, asset management, risk management, and investment transactions are also changed thanks to Fintech (Lv & Liu, 2022).

The rise of Fintech is driving a significant transformation within the global financial industry, marking the advent of a digital era for the banking sector (Zhang & Zhuang, 2020). Technologies such as big data, blockchain, cloud computing, and artificial intelligence are being increasingly leveraged by banks due to their critical role in evolving business models and enhancing service offerings (Gupta et al., 2018). These technologies contribute to substantial reductions in management costs and advancements in financial services.

For the stock market, investment in information technology increases bank stock prices (Zhang & Zhuang, 2020), especially when businesses disclose investment information related to technology factors. In addition, stock liquidity has also significantly improved, but no relationship between technology and stock returns was found during the Covid period (Celik et al., 2024). In addition to technological factors, micro and macro factors also significantly impact stock returns. Factors such as inflation, unemployment, economic growth rate, oil prices and exchange rates also impact stock markets in many countries. The micro factors, bank size, book value per share, and non-interest income ratio increase stock returns (Kasman & Kasman, 2011).

With some of the above comments, some studies record the positive impact of technology investment. Still, several studies have shown that investing in technology might harm operational efficiency in the near term, owing to the costs involved. However, in the long run, it has a favourable effect. Empirical evidence and theoretical analysis indicate the necessity for further study to assess the influence of technology investment on the operational efficiency of commercial banks in Vietnam. This research will aid in promoting sustainable development within the banking sector.

This study aimed to explore the correlation between technological investments stock returns and bank profitability in Vietnamese commercial banks from 2010 to 2023 within the context of Fintech advancement. With the rapid development of technology and customer demand, banks must invest in technological innovation to keep up with the market, which will have certain effects on stock prices and banks' annual profits. Furthermore, the study also assesses the effectiveness of technology investment during COVID-19 and considers other micro and macro factors.

This study has important implications for policy and regulations as it offers valuable insights into the financial returns of technological investments in the Vietnamese banking sector. Additionally, it contributes to academic knowledge, informs policy decisions, and provides practical guidance to industry stakeholders. All of this is particularly relevant in the rapidly changing fintech landscape. The main aim of this study is to investigate the practical effects of technology investment on the stock returns and profitability of Vietnamese commercial banks, specifically in

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relation to the rapid expansion of Fintech. Therefore, the article will be organised as follows: (2) Literature review, (3) Data and methodology, (4) Results, (5) Discussion and (6) Conclusion and recommendations.

Theoretical Framework

The impact of technological investment on stock return

Zhang and Zhuang (2020) found that Fintech positively influences commercial bank stock prices, albeit with a delay. Their study indicated that the technological factor significantly positively impacted stock prices starting on the fourth day and peaking by the eighth day. Similarly, IT investment announcements increased market value for 97 firms in the financial and manufacturing sectors that announced technology investments between 1981 and 1988. The study demonstrated that investors' and businesses' comprehension and application of IT enhance stock market efficiency, based on a study involving 60 countries using the World Bank's financial development report. Conversely, Taherian (2022) found that the Information and Communication Technology (ICT) Development Index negatively affects stock market volatility in Iran. Ammar et al. (2020) noted that the rise of high-frequency trading increased both liquidity and volatility in the stock market. However, during the pandemic, Celik et al. (2024) observed that high-frequency trading did not impact stock market liquidity.

The study discovered that certain micro-factors, such as the loan-to-asset ratio, non-interest income ratio, and off-balance sheet items-to-asset ratio, were positively correlated with stock returns in their study of European banks. Conversely, they found that the loan loss provision ratio and book value of equity ratio negatively correlated with stock returns. Similarly, Kasman and Kasman (2011) determined that technical efficiency, scale efficiency, and productivity positively influenced stock returns, while increases in the equity-to-asset ratio and bank size were associated with lower stock returns. Additional research has identified significant relationships between various micro variables and stock returns.

The impact of technological investment on banks' profitability

The outbreak of the COVID-19 pandemic has contributed to accelerating the digital transformation process and the rapid application of information technology products in banks (Dadoukis et al., 2021). The authors also showed the significant role of information technology in improving market profits and lending performance, and information technology accelerates banks' recovery after crises and strengthens financial stability. In addition, banks with higher technology investment rates will attract more deposits from customers, which means that banks will enhance their competitive advantage based on technology factors. The benefits of applying information technology are also reflected in controlling and reducing the bank's bad debt ratio, contributing to credit growth, reducing operating costs, improving the quality of customer service management, and increasing bank profits during the Covid-19period (Pham et al., 2024).

The technological innovation and risk management software application by 3,692 banks in 28 European countries in 2013 had an inverse effect on leverage but increased bank profits. The authors demonstrated that breakthroughs in technological factors not only help improve bank efficiency but also strengthen financial stability. Al-Azzawi and Altmimi (2015) also showed

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similar results when finding a positive impact between Information and Communication Technology Investment (ICT) and bank profits at commercial banks in Jordan. The author used FEM and REM models to find a positive relationship between Internet banking and service profits in an empirical study at Vietnamese banks. In addition, in commercial banks in China, the development of Internet finance improves financial efficiency, promotes diversification, improves profitability and reduces liquidity (Dong et al., 2020). However, the study concluded that technology investment reduces bank profitability when conducting empirical research in the US.

Technological investment, stock return and banks' profitability measurement

Technological investment: With the advancements and advances of technology, the speed of the 4.0 revolution is taking place faster and affecting every aspect of the economy of countries worldwide, including the banking sector of Vietnam (Tam & Thuy, 2023). Information technology invested and applied in the banking sector has brought about many significant changes in the business operations of banks, typically the improvement in the quality of customer service, modern products and services (Gupta et al., 2018). Financial technology (financial technology) is abbreviated as Fintech, which is the application of various technological advances to the financial sector. Digital transformation is applying big data models, artificial intelligence, and blockchain to change how a company operates (Naimi-Sadigh et al., 2021), thereby promoting the process of connecting with customers and supporting business operations. Therefore, to implement and deploy digitalisation in enterprises, companies must invest in technology projects, which are time-consuming and expensive. Studies by Gupta et al. (2018) also apply a similar formula to measure banks' technology investment level. Therefore, the author measures the technology investment index by taking the logarithm of the total annual expenditure of Vietnamese commercial banks related to software and technology factors shown in the financial statements.

Stock return: The authors define stock return as the profit earned when the price increases. This means that investors will benefit from the increase in stock price, and this encourages investors to put more money into the stock market. Based on the research (Allozi & Obeidat, 2016; Dang & Tran, 2019). The formula used by the authors to measure stock return is:

$$RET_{it} = \frac{P_{it} - P_{it-1} + D_{it}}{P_{it-1}}$$

In there:

RET_{it}: Realized stock return percentage of commercial banks i in year t.

P_{it}: The stock market price for commercial banks i at the end of period t.

P_{it-1}: The market stock price for commercial banks i at the end of period t – 1.

D_{it}: Dividends of firm i in year t.

Banks' profitability: The bank profits are considered the main indicator of bank performance because they create the difference between the interest earned on savings deposits and the interest paid by borrowers on their loans. The bank's profits are also defined as net income after tax or the bank's net income. A business's profitability reflects management's efficiency in generating benefits from all business activities. According to the research of Gupta et al. (2018), a bank's profitability is represented by the return on assets (ROA) and is calculated as net income over total assets.

Research Data and Methodology

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Research Data: This study examined a sample of 26 joint-stock commercial banks in Vietnam from 2010 to 2023. The author collected data from the audited financial statements of commercial banks, while macroeconomic variables were sourced from the General Statistics Office of Vietnam.

Methodology: To address potential endogeneity in the model, the two-step Generalized Method of Moments (GMM) model will be used, incorporating instrumental variables (Arellano & Bover, 1995). The author uses panel data to evaluate the impact of technology investment factors on stock returns and bank returns in the Vietnamese market. Based on the reviewed studies, the author builds research models of 9 independent variables, including internal bank and macro variables.

$$RET_{it} = \beta_0 + \beta_1 TE_{it} + \beta_2 TECOVID_{it} + \beta_3 SIZE_{it} + \beta_4 DIV_{it} + \beta_5 CIR_{it} + \beta_6 CIRCOVID_{it} + \beta_7 FT_{it} + \beta_8 GDP_{it} + \beta_9 INF_{it} \quad (1)$$

$$ROA_{it} = \beta_0 + \beta_1 TE_{it} + \beta_2 TECOVID_{it} + \beta_3 SIZE_{it} + \beta_4 DIV_{it} + \beta_5 CIR_{it} + \beta_6 CIRCOVID_{it} + \beta_7 FT_{it} + \beta_8 GDP_{it} + \beta_9 INF_{it} \quad (2)$$

Table 1: ***Description of variables***

Variables	Symbols	Formula	Expected Results
Dependent variables			
Stock Return	RET	$\frac{(P_t - P_{t-1}) + D_t}{P_{t-1}$ In there: P_t: the stock prices at the end of year t P_{t-1}: the stock prices at the end of year t – 1 D_t: dividends of banks during the year	
Profitability	ROA		
Bank-specific variables			
Technological investment	TE	Log(The total of technology software investment)	+
Technological investment in Covid	TECOVID	Log(The total of technology software investment)*Covid Covid value = 1 for years > 2020 Covid value = 0 for years < 2020	+
Bank size	SIZE	Log(total asset)	+
Income Diversification	DIV	HHI index	+
Cost-to-income ratio	CIR	$\frac{Total\ operating\ expenses}{Total\ operating\ income}$	-
Cost-to-income ratio in Covid	CIRCOVID	$\frac{Total\ operating\ expenses}{Total\ operating\ income} * Covid$ Covid value = 1 for years > 2020 Covid value = 0 for years < 2020	-
Fintech companies	FT	Log(Fintech companies)	+
Macroeconomic variables			
Economic growth rate	GDP	Collected from General Statistics Office Vietnam	+
Inflation rate	INF	Collected from General Statistics Office Vietnam	-

Source: Complied by the author

Table 1 provides a comprehensive view of the variables used in the study, including their formulas and expected effects on stock returns and profitability. The stock price data and relevant financial

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measures were acquired from the Ho Chi Minh City Stock Exchange (HOSE) and the Hanoi Stock Exchange (HNX) from 2010 to 2023. This data was essential for evaluating the influence of technical investments on stock returns.

Study Results

Table 2: ***Statistical results of variables***

Variables	Obs	Mean	Std.Dev.	Min	Max
RET	269	0.0140	0.2544	-0.6380	0.99
ROA	269	0.0132	0.0149	0.0001	0.0883
TE	269	4.8331	0.6510	2.8451	6.4438
TECOVID	269	1.4424	2.3469	0	6.4438
SIZE	269	18.7882	1.2696	15.9227	21.5566
DIV	269	0.3035	0.1223	0	0.4999
CIR	269	0.4890	0.1473	0.0512	0.8915
CIRCOVID	269	0.1195	0.2022	0	0.8745
FT	269	1.8893	0.3143	1.2788	2.2742
GDP	269	0.0596	0.0148	0.0258	0.0802
INF	269	0.0497	0.4318	0.0063	0.1868

Source: Calculated by the author

The average stock return value is 1.40%, and the stock return value of commercial banks is quite low. Similarly, the profits of Vietnamese commercial banks are relatively low, as shown by the ROA index, which is also at an average of 1.32%. Banks also focus on income diversification, with the highest value reaching 0.4999. However, the operating expense ratio is relatively high, with an average value of 48.90% and a standard deviation of 14.73%. During the Covid period, the operating expense ratio remained quite high, as shown by the highest value of 87.45%. The operating scale of fintech companies in the Vietnamese market does not differ much, as shown by the smallest value of 1.2788 and the largest value of 2.2742.

Table 3: ***Correlation coefficient matrix of research variables***

	RET	ROA	TE	TECOVID	SIZE	DIV	CIR	CIRCOVID	FT	GDP	INF
RET	1.000										
ROA	0.061	1.000									
TE	0.179	0.355	1.000								
TECOVID	0.094	0.526	0.393	1.000							
SIZE	0.065	0.242	0.715	0.421	1.000						
DIV	0.081	0.153	0.233	0.199	0.196	1.000					
CIR	0.001	-0.614	-0.238	-0.314	-0.161	-0.190	1.000				
CIRCOVID	0.096	0.335	0.203	0.899	0.288	0.166	-0.145	1.000			
FT	0.097	0.382	0.319	0.647	0.490	0.192	-0.084	0.612	1.000		
GDP	-0.617	-0.088	-0.081	-0.386	-0.061	-0.089	0.068	-0.406	-0.064	1.000	
INF	-0.150	-0.153	-0.187	-0.305	-0.344	-0.131	-0.106	-0.291	-0.726	-0.057	1.000

Source: Calculated by the author

Table 3 tests the correlation coefficient values below 0.8, so multicollinearity does not exist in the model. Table 3 shows the results of the correlation coefficient matrix between pairs of variables in the study. The variable technology investment (TE) and technology investment during the COVID

DOI: https://doi.org/ 10.5281/zenodo.13895099 EISSN: 2735-9891

period (TECOVID) positively impact both stock value and bank profitability. Bank size (SIZE), income diversification level (DIV) and Fintech company size (FT) also have a similar trend, affecting both independent variables (RET and ROA).

Regression results

Table 4: ***Results of OLS, FEM, REM and FGLS model***

	RET				ROA			
Variables	Pooled-OLS	FEM	REM	FGLS	Pooled-OLS	FEM	REM	FGLS
TE	0.1203***	0.1750***	0.1354***	0.0878***	0.0041***	0.0078***	0.0055***	0.0041***
TECOVID	-0.0438***	-0.0448***	-0.0442***	-0.0224**	0.0035***	0.0028***	0.0033***	0.0035***
SIZE	-0.0362***	-0.0831***	-0.0447***	-0.0303**	-0.0024***	0.0031*	-0.0020**	-00024***
DIV	0.0040	0.0799	0.0354	0.0498	-0.0041	-0.0045	-0.0055	-0.0041
CIR	-0.0188	-0.0907	-0.0332	-0.0321	-0.0466***	-0.0505***	-0.0480***	-0.0466***
CIRCOVID	-0.0868	-0.1163	-0.0955	-0.3441***	-0.0218***	-0.0197**	-0.0207**	-0.0218***
FT	0.2667***	0.3236***	0.2715***	0.2308***	0.0105**	0.0002	0.0096**	0.0105***
GDP	-13.1095***	-13.1545***	-13.1000***	-13.2045***	0.0469	0.0469	0.0488	0.0468
INF	-0.0913	-0.1871	-0.1158	-0.0477	-0.0018	0.0019	0.0011	-0.0018
Cons	0.4766**	1.0110**	0.5527**	0.5776***	0.0375***	-0.0622**	0.0259*	0.0375***
Observations	269							
R-squared	0.5041	0.5326	0.5080		0.5580	0.5726	0.5451	
F-value/Wald chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mean VIF	3.58							
F-test		F(25, 234)=1.61 Prob>F=0.0369				F(25, 234)=3.03 Prob > F=0.0000		
Hausman test			Chi2(9)=21.28 Prob>chi2=0.6603				Chi2(9)=6.78 Prob>chi2=0.0115	
Breusch – Pagan test	Chibat2(01)=2.89 Prob>chibar2=0.0445							
Modified Wald test					Chibar2(26)=837.60 Prob>chi2=0.0000			
Wooldridge test	F(1,25)=2.106 Prob>F=0.1592				F(1,25)=2.887 Prob>F=0.1017			

*Note: *, **, *** represent statistical significance level at 10%, 5%, and 1%, respectively.*

Source: Calculated by the author

Table 4 shows statistical models (Pooled-OLS, FEM, REM, and FGLS) along with the criteria and tests for model selection. VIF test was performed after implementing the Pooled-OLS model. The values of the variables in the VIF model are all below the threshold of 10, and the mean VIF value is 3.58, which means that the model does not have multicollinearity.

The results of Table 4 show that the F-value or Waldchi2 value are all 0.0000, less than 0.05. Therefore, the models (Pooled-OLS, FEM, REM, FGLS) are suitable for both independent variables. The R-squared values of the Pooled-OLS, FEM, and REM models of both RET and ROA variables are greater than 50%, which means that the quantitative model explains more than 50% of the variations in RET and ROA.

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The FEM model is the most suitable for the ROA model. Meanwhile, for the RET variable model, the test result was Prob>chi2=0.6606, greater than 0.05. Therefore, REM is the model chosen for the RET variable model. Breusch-Pagan, Modified Wald, and Wooldridge tests were used to check for multicollinearity and autocorrelation in the REM and FEM models of the two research models.

In the Breusch-Pagan test, Prob>chibar2=0.0445, which is less than 0.05, so the RET variable research model exists multicollinearity. However, the results of the Wooldridge test show that Prob>F=0.1592, higher than 0.05. Therefore, the RET variable research model does not have autocorrelation. For the ROA research model, the Modified Wald test gives Prob>chi2=0.0000, below 0.05, and Prob>F=0.1017 in the Wooldridge test, higher than 0.05. Therefore, the ROA variable model has multicollinearity but no autocorrelation. To overcome the phenomenon in both research models, the author uses the FGLS model. However, the FGLS model cannot overcome the endogeneity phenomenon, so the GMM model is used in the study to overcome the endogenous variable phenomenon through instrumental variables.

Based on the analysis above, banks will recognise their limitations through development trends, thereby paving the way for more complete technological innovations. Developing digital technology is a continuous process and requires commitment and investment; banks need to continue to change and optimize to provide modern financial services, meeting customers' increasingly complex needs.

Table 5: ***Results of testing for variables affecting stock return and profitability***

Variables	RET	ROA
TE	0.1288***	0.0102***
TECOVID	-0.0893***	0.0041***
SIZE	-0.0261**	-0.0039**
DIV	-0.0286	-0.0024
CIR	-0.4160	-0.0772***
CIRCOVID	0.2159	-0.0475**
FT	0.1858*	0.0123**
GDP	-14.2295***	-0.0520
INF	-1.2658	0.0366
Cons	0.7544**	0.0536**
Prob>F	0.000	0.000
Number of instruments	25	22
Number of groups	26	26
AR(2)	0.274	0.481
Hansen test	0.690	0.308

*Note: *, **, *** represent statistical significance level at 10%, 5% and 1%, respectively.*

Source: Calculated by the author

The results of Table 5 show that the number of instrumental variables used in the model is lower than the number of groups in both research models, which is consistent with the general rule of thumb in GMM, the Hansen test of the RET and ROA models are 0.690 and 0.308, respectively, which shows that the instrumental variables used in the model are appropriate. In addition, the AR(2) value of the stock return and bank return research models are 0.274 and 0.481, respectively, higher than 0.05, meaning that there is no autocorrelation phenomenon in both models. Based on

DOI: https://doi.org/ 10.5281/zenodo.13895099 EISSN: 2735-9891

the above factors, the GMM model is the most suitable, effective, and accurate model because it eliminates the defects of the model.

Discussion of findings

Technology investment has a significant impact on both stock returns and increases banks' profitability at the 1% significance level. The author's research results are in line with the research of Hadi et al. (2023) and Zhang and Zhuang (2020) and are different from Iraya and Sati (2018), who did not find a relationship between technology and bank stock returns in Kenya. For the factor of bank profitability, the empirical research results are in line with Al-Azzawi and Altmimi (2015). This means that investment in technology will bring benefits in terms of profits and increase the growth of stock returns for banks. The study also argued that the speed of digitalisation of banks is directly proportional to their profitability. In addition, intermediate factors such as innovation in operating processes and improvement in customer management quality also contribute to improving the effectiveness of technological transformation, thereby significantly improving the efficiency and financial stability of banks Hadi et al. (2023).

During the Covid period, the study found that technology investment positively impacted financial stability at the 1% significance level, Pham et al. (2024) and Dadoukis et al. (2021) but reduced the bank's stock return. The products of technological advances in the banking sector, such as Internet banking and mobile banking, increase bank profits. This phenomenon also occurs similarly in the Vietnamese market in order to meet customers' transaction needs. However, banks face difficulties due to the lack of a legal framework for Fintech activities and issues arising from cybersecurity that affect bank stock prices. The size of a bank has a detrimental effect on both the returns of its stocks and its overall financial performance. This conclusion contradicts the findings (Pham & Nguyen, 2023; Kasman & Kasman, 2011).

The study by Taherian (2022) found that income diversification has a negative impact. However, the significance of income diversification on both independent variables was not observed. Similar results were obtained, but no direct relationship was found between non-interest income and bank financial performance. It was observed that higher operating costs lead to lower bank profits, which aligns with the author's initial expectation. However, operating costs and operating costs calculated for the Covid period were only significant for the ROA variable, and no relationship was found for stock returns. The operating costs of banks in Vietnam are usually quite high. During the COVID-19 period, costs remained high, leading to an increase in the operating cost ratio while the bank's income decreased due to the impact of the epidemic (Pham & Nguyen, 2023). This leads to decreased bank profits due to the need to compensate for operating costs. However, applying technology in bank operations helps banks save certain operating costs (Miklaszewska et al., 2021).

The development of Fintech companies has a positive impact on both stock returns and bank profits at the 10% and 5% significance levels, respectively. Commercial banks benefit from the services of Fintech companies. Instead of competing, banks tend to cooperate with companies in the fintech sector to reduce technology investment costs and meet most of the needs of customers. Because the products created through the cooperation between Fintech companies and banks attract

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customers, increase profits, and create competitive advantages, thereby increasing the stocks and stock returns of commercial banks, the number of Fintech companies in Vietnam is currently second in the ASEAN region, after Singapore.

For macro variables, both GDP and INF have a negative correlation with RET and a positive correlation with ROA. However, the regression results only found that GDP has a negative impact on RET at the 1% significance level. Le Cuong (2024) also found a negative relationship between the economic growth rate and the stock market.

This study is distinctive because it specifically examines Vietnamese banks, investigates the integration of Fintech and traditional banking, employs a rigorous methodology, offers practical insights for emerging markets, and contributes to the theoretical understanding of technological investment in the banking sector. The study's various components contribute significantly to its value as an addition to both academic literature and practical applications in the financial industry.

This study addresses important knowledge gaps in the existing literature by concentrating on a developing sector and investigating the relatively unexplored connection between Fintech and traditional banks. It employs sophisticated research methods, conducts long-term analysis, and provides valuable insights for policymakers and industry leaders. The contributions of this aid in connecting the divide between theoretical comprehension and practical implementation within the framework of technological investment in the banking industry.

Conclusion and Recommendations

After analysing empirical data from 2010 to 2023 and assessing the impact of technology as well as other factors on stock returns and bank profits, the author used OLS, FEM, REM, FGLS, and GMM to analyse the impact of technology investments on stock returns and profitability having the specific conclusions derived from this study. This study underscores the importance of technological investments for Vietnamese commercial banks, especially in the context of rapidly evolving Fintech innovations and challenges posed by the COVID-19 pandemic. Besides, technology investments and Fintech development positively impact stock returns and profitability, while bank size shows a negative impact. Macroeconomic variables like GDP negatively affect stock returns. Finally, the study provides a comprehensive understanding of the relationship between technological investments, stock returns, and profitability in the context of Vietnamese commercial banks amid the growth of Fintech. Regulatory and policy frameworks must be improved to enhance the benefits of technological investments. This includes establishing rational benchmarks for technology investments tailored to different banks' diverse needs and conditions. To successfully grasp digital technology, thereby improving the quality of products and services and making financial services meet competitive requirements, commercial banks need to focus on some recommendations as follows:

First, investment should be increased, and the focus should be on applying technology in banking business activities to increase the bank's position in the market and attract customers, thereby creating profits and increasing stock returns. However, banks need to be careful when investing to avoid the phenomenon of massive investment leading to inefficiency. Besides, the banks should plan for the transformation in the coming period, focusing on creating value for

DOI: https://doi.org/ 10.5281/zenodo.13895099 EISSN: 2735-9891

customers and improving efficiency for the bank. Continuously evaluate and optimise the bank's digital strategy to ensure it reflects the latest trends and needs of customers and the market.

Second, in addition to technology investment, banks cooperate with fintech companies in the market to keep up with technological advances and save on technology investment costs. However, the explosive development of fintech companies also threatens commercial banks in the future. Therefore, accelerating digital transformation and focusing on technology development should still be carried out. Besides, the banks should build digital applications and services using technological achievements, providing customers with good experiences and optimising transaction processes. Invest in new systems, software, and technology infrastructure to ensure flexibility and efficiency in the digital transformation. Cooperate with Fintech companies and service providers to exploit new technologies and provide better services.

Third, applying information technology to the bank's operating processes and structure to reduce the bank's operating costs and increase the bank's profits. In addition, they typically develop and expand more products and services through Internet banking and mobile banking to meet customer needs. Finally, the banking system needs to ensure information security as well as have security measures to protect customer data, prevent fraud and illegal attacks, and comply with all regulations and laws related to security, identity management, and privacy when using digital technology.

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