

The impact of digitalization on the banking sector: Evidence from fintech countries



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ABSTRACT

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Banking services are now branded and are provided in distinct ways. It has been proven that the development of new financial services and products substantially impacts bank performance. This paper investigates the effect of e-banking services on the performance of banks before the pandemic. The study looks at a sample of 24 nations, including leading fintech nations. Data from 2012 to 2019 was gathered from the World Development Indicators and the Bank for International Settlements (BIS) databases. The findings show a significant positive correlation between cashless payments and banks' ROA. The performance of a bank is significantly impacted by mobile subscribers. In fact, customers are willing to use mobile transactions in place of traditional bank accounts. Banks' ability to generate revenue from assets (in the form of credits) is consequently restricted, which has an impact on their ability to earn a profit. The research suggests a range of policy implications and policy interconnections between digital financial services, banking stability, and efficiency. The banking sector has become more digitalized after the recent pandemic. To date, there is very little literature that has focused on the effect of digitalization on the banking sector before the Covid-19 crisis. The current study contributes to the literature by providing an overview of the relationship between the banking industry and digitalization before the latest pandemic for some leading fintech countries. This research will contribute to later comparisons between the different situations of the banking sector pre- and post-pandemic.

Contribution/Originality: The current research adds to the existing literature by summarizing how the banking sector and digitalization interacted before the most recent pandemic. This study will enable future comparisons of the various pre- and post-pandemic banking sector conditions.

1. INTRODUCTION

Rapid technological and internet advances have transformed the entire transaction market (Burt & Sparks, 2003) including the financial market. The way in which financial services are designated and delivered has changed dramatically. The introduction of digital technology into the banking sector has transformed the delivery of traditional transaction and banking services, and this continues to attract customers in different sectors.

Yao, Li, Wu, and Wang (2020) argue that while digital transactions and digitization are necessary for the future, less is known about their economic and financial effects. The banking industry is thought to be the most important source of economic growth for a country. As time goes on, bank branches are becoming less and less integrated with the banking sector. Due to the widespread use of the internet and information technology, several banks are

developing cutting-edge solutions that could eventually result in branchless and cashless banking. The use of mobile banking and e-banking are two examples (Deloitte, 2022).

E-banking is defined as the delivery of internet banking services directly to customers (Belbergui, Elkamoun, & Hilal, 2021) and allows customers to complete a variety of transactions electronically through the bank's website, such as paying debts, transferring funds, printing statements, and viewing balances (Tan & Teo, 2000).

Electronic banking services are generally seen as vital for retaining customers and maintaining a competitive advantage (DeYoung & Duffy, 2002). Current providers of such financial services fall into four main categories according to the nature of the entity that maintains the contractual relationship with the customer: i) multiservice banks, which offer their customers 'basic' transaction accounts for payments and fund transfers through mobile devices, payment cards and points of sale (POS) terminals; ii) niche banks that offer a specific range of products and services through mobile devices, payment cards and POS terminals; iii) mobile telephony issuers of electronic money; iv) issuers of electronic money which are neither banks nor mobile telephony operators. These four models generally use three components: an online transaction platform, a network, and the access device used by the customer. These components offer electronic services for payments and the transfer of funds, as well as credit, savings, insurance services, and even securities services.

In fact, the transition has been rapid and significant in the financial sector because electronic financial services can make customers' lives easier by allowing them to perform local and international transactions, as well as provide better management of charges.

Customers' lives have been made easier by e-banking because they no longer need to visit a branch to check their balance or make payments because they can carry out these tasks without the help of a third party. Dixon and Nixon (2000) thoroughly explain the significant impact of e-banking on customers' daily lives. They claim that electronic banking allows users to sign up for new credit cards, apply for loans, pay bills by transferring money to creditors' accounts, view all of their accounts and their balances at once, keep track of new transactions (deposits, withdrawals, etc.), transfer money easily, quickly, and in real time to another account, and more. The relationship between a customer and their bank is only strengthened by the customer's perception of receiving consistent service from their bank.

No one can deny that with the advent of electronic banking, the user has felt increasingly comfortable with their bank. In addition, we have seen efforts from both parties to ensure that this innovation is a success and is established easily and quickly.

Payment and transfer services through electronic transaction platforms, and information collected on the use of these services by customers, can allow providers to adapt and offer additional financial services tailored to the needs of their customers. Financial inclusion of digital technology can also reduce the risk of loss, threat, or other financial crimes related to cash transactions, as well as other associated costs. It can ultimately promote economic growth by allowing capital accumulation and having a positive impact on the economy.

Digital finance is being more frequently identified as a key contributor to financial sectors all over the world, enabling more competitive and efficient financial markets while extending access to finance to individuals who have previously been underserved. By fostering financial development, inclusion, and efficiency, the financial technology process can support economic progress and the eradication of poverty. Leveraging the advantages and possibilities of digital finance while managing its inherent risks is the key challenge for policymakers.

Banks face difficulties with the integration of e-services. The willingness of customers to accept and use these services is one of the challenges, reflecting the idea that customers have a considerably greater influence on the adoption of e-banking than the products and services offered. Customers are value-driven (Cvijović, Kostić-Stanković, & Reljić, 2017), and they rarely move to e-banking unless it can satisfy their specific demands (Estrella-Ramón, 2017). Understanding their requirements and expectations means being aware of where the value is from their point of view.

For banks operating in dynamic and competitive financial markets, providing the highest level of customer service to clients is still a critical strategic priority.

Given the abovementioned background, the purpose of this study is to investigate how e-banking services affect banks' efficiency and productivity. Different proxies, including mobile subscriptions, use of e-money cards, ownership of accounts, and cashless payments, will be used in the model to represent digital banking services. The return on assets (ROA) will be used to evaluate the bank's performance.

The study analyzes a sample of 24 countries, including leading fintech nations such as the US, UK, Singapore, Australia, Canada, Sweden, and Switzerland. Data from 2012 to 2019 were gathered from the World Development Indicators and Bank for International Settlements (BIS) databases.

The remainder of the paper is organized as follows: Section 2 contains the literature review of the theoretical foundation of e-banking; Section 3 explains the methodology; Section 4 discusses the key findings; Section 5 shows the robustness tests of the model; Section 6 contains the conclusion; and Section 7 provide the discussion, the limitations of the study and recommendations for further analysis.

2. LITERATURE REVIEW AND THEORETICAL BACKGROUND

According to the theory of technological spillover, digital finance supports the financial sector in three ways. First, it broadens financial inclusion by acting as an intermediary; second, with technology advancement, it lowers the workload; and third, it increases productivity and efficiency. The “squid effect” also benefits the traditional financial sector by offering affordable fintech products and expanding outreach initiatives (Wang, Liu, & Luo, 2021). The underlying assumption of the theory explaining how digital finance, banking efficiency, and stability are related is that underdeveloped nations lack the resources necessary for regulated fintech expansion. The proper deployment of digital financial services is hampered by the lack of strict privacy legislation and security safeguards, which results in both micro- and macro-financial dangers. Additionally, the inadequate regulatory environment in developing nations will increase management risks.

The fintech revolution may exacerbate the issue of banking efficiency and stability because banks in developing countries are already facing issues including a rising number of non-performing loans (NPLs), low profitability, and competition from private businesses (Scardovi, 2017). Therefore, using these conceptual frameworks and theoretical foundations, we investigated the link between digitalization and the competitiveness of the financial sector.

In recent years, there has been a lot of focus on the effects of digital transactions on the efficiency of banks. Since banks are the primary providers of liquidity insurance for economies (Barattieri, Eden, & Stevanovic, 2020), a healthy banking system promotes economic growth by allocating credit and ensuring the availability of sufficient liquidity (Berger & Sedunov, 2017).

There are two types of current payment: cash and non-cash. The transition from using physical cash to online payments has been facilitated by the development of technology. Although digital banking systems initially need significant capital, they give banks a long-term competitive advantage. Hernando and Nieto (2007) stated that it took three years for Spanish banks to realize the profitability of internet banking. According to Zavalco, Matyunina, Izmailova, Kozhina, and Lebedev (2018), the adoption of digital banking requires investment in telecommunications and computer technologies. However, as more people become aware of the efficiency and simplicity of cashless banking over time, banks' net profitability will increase once the system is implemented.

It has been established that the performance of banks is strongly influenced by the innovation of banking services and products. With the use of digital transactions, banks' return on assets (ROA) and return on equity (ROE) will be boosted (Morais, Peydró, Roldán-Peña, & Ruiz-Ortega, 2019; Misra, 2015; Neves, Proença, & Dias, 2020; Rahman, Yousaf, & Tabassum, 2020).

ATMs, internet banking, credit and debit cards, and other forms of digital banking reduce banks' expenses and increase their income, which has greatly increased their profitability (Akara, 2018; Gündoğdu & Taşkin, 2017).

However, Simpson (2002) showed that, due to a robust information technology infrastructure in the USA compared to developing nations, digital banking generated more revenue for banks in the US than in emerging economies.

Moreover, e-banking increases business efficiency by lowering operating expenses and raising revenues (Ardizzi, Crudu, & Petraglia, 2019). The number of people required for bank operations is reduced through the implementation of information and technology (Dubey & Sharma, 2022). Without significantly increasing operating costs, e-banking successfully handles the rapidly rising volume of retail banking transactions (Kolodinsky, Hogarth, & Hilgert, 2004). Compared to emerging nations, electronic banking increases banks' assets, lowers operational costs and improves their portfolios by delivering efficient services to consumers (Adewoye, 2013).

Nevertheless, some investigations produced inconsistent findings. For instance, Malhotra and Singh (2009) examined the profitability of Indian banks and found that digital banking has no meaningful effect on it. According to Onay and Ozsoz (2013), Turkey's high level of competition in digital banking resulted in fewer investment returns after two years of implementation. According to Khrawish and Al-Sa'di (2011), the high costs for banks in Jordan prevent e-banking from increasing banks' profitability. The profitability of banks is also threatened by the growth of fintech businesses. According to Chen, Huang, and Ye (2020), China's peer-to-peer (P2P) lending and third-party payment giants Alibaba, Ant Financial, and Tencent have had a detrimental effect on banks' profitability.

Although there is limited research on how progressive digital development affects bank performance, this paper assumes that in the current digital age, the advancement of digital banking has a positive impact on banks' performance. Hence, we can formulate the research hypotheses as follows:

H₀: There is no relation between digital banking services and a bank's performance.

H₁: Digital banking services positively impact a bank's performance.

3. DATA AND METHODOLOGY

3.1. Data

This section analyzes the different links between the variables associated with the research problem and empirically assesses the importance of digital banking products to the overall improvement of bank performance using panel data regression, first with fixed effects and then with random effects.

The digital banking services are presented in the model using different proxies (see Table 1), and bank performance is measured by return on assets (ROA).

The research uses a sample of 24 countries,¹ including top fintech countries such as the United States, United Kingdom, Singapore, Australia, Canada, Sweden, and Switzerland. Data is collected from the BIS and World Development Indicators databases for the period from 2012–2019. The analysis of the data was conducted using EViews 10. The definitions of the variables are presented in Table 1.

3.2. Methodology

Panel data analysis is the assessment of economic linkages using cross-sectional time series data with repeated observations for each person rather than at the aggregate level (Greene, 2012). The study employs fixed and random effects panel data models. The model is as follows:

$$ROA_{it} = \alpha + \delta_1 ROA_{it-1} + \delta_2 W_{it} + \varepsilon_{it} \quad (1)$$

ROA_{it} represents the return on assets for country i in period t , W_{it} represents the vector of the independent variables (VCashPay, TCardEmoney, Accownership, Mobilesub, Tvalbc,) for country i in period t , and ε_{it} is the associated error.

¹ The sample includes Argentina, Australia, Belgium, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Korea, Mexico, Netherlands, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom, and the United States.

Table 1. Variables included in the model.

Variables	Code	Definition
Dependent variable		
Banks' return on assets	ROA	An indicator of the profitability of bank assets (%)
Independent variables		
Cashless payments	VCashPay	The total volume of cashless payments (Millions of US\$)
E-money cards	TCardEmoney	Cards with an e-money function (Thousands of US\$)
Account ownership	Accownership	Account ownership at a financial institution or with a mobile money service provider (% Of population aged 15+)
Mobile subscriptions	Mobilesub	Mobile cellular subscriptions
Money supply (Control variable)	Tvalbc	The total value of banknotes and coins in circulation (In billions of US\$)

Source: BIS and World Development Indicators databases.

4. EMPIRICAL RESULTS

The current study aims to expand debates on how digitalization might regulate the performance of the banking sector in fintech countries. The empirical results of the models are presented in Table 2.

Table 2. Empirical results.

	OLS model	Fixed effects model	Random effects model	
C	412.195*** (52.742)	124.544** (51.111)	412.195*** (21.748)	
ROA-1	0.576*** (0.143)	0.458*** (0.125)	0.657*** (0.156)	
VCashPay	-0.005 (0.004)	-0.001** (0.000)	-0.005*** (0.001)	
TCardEmoney	0.001*** (0.002)	0.005 (0.002)	0.001*** (0.001)	
Accownership	3.502*** (0.565)	0.566 (0.685)	3.502*** (0.233)	
Mobilesub	-0.001 (0.003)	-0.001* (0.006)	-0.007 (0.001)	
Control variable	-0.532*** (0.132)	0.406*** (0.113)	-0.532*** (0.057)	
	Effects specification		SD	Rho
Cross section random			0.000	0.000
Idiosyncratic random			10.373	1.000
Number of obs.	45	45	45	
Durbin-Watson stat	1.608	2.233	1.608	
F-statistic	17.698	71.581	1236.03	
(P-value)	0.000	0.000	0.000	
R ²	0.694	0.9546	0.694	

Note: Robust standard errors are reported in brackets. Levels of statistical significance: *** p < 0.01, ** p < 0.05, * p < 0.1.

The estimation results are presented in Table 2 and are divided into three models: Ordinary least squares (OLS), panel with fixed effects, and panel with random effects. The findings confirm the hypothesis that "Digital banking services positively impact a bank's performance."

The use of a credit card with an e-money function or being the owner of an account with a mobile money service provider presents a positive and significant effect on a bank's return. In fact, the use of electronic banking services can boost customer satisfaction, diversify services, and raise quality standards, all of which increase customer numbers and improve a bank's profits. Therefore, e-money may have a direct and favorable impact on a bank's financial operations. These findings are confirmed by Nikabadi and Mousavi (2016). In contrast, Lu (2022) shows that cashless payment systems have no obvious effect over time on how efficiently banks operate.

The results show that mobile subscriptions have a negative effect on ROA. This negative relationship conflicts with Muisyo, Alala, and Musiega (2014) but is consistent with Iheanachor and Ozegebe (2020). The return on assets

ratio measures how much a company's assets contribute to its profitability. This result confirms the hypothesis that a high volume of mobile transactions may cause most funds to be transferred outside the banking system for a significant period of time (Kulu, Opoku, Gbolonyo, & Kodwo, 2022). Therefore, individuals will start using mobile transactions in place of conventional banking methods. Because of this, banks' ability to generate profits from their assets (in the form of credit) is reduced, which lowers their ability to make money. A decrease in sales can, in fact, negatively affect the banking industry's performance. As a result, mobile money services have drawn the majority of the urban population away from traditional banks. The immediate and indirect advantages that mobile money services provide to society motivate this course of action. The use of mobile money may affect commercial banks' liquidity, which would limit their ability to fulfill their crucial position as lenders (Kamukama & Tumwine, 2012).

5. ROBUSTNESS OF THE MODEL

The Hausman test, the likelihood ratio test, and the standardized residuals test must be carried out in order to evaluate the robustness of the panel model.

5.1. The Hausman test

The Hausman test is a test for model misspecification. When analyzing panel data, the Hausman test can assist in determining whether to use a fixed effects model or a random effects model. The preferred model, according to the alternative hypothesis, has fixed effects, while the preferred model, according to the null hypothesis, has random effects. The results in Table 3 show that the fixed effects model is the most appropriate.

Table 3. Hausman test results (Random effects).

Test: cross-sectional random effects			
	Statistic	Df	Prob.
Cross-sectional chi-squared	139.364	5	0.000

5.2. The Likelihood Ratio Test

The error terms are now tested for heteroscedasticity using the likelihood ratio test. Heteroscedasticity occurs when a data set contains observations with distinct variances. The null hypothesis of the test is that all of the error terms have the same variance (homoscedastic). This is in contrast to the alternative hypothesis that the variance of the error term varies widely (heteroscedastic).

The probability of the F-statistic values in Table 4 does not support the null hypothesis that heteroscedasticity does not exist and that the error terms have the same variance.

Table 4. The likelihood ratio test.

Test: cross-sectional fixed effects			
	Statistic	Df	Prob.
Cross-sectional F	39.072	5.34	0.000
Cross-sectional chi-squared	85.902	5	0.000

5.3. Residual Cross-Section Test

The test for serial correlation across the error terms is shown in Table 5. The alternative hypothesis suggests that there is a serial connection among the error terms, as opposed to the null hypothesis of this test, which states that there is no serial correlation of the equation errors up to lag k. The first section of the test result, which includes the probabilities for the two statistical tests, F-statistic and R-squared, is the most important. Table 5 shows that there is no serial correlation across the error terms since the probabilities of the f-statistics do not allow rejection of the null hypothesis.

Table 5. Residual cross-section test.

Test	F-statistic	Degrees of freedom	Prob.
Breusch–Pagan Lagrange multiplier	25.157	15	0.047
Pesaran scaled Lagrange multiplier	1.854	15	0.063
Bias-correlated scaled Lagrange multiplier	1.425	15	0.153
Pesaran cross-dependence	-0.836	15	0.403
Cross-sections	6	15	-
Total panel	45		-

6. CONCLUSION

Cashless societies have become more widespread in a number of countries as a result of the Industrial Revolution 4.0, and the banking system contributes to the achievement of this goal. This study looks at how digital banking services (including automated teller machines [ATMs], internet banking, mobile banking, credit, debit, charge, and e-money) affect the performance of banks over the period from 2012–2019 for several fintech countries. The findings reveal that cashless transactions have benefited banks' performance. The use of e-money and cashless payments are statistically significant and positively correlated with banks' ROA. However, the impact of mobile subscriptions used in mobile transactions negatively impact banks' performance. In fact, consumers are willing to replace traditional banking with mobile transactions. As a result, banks' capacity to turn assets into profits (in the form of credit) is reduced, which affects their capacity to make a profit.

In conclusion, banks in several countries have succeeded in raising the number of cashless payment transactions. The growth of technology around the world, however, raises the possibility that worries regarding the stability and profitability of banks will be ignored. The line separating traditional and modern banking is getting hazier because of the escalating intensity of competition.

The ongoing digital transformation is crucial for financial stability and inclusivity, as well as for the long-term competitiveness of banks. With the growth of bank digitization, huge tech companies and non-bank fintech companies are becoming more competitive, and banks are playing less of a role in driving financial technology advancement. This study compares how banks are developing digitally around the world and concludes that while non-banks may be driving development in lower-income nations, banks are the dominating actors in high-income economies when it comes to providing digital financial services.

In order to gain a competitive edge, banks should complement one another by connecting their infrastructures. In comparison to fintech firms, traditional banks benefit from a broader clientele and the capacity to establish virtual banks. Policymakers should be inspired by fintech businesses to provide more convenient services and more individualized consumer experiences. In a society without cash, cooperation between these two parties can result in a win-win situation, (Lu, 2022).

7. DISCUSSION AND LIMITATIONS

Further research can investigate the long-term effects of cashless transactions on bank performance. Tobin's q model can be used to measure this and gain a better understanding of the long-term performance of banks by looking at the financial market performance of banks. Due to the significant effects of the Covid-19 pandemic on human wealth, the economy as a whole, and technology, future studies can compare the effects of cashless payments on banking performance before and after the pandemic.

Several recent studies indicate that banks' performance, as assessed by ROE and ROA, declined when Covid-19 infection rates increased, which is consistent with findings from other studies conducted at the European level by Haider and Mohammad (2022) and Miklaszewska, Kil, and Idzik (2021), or for particular nations, e.g., Gazi, Nahiduzzaman, Harymawan, Al Masud, and Dhar (2022) and Fajri, Muhammad, Umam, Putri, and Ramadhan (2022).

Regarding whether digitalization affects performance, Dadoukis, Fiaschetti, and Fusi (2021) argued that a boost in online banking use and the security of bank servers had a favorable impact on banks' performance.

Distinct conclusions present the impact of Covid-19 on digital services and the performance of the banking sector. However, the variables related to bank cards led to contradictory results. Ndhine, Kibati, and Jепtepkeny (2020) emphasized that while the rise in credit cards had a negative impact on bank performance, which stands in contrast to previous studies, the rise in debit cards had a positive impact on performance, which is consistent with other studies.

Some limitations of the current study must be underlined. This study is limited to electronic banking, an aspect of digital banking, and customer satisfaction. The choice of electronic banking as the central topic is because it has become one of the core services provided by banks all over the world. In addition, the analysis was conducted on a small sample that includes top fintech countries because the use of electronic banking in these countries exceeds the total number of users of banking services. The other limitation of the study is related to the time period studied (2012–2019) due to the limited availability of data.

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REFERENCES

- Adewoye, J. (2013). Impact of mobile banking on service delivery in the Nigerian commercial banks. *International Review of Management and Business Research*, 2(2), 333-344.
- Akara, C. K. (2018). Cashless policy and commercial banks' profitability in Nigeria. *Advances in Social Sciences Research Journal*, 5(3), 395-406. <https://doi.org/10.14738/assrj.53.4262>
- Ardizzi, G., Crudu, F., & Petraglia, C. (2019). Innovation and cost efficiency in the banking industry: The role of electronic payments. *Economic Notes: Review of Banking, Finance and Monetary Economics*, 48(1), 12121. <https://doi.org/10.1111/ecno.12121>
- Barattieri, A., Eden, M., & Stevanovic, D. (2020). Risk sharing, efficiency of capital allocation, and the connection between banks and the real economy. *Journal of Corporate Finance*, 60, 101538. <https://doi.org/10.1016/j.jcorpfin.2019.101538>
- Belbergui, C., Elkamoun, N., & Hilal, R. (2021). E-banking overview: Concepts, challenges and solutions. *Wireless Personal Communications*, 117(28), 1-20. <https://doi.org/10.1007/s11277-020-07911-0>
- Berger, A. N., & Sedunov, J. (2017). Bank liquidity creation and real economic output. *Journal of Banking & Finance*, 81, 1-19. <https://doi.org/10.1016/j.jbankfin.2017.04.005>
- Burt, S., & Sparks, L. (2003). E-commerce and the retail process: A review. *Journal of Retailing and Consumer Services*, 10(5), 275-286. [https://doi.org/10.1016/s0969-6989\(02\)00062-0](https://doi.org/10.1016/s0969-6989(02)00062-0)
- Chen, X., Huang, B., & Ye, D. (2020). Gender gap in peer-to-peer lending: Evidence from China. *Journal of Banking & Finance*, 112, 105633. <https://doi.org/10.1016/j.jbankfin.2019.105633>
- Cvijović, J., Kostić-Stanković, M., & Reljić, M. (2017). Customer relationship management in banking industry: Modern approach. *Industrija*, 45(3), 151-165. <https://doi.org/10.5937/industrija45-15975>
- Dadoukis, A., Fiaschetti, M., & Fusi, G. (2021). IT adoption and bank performance during the Covid-19 pandemic. *Economics Letters*, 204, 109904. <https://doi.org/10.1016/j.econlet.2021.109904>
- Deloitte. (2022). *Digital banking maturity*. Retrieved from Deloitte Report.
- DeYoung, R., & Duffy, D. (2002). The challenges facing community banks: In their own words. *Economic Perspectives*, 26(Q IV), 2-17. <https://doi.org/10.1007/bf02712704>
- Dixon, M., & Nixon, B. (2000). *Sams Teach yourself e-banking today* (1st ed.): Series: Sams Teach Yourself Today Series.
- Dubey, A., & Sharma, B. (2022). Digital banking: A need of time. *International Journal of Advance and Applied Research*, 9(3), 504-513.
- Estrella-Ramón, A. (2017). Explaining customers' financial service choice with loyalty and cross-buying behaviour. *Journal of Services Marketing*, 31(6), 539-555. <https://doi.org/10.1108/jism-05-2015-0189>

- Fajri, M. Z. N., Muhammad, A. A., Umam, K., Putri, L. P., & Ramadhan, M. A. (2022). The effect of covid-19 and sectoral financing on islamic bank profitability in Indonesia. *Journal of Islamic Economic Laws*, 5(1), 38-60. <https://doi.org/10.23917/jisel.v5i1.17181>
- Gazi, M. A. I., Nahiduzzaman, M., Harymawan, I., Al Masud, A., & Dhar, B. K. (2022). Impact of COVID-19 on financial performance and profitability of banking sector in special reference to private commercial banks: Empirical evidence from Bangladesh. *Sustainability*, 14(10), 1-26. <https://doi.org/10.3390/su14106260>
- Greene, W. (2012). *Econometric analysis* (7th ed.). Upper Saddle River: Prentice Hall.
- Gündoğdu, A., & Taşkin, F. D. (2017). Analysis of the relationship between financial innovation and the performance of Turkish banking. *International Review of Economics and Management*, 5(3), 16-32. <https://doi.org/10.18825/iremjournal.280341>
- Haider, J., & Mohammad, K. U. (2022). The effect of Covid-19 on bank profitability determinants of developed and developing economies. *iRASD Journal of Economics*, 4(2), 187-203. <https://doi.org/10.52131/joe.2022.0402.0072>
- Hernando, I., & Nieto, M. J. (2007). Is the Internet delivery channel changing banks' performance? The case of Spanish banks. *Journal of Banking & Finance*, 31(4), 1083-1099. <https://doi.org/10.1016/j.jbankfin.2006.10.011>
- Iheanachor, N., & Ozegbe, A. E. (2020). Dynamic linkages between mobile money and banks' performance in Nigeria: An autoregressive distributed lag (ARDL) approach. *International Journal of Management, Economics and Social Sciences*, 9(3), 224-246. <https://doi.org/10.32327/ijmess/9.3.2020.12>
- Kamukama, N., & Tumwine, S. (2012). Mobile money services: A liquidity threat to Uganda's commercial banks. *African Journal of Accounting, Economics, Finance and Banking Research*, 8(8), 33-46.
- Khrawish, H. A., & Al-Sa'di, N. M. (2011). The impact of e-banking on bank profitability: Evidence from Jordan. *Middle Eastern Finance and Economics*, 13(1), 142-158.
- Kolodinsky, J. M., Hogarth, J. M., & Hilgert, M. A. (2004). The adoption of electronic banking technologies by US consumers. *International Journal of Bank Marketing*, 22(4), 238-259. <https://doi.org/10.1108/02652320410542536>
- Kulu, E., Opoku, A., Gbolonyo, E., & Kodwo, M. A. T. (2022). Mobile money transactions and banking sector performance in Ghana. *Heliyon*, 8(10), e10761. <https://doi.org/10.1016/j.heliyon.2022.e10761>
- Lu, M.-P. (2022). Cashless payments and banking performances: A study of local commercial banks in Malaysia. *International Journal of Business and Society*, 23(2), 855-876. <https://doi.org/10.33736/ijbs.4842.2022>
- Malhotra, P., & Singh, B. (2009). The impact of internet banking on bank performance and risk: The Indian experience. *Eurasian Journal of Business and Economics*, 2(4), 43-62.
- Miklaszewska, E., Kil, K., & Idzik, M. (2021). How the COVID-19 pandemic affects bank risks and returns: Evidence from eu members in Central, Eastern, and Northern Europe. *Risks*, 9(10), 1-22. <https://doi.org/10.3390/risks9100180>
- Misra, S. D. (2015). Determinants of bank profitability in India. *International Journal of Indian Culture and Business Management*, 10(2), 193-211.
- Morais, B., Peydró, J. L., Roldán-Peña, J., & Ruiz-Ortega, C. (2019). The international bank lending channel of monetary policy rates and QE: Credit supply, reach-for-yield, and real effects. *The Journal of Finance*, 74(1), 55-90. <https://doi.org/10.1111/jofi.12735>
- Muisyo, J. M., Alala, O., & Musiega, D. (2014). The effects of mobile money services on the performance of the banking institutions: A case of Kakamega town. *The International Journal of Engineering and Science*, 3(4), 16-24.
- Ndhine, T., Kibati, P., & Jeptepkeny, B. (2020). Effect of debit cards on financial performance of listed commercial Banks in Kenya. *World Journal of Innovative Research*, 9(5), 23-28.
- Neves, M. E., Proença, C., & Dias, A. (2020). Bank profitability and efficiency in Portugal and Spain: A non-linearity approach. *Journal of Risk and Financial Management*, 13(11), 1-19.
- Nikabadi, M. S., & Mousavi, S. M. (2016). The effect of E-money on the non-Financial performance of banks: (Case Study: Bank Mellat of Iran). *International Journal of Innovation in the Digital Economy*, 7(1), 12-23. <https://doi.org/10.4018/ijide.2016010102>

- Onay, C., & Ozsoz, E. (2013). The impact of internet-banking on brick and mortar branches: The case of Turkey. *Journal of Financial Services Research*, 44(2), 187-204. <https://doi.org/10.1007/s10693-011-0124-9>
- Rahman, H.-u., Yousaf, M. W., & Tabassum, N. (2020). Bank-specific and macroeconomic determinants of profitability : A revisit of Pakistani banking sector under dynamic panel data approach. *International Journal of Financial Studies*, 8(3), 1-19.
- Scardovi, C. (2017). Transformation in risk management. *Digital Transformation in Financial Services*, 143-162. https://doi.org/10.1007/978-3-319-66945-8_9
- Simpson, J. (2002). The impact of the Internet in banking: Observations and evidence from developed and emerging markets. *Telematics and Informatics*, 19(4), 315-330. [https://doi.org/10.1016/s0736-5853\(01\)00019-3](https://doi.org/10.1016/s0736-5853(01)00019-3)
- Tan, M., & Teo, T. S. (2000). Factors influencing the adoption of Internet banking. *Journal of the Association for Information Systems*, 1(1), 1-45.
- Wang, R., Liu, J., & Luo, H. (2021). Fintech development and bank risk taking in China. *The European Journal of Finance*, 27(4-5), 397-418. <https://doi.org/10.1080/1351847x.2020.1805782>
- Yao, J., Li, M., Wu, Y., & Wang, M. (2020). *COMAC's digital transformation and intelligent manufacturing*. Beijing, China: Renmin University Business School.
- Zavalko, N., Matyunina, O., Izmailova, S., Kozhina, V., & Lebedev, K. (2018). Key components of the financial infrastructure of the digital economy within the fuel and energy complex. *International Journal of Engineering and Technology (UAE)*, 7(4.38), 672-675. <https://doi.org/10.14419/ijet.v7i4.38.24751>

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