

The impact of electronic banking on net interest margin in Egypt -An Empirical Evidence from The Egyptian Banking Sector During Covid-19

Habiba Mohamed Hassan
Teaching Assistant
Faculty of Commerce & Business Administration
Future University in Egypt

Keywords

COVID-19, EGX₁₀₀, Egyptian Banking Sector, Electronic Banking, Net Interest Margin

Abstract

This study investigates how the COVID-19 pandemic has affected the relationship between Electronic Banking and the profitability of commercial banks in the Egyptian Banking Sector. The researcher collected annual data for 10 years from 17 out of 34 commercial banks listed on the Egyptian Stock Exchange (EGX₁₀₀), specifically from 2013 to 2022. The study utilized a panel linear regression model to test the research hypothesis. The findings indicate that the independent variable (Electronic Banking) significantly impacts the dependent variable (Net Interest Margin). Therefore, the hypothesis stating that electronic banking has no significant impact on NIM is rejected, considering the presence of a control variable, COVID-19. It was found that Internet banking and loans to assets directly and significantly impact NIM, while deposits to assets and COVID-19 have an inverse and significant impact on NIM.

Introduction

The rapid advancements in information and communication technologies are heightening competition among financial institutions worldwide. Consequently, it is imperative to embrace cutting-edge technologies to gain a competitive edge. The banking sector has recently undergone disruptions due to technological advancements, resulting in a transformation of service delivery methods. These advancements encompass the utilization of automated teller machines, telephones, the Internet, credit cards, and electronic currencies. The retail banking sector in Egypt has undergone substantial transformations in line with global trends. Historically, banks faced significant uncertainty when considering investments in cutting-edge technologies. However, in recent times, banks have been significantly investing in technology to maintain their competitive advantage. (Kamel, 2006).

Electronic banking, also known as e-banking or online banking, refers to the use of electronic and digital technology to conduct various banking activities and transactions over the Internet or other electronic channels. This includes services such as checking account balances, transferring funds between accounts, paying bills, applying for loans, and managing investments, all through secure online platforms provided by financial institutions. Electronic banking offers convenience, accessibility, and efficiency to customers, allowing them to perform banking tasks anytime and anywhere with an Internet connection. (Mohammad & Elham, 2014)

The global outbreak of the Coronavirus disease has had a significant impact on financial markets worldwide, leading to unprecedented macroeconomic shocks and an uncertain recession. In response, the Central Bank of Egypt (CBE) and other monetary authorities have taken aggressive measures to support the financial system in absorbing the impacts of COVID-19. The implementation of lockdown measures has reshaped consumer behavior, particularly in Egypt, where there has been an increased demand for digital banking services such as online banking, mobile transfers, and contactless e-wallets. While the trend towards digital banking was already underway before the pandemic, the current situation has accelerated the digitalization of financial services in Egypt. As digital adoption and consumer preferences continue to evolve, the use of digital banking services is anticipated to increase. However, it's important to note that

while Internet banking has seen rapid adoption in Egypt, this does not automatically translate to improved bank performance. Additionally, the extensive use of Internet banking as a delivery channel does not guarantee economic viability, productivity, or profitability. (American Chamber of Commerce in Egypt, 2020) (Central Bank of Egypt, 2022) (Nehad, 2022)

This paper will figure out whether the COVID-19 pandemic affects the relationship between Electronic Banking and the profitability of commercial banks in the Egyptian Banking sector listed in EGX₁₀₀.

Literature review

Previous Studies

The concept of E-banking has been defined multiple times in recent literature. E-banking encompasses all online banking services provided to bank customers (Daniel, 1999). It involves the electronic distribution of banking products and services, which includes ATMs and phone transactions that have been used for electronic banking for a long time. However, internet delivery has revolutionized banking for both customers and banks. The internet provides faster, more convenient, and 24/7 access, making it the preferred channel for customers. It is also more efficient and cost-effective for banks (Nitsure, 2003). Additionally, advancements in information communication technology and various banking apps have significantly improved the quality of banking services (Mahmoud, 2019).

The study of (Jordan, 2011) examined the impact of banks' e-banking services on profitability from 2000 to 2009. It included Jordanian domestic banks divided into non-internet service providers, recent adopters, and early adopters. Ratios such as Return on Assets, Return on Equity, and Interest Margin were used. Regression analysis showed that e-banking had no significant effect on profitability for recent adopters, possibly due to high expenses. Early adopters saw better results but still not significant. The study noted that results may vary due to the rapidly changing nature of Internet banking.

However, the study of (Mawutor, 2014) investigated how the implementation of electronic banking impacted the profitability of a bank in Ghana, specifically the Agricultural Development Bank. It explored the shift from traditional to computerized work procedures and the influence of electronic banking services such as online banking and ATMs on general banking services and profitability. The study utilized a quantitative methodology, distributing 150 questionnaires to the bank's customers. Data analysis was performed using the Statistical Package for Social Sciences (SPSS). The findings revealed that E-banking had a positive impact on the Agricultural Development Bank's profitability, with the bank's net profit margin notably increasing in the year (2011) following the implementation of E-banking. Although there were slight fluctuations in the subsequent years, the overall impact remained positive.

Furthermore, the study of (Eze & Egoro, 2016) examined the correlation between various e-banking channels and the profitability of commercial banks conducted in Nigeria between 2006 and 2014. The study identified four e-banking channels - automated teller machines (ATMs), electronic mobile banking, internet banking transactions, and point of sale services - and their relationship with the profit before tax of commercial banks. The researchers employed the error correction model for evaluation and found that electronic banking significantly impacts commercial bank profitability, with varying effects from specific channels. The study recommends that commercial banks increase the number and efficacy of ATM delivery points. Additionally, it suggests that regulatory authorities collaborate with banks to establish an enabling operational environment and regulatory framework to ensure optimal service delivery to customers, particularly in instances of failed transactions.

In addition, the study of (Kassem & Sakr, 2018) investigated how the characteristics of Egyptian banks and their profitability are related. Identifying the key internal traits could help increase profitability. The study used OLS regression analysis to explore the relationship between the profitability of 19 Egyptian banks from 2007 to 2016. The results showed a significant correlation between profitability measures, indicating that bank size and loan loss provision ratio are the main determinants of bank profitability. The relationships between capital ratio and ROA, NIM, and ROE were significant, but not extremely strong. However, the bank's profitability was not significantly affected by the loan and deposit ratios.

Besides, the study of (Chaimaa, et al., 2020) provided an overview of e-banking, explored potential challenges and security threats, and evaluated security solutions for e-banking users. In recent years, the banking sector has emerged as a dominant force in global e-business, significantly reshaping the industry

and transcending geographic boundaries. While e-banking offers many advantages, it also amplifies the risks associated with traditional banking. Banks offering e-banking services encounter challenges in ensuring financial security for electronic banking.

Moreover, a study of (Imran, 2021) conducted a study to analyze the relationship between the introduction of electronic banking services and the financial performance of state-owned commercial banks in Bangladesh. I examined the panel data of the sample banks using the pooled ordinary least square estimate. The study revealed that the adoption of e-banking had a significant negative impact on the profitability of banks in the year of adoption in terms of return on assets, return on equity, and net interest margin. However, the findings also showed that e-banking had a significant positive impact on return on assets in the first year after adoption.

However, the study (Katusiime, 2021) examined the impact of the COVID-19 pandemic on banking sector profitability in Uganda from Q1 2000 to Q1 2021. It found that the pandemic had a significant long-term impact on bank profitability. Factors such as non-performing loan ratio, liquidity ratio, and market sensitivity risk had a major negative impact, while interest rates had a positive impact. Inflation did not significantly affect bank profitability in the short or long term.

While the study of (Nguyen, et al., 2021) aimed to understand the impact of digital banking (DB) on the financial performance (FP) of banks before and during the Vietnam Lockdown. Customer surveys conducted in 2018 and 2020 revealed that before COVID-19, customer satisfaction with DB had a significant and positive effect on FP. However, during the lockdown, only word-of-mouth (WoM) had a positive influence on FP, indicating a shift in the CE-FP connection. This suggests that during the lockdown, DB replaced WoM as the primary point of contact for clients, altering the CE-FP relationship.

Moreover, the study of (Elkmash, 2022) evaluated the effectiveness of Egyptian banks in response to the growth of fintech. It found that, except for deposits and total loans, the introduction of financial technology did not significantly improve the efficiency of the banks. This underscores the need for Egyptian banks to devise innovative solutions to expedite the transition to a non-monetary society as part of Egypt's 2030 Sustainable Development Plan.

Despite, the study of (Le, et al., 2023) examined the COVID-19 pandemic's effects on Vietnam's financial stability, a developing nation with a banking-based financial system, were examined. The study used the Vector Error Correction Model (VECM) and nonlinear autoregressive distributed lag (NARDL) models to analyze Vietnam's financial stability from January 23, 2020, to June 30, 2022. The impact of the pandemic was assessed using daily data on infected cases and national lockdown levels. Since the Vietnamese government relied on the banking sector to control the economy, the authors evaluated financial stability from the perspectives of the stock market and the interbank market. The study concluded that the pandemic initially had a damaging impact on financial stability, but over time, this impact steadily diminished. The NARDL data also revealed an unbalanced long-term association between the financial market and the COVID-19 pandemic.

Based on previous research, it is evident that both profitability and E-banking services are significant factors that have garnered attention from numerous researchers. However, there is a lack of **adequate studies on these variables. It is important to note that E-banking services are a relatively new concept in Egypt, and further research is needed to yield comprehensive results, especially** considering the impact of the COVID-19 pandemic. Therefore, this study seeks to explore the relationship between E-banking services and profitability in commercial banks in Egypt, with the COVID-19 pandemic as a control variable.

Diffusion of innovation theory (DIT)

The theory of diffusion of innovation (DIT) is widely recognized as one of the pioneering theories exploring the factors influencing an individual's decision to adopt innovations or technologies. According to this theory, the acceptance of innovation is a gradual process characterized by the reduction of uncertainty. To alleviate uncertainty surrounding the new technology, individuals tend to gather and assimilate knowledge. As a result, there is a shift in attitudes towards the use of technology. These changed perceptions then lead individuals to either embrace or reject the technology. (Rogers, 1983) In this study, electronic banking represents such an innovation, with a bank serving as the conduit for disseminating this innovation.

(Rogers, 2003) examines and discusses five traits of individuals who are inclined to embrace new technology due to the significance of these processes. He discovered five cohorts of individuals that embraced modern technology. These groupings varied based on the stage of the new product's life cycle. The list includes creators, early adopters, the early majority, the late majority, and laggards. (Rambocas, 2012) Each group differs in the rate at which they acquire recent technologies. The first type, known as "innovators," consists of individuals who possess a strong enthusiasm for experimenting with novel ideas and concepts. The second type consists of "early adopters," individuals who purchase a product prior to its popularity and before the inventors themselves. Individuals in the third category, known as the "early majority," acquire further knowledge about products and services before making a purchase. The warnings offered by early users or opinion leaders have a significant impact on the likelihood of its acceptance. The "late majority" segment, conversely, refrains from purchasing the goods until it has been tested and approved by other groups. Ultimately, individuals known as "laggards," who frequently harbor uncertainties over novel products, are sometimes excluded from civilizations that progress rapidly.

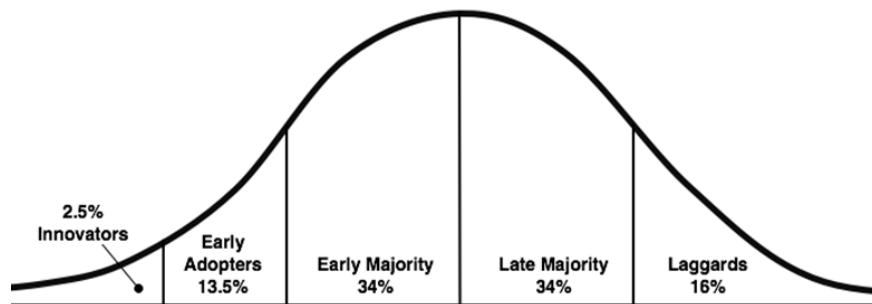


Figure 1: Diffusion of Innovation Model

The theory suggests that certain factors, such as age, gender, level of education, and wealth, are associated with a person's acceptance of new ideas and their connection to different social groups. (Rogers, 1995) According to this theory, these social factors influence how people react to new ideas, which in turn affects the speed at which the ideas spread and gain popularity. For example, the theory proposes that young adults with higher income and more years of education are more likely to be among the first adopters of new ideas. These early adopters are believed to be more open to new things and have the resources and willingness to take risks by embracing innovation.

In summary, The Diffusion of Innovation theory presents a framework for comprehending the adoption of E-banking in Egypt. It underscores the necessity for effective communication channels, innovation, consideration of cultural barriers, individual characteristics, and adoption rates. A comprehensive understanding of these factors can enable banks in Egypt to formulate strategies for enhancing the adoption of E-banking services.

Research methodology

Electronic banking presents the applied study independent variable, and from the literature review, the researcher found that electronic banking is measured by the following dimensions which are: (Internet Banking, Loans to Assets ratio, and Deposits to Assets ratio). The profitability performance of commercial banks presents the applied study dependent variable, and it consists of one main dimension which is Net Interest Margin.

The following table presents the independent variable dimensions, the dependent variable dimensions, and control variables measurement and abbreviations.

Table 1: Study variables measurement.

Variables	Abbreviation	Measurements
<i>The Independent Variable Dimensions</i>		
Internet Banking	IB	Dummy variable: 0 if there is no IB,1 if there is IB.
Loan to Asset	LA	$= \frac{\text{Total Debts}}{\text{Total Assets}}$
Deposit to Asset	DA	$= \frac{\text{Total Deposits}}{\text{Total Assets}}$
<i>The Dependent Variable Dimensions</i>		
Net Interest Margin	NIM	$= \frac{\text{Interest Income} - \text{Interest Expenses}}{\text{Average Earning Assets}}$
<i>The control Variable</i>		
Coronavirus	COVID-19	Dummy variable: 0 from 2013 till 2018,1 from 2019 till 2022

Source: prepared by the researcher.

The researcher took a sample consisting of 17 out of 34 commercial banks under EGX₁₀₀ for a time series of 10 years starting from 2013 to 2022, so the total final number of the applied study sample is 170 observations. The researcher used quantitative research data as secondary data collected from banks' annual reports, financial statements, official websites, and The Egyptian Exchange website.

The researcher applies the Linear panel regression models to test the relationship between electronic banking and the profitability performance of commercial banks in the presence of the COVID-19 pandemic as a control variable.

Theoretical Framework

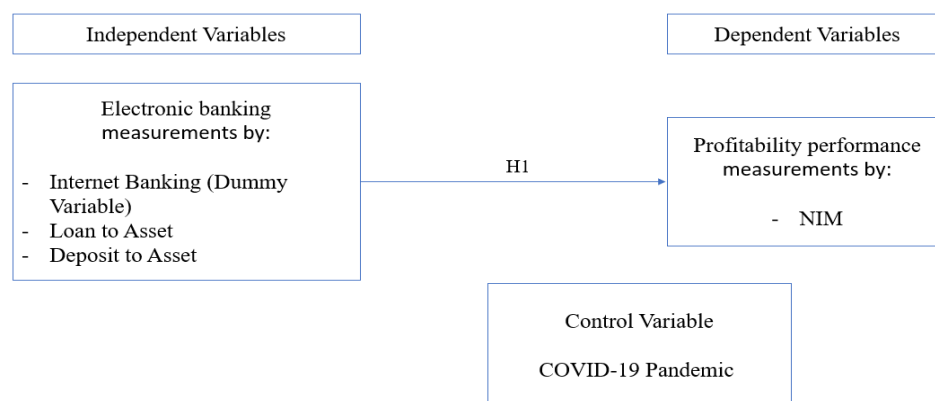


Figure 2: Theoretical Framework

Study hypothesis

For testing the relationship between electronic banking and the profitability performance of commercial banks in the presence of the COVID-19 pandemic as a control variable, the researcher will test the following hypothesis:

H₀: There is no significant impact of electronic banking on NIM in the presence of COVID-19

Linear panel regression model specification

The study hypothesis postulates the relationship between electronic banking and the profitability performance of commercial banks in the presence of the COVID-19 pandemic as a control variable.

Typically, the data set has a cross-sectional observation among different commercial banks and is resampled at a certain period, so a Panel data regression will be most applicable to represent such a linear relationship the following is the model equation:

For the Hypothesis, the researcher will apply the following linear panel regression model:

$$NIM = \widehat{\beta}_0 + \widehat{\beta}_1 IM_{it} + \widehat{\beta}_2 LA_{it} + \widehat{\beta}_3 DA_{it} + \widehat{\beta}_4 covid - 19_{it} + \varepsilon_{it}$$

NIM: Net interest margin proxy for a bank's financial performance measured by interest income minus interest expense divided by earning assets.

α : year and bank fixed effects.

β_1 : Internet Banking and is calculated as a Dummy variable: 0 if there is no IB, 1 if there is IB.

β_2 : Loans-to-assets ratio is a basic measure of the asset composition of a bank, quickly showing what percentage of assets on the books are dedicated to loans.

β_3 : The Deposit-to-Asset Ratio is a metric used to assess whether banks with higher levels of deposits experience more operational expenses to attract these deposits.

β_4 : COVID-19 Pandemic and is calculated as a Dummy variable: 0 if there is no COVID-19, 1 if there is COVID-19.

i : refers to the bank.

t : refers to the year.

Testing the impact of electronic banking on NIM

Model Diagnostics

The following table presents the diagnostic results of the three-panel models to determine the most suitable model for forecasting NIM.

Table 2: The pooled panel model diagnostics for the third hypothesis

Test	Purpose	Test-statistic result	P-value	Fitted panel model
F-test	Comparing between Pooled panel and Fixed Effect Panel	F = 1.2882	0.14727015	Pooled panel
Breusch-Pagan test	Comparing between Pooled panel and Random Effect Panel	LM = 8.7874	0.091663019	Pooled panel
Hausman test				

Source: Prepared by the researcher depending on E-views software output.

The previous table shows that the pooled panel model is the most suitable model for explaining the impact of the independent variable on the dependent variable.

Pooled Panel

The following table presents the pooled panel linear regression model for Net Interest Margin (NIM) as a dependent variable and Electronic Banking as an independent variable, with COVID-19 being used as a control variable.

Table 3: The pooled panel model of NIM for the third hypothesis

Model	Stepwise Pooled Panel	Dependent variable		NIM
Independent variables	Coefficient	t-ratio	p-value	Significance
Constant	-0.0158875	-1.027	0.3059	Insignificant
Internet Banking	0.0546147	4.830	0.0028	Significant
Loans to Assets	0.0554816	2.061	0.0408	Significant
Deposits to Assets	-0.0307471	-2.126	0.0350	Significant
COVID-19	-0.0187878	-2.20	0.0278	Significant
F-test	4.202774	p-value		0.002882
Adjusted R-squared			10.0464%	

Source: Prepared by the researcher depending on E-views software output.

From Table (3) it is concluded that:

▪ The overall pooled panel model is significant as the overall F-test for significance has a value of 4.202774 and a *P-value* of 0.002882 which is less than 0.05, with an adjusted R-squared value of 10.0464% which means that (internet banking, loans to assets, deposits to assets, and COVID-19) explain the change in the NIM by 10.0464%.

- (Internet banking and loans to assets) have a positive and significant impact on NIM.
- (Deposits to assets and COVID-19) have a negative and significant impact on NIM.
- The overall equation for forecasting the NIM is:

$$\widehat{NIM} = 0.046147 IM_{it} + 0.0554816 LA_{it} - 0.0307471 DA_{it} - 0.0187878 Covid - 19_{it}$$

Ramsey Reset Test

This test is used to determine whether the model contains all the appropriate variables and excludes all irrelevant variables to ensure that the model-estimated coefficients are not biased. This is done through the Ramsey RESET Test. The decision criterion is to accept the null hypothesis that the study model includes all the appropriate variables when the P-value is greater than (0.05).

Table 4: Ramsey Reset test for the third hypothesis

Ramsey RESET overall Test	F-test	P - value
	9.32158	0.0599668

Source: Prepared by the researcher depending on E-views software output.

The table above indicates that the P-value for the F test is greater than (0.05), implying that the study model does not contain any inappropriate variables.

Heteroscedasticity Test for Residual Stability

The regression models and the Ordinary Least Squares (OLS) method rely on several assumptions. These include the assumption of homoscedasticity, which means that the variance of the errors is constant. If there is evidence of heteroscedasticity, some methods can be used to address this issue, such as the White test. The null hypothesis is that the model exhibits random error instability if the p-value is less than 0.05.

Table 4: Heteroscedasticity test for the third hypothesis

Overall test of Heteroscedasticity	Chi-square	P - value
	9.0402	0.0511984

Source: Prepared by the researcher depending on E-views software output.

The above table shows that the chi-squared test of value 9.0402 has a p-value of 0.0511984 which means accepting the null hypothesis which means that the study model does not suffer from the problem of random error instability.

Normality of Residuals

The table below shows the distribution of residuals. For the model to be accurate, the residuals must follow a normal distribution with a mean of zero and a variance of one.

Table 6: Normality of residuals for the third hypothesis

Chi-square test of Normality	Test	P - value
	9.76597	0.0757438

Source: Prepared by the researcher depending on E-views software output.

The previous table shows that the chi-square test of normality has a *p-value* is 0.0757438 which is greater than 0.05 which means that residuals are normally distributed.

Variance Inflation Factor (VIF) Test

The minimum possible value equals 1.0 and the values greater than 10.0 indicate a collinearity problem.

Table 7: VIF of the independent and control variable for the third hypothesis

Variable	VIF
Internet Banking	1.031
Loans to Assets	1.039
Deposits to Assets	1.043
COVID-19	1.036

Source: Prepared by the researcher depending on E-views software output.

From the previous table, it is concluded that there are no variables that suffer from multi-collinearity as the VIF values do not exceed 10.

The Finding

From Table (3) it is found that the independent variable (electronic banking) has a significant impact on the dependent variable (NIM), so the researcher rejects the hypothesis that's mentioned that there is no significant impact of electronic banking on the Net interest margin in the presence of COVID-19 as a control variable. It is found that Internet banking and loans to assets have a positive and significant impact on NIM, while deposits to assets and COVID-19 have a negative and significant impact on NIM.

Discussions and conclusions

Innovation brings about multiple advantages by creating greater opportunities for businesses. In this paper, we aim to integrate empirical evidence with the theoretical foundation of online banking. The focus is on investigating the impact of the COVID-19 pandemic on the relationship between electronic banking and the profitability performance of commercial banks in the Egyptian banking sector. Thus, the main objective of this paper is to examine the impact of COVID-19 on the relationship between e-banking and NIM.

E-banking services offer banks the chance to enhance the quality of their services and attain client satisfaction, thereby gaining a competitive edge. E-banking refers to the electronic method via which customers can conduct banking transactions without physically visiting bank locations.

The findings indicate that the independent variable (electronic banking) significantly impacts the dependent variable (NIM). It is found that Internet banking and loans to assets have a positive and significant impact on NIM, while deposits to assets and COVID-19 have a negative and significant impact on NIM.

Limitations and direction for future research**Study limitations**

The study's limitations are summarized in the following points:

- Challenges arise when attempting to access bank-specific information and documentation, especially statistics relating to electronic payment measurements. These statistics are vital for our study as they help us to understand the impact of electronic payments on the revenue of commercial banks while ensuring the confidentiality of the information.
- The challenge of acquiring information on the study's subject arises from the scarcity of literature on electronic payments and their correlation with Egyptian banks, particularly in the context of the COVID-19 pandemic.

Future research

Through this paper, we have identified the importance and role of electronic payment methods in commercial banks. This has opened new prospects for new topics mentioned below:

- Impact of electronic payment methods on financial inclusion in Egypt
- Sustainability and environmental impact of electronic payment systems in Egypt

Appendix

List of Banks
Abu Dhabi Islamic Bank" S.A.E"
Ahli United Bank
Al Baraka Bank Egypt
Alex Bank
Arab International Bank (AIB)
Arab Investment Bank
Banque Misr
Blom Bank Egypt
CIB
Credit Agricole
EG Bank
Emirates (NBD) EGYPT
HSBC Egypt
National Bank of Egypt (NBE)
National Bank of Kuwait
QNB Alahli
Saib Bank

References

- American Chamber of Commerce in Egypt, 2020. *COVID-19's Impact on Egypt's Banking Sector*, s.l.: American Chamber of Commerce in Egypt.
- Central Bank of Egypt, 2022. *Central Bank of Egypt's Measures to Offset the Impact of COVID-19*, Egypt: Central Bank of Egypt.
- Chaimaa, B., Najib, E. & Rachid, H., 2020. E-banking Overview: Concepts, Challenges and Solutions. *Wireless Personal Communications*, 29 10.
- Daniel, E., 1999. Provision of electronic banking in the UK and the Republic of Ireland. pp. 72-83.
- Elkmash, M. R. M. A., 2022. The Impact of Financial Technology on Banking Sector: Evidence from Egypt: Evidence from Egypt. *International Journal of Finance, Insurance and Risk Management*, 1 March, 12(1), pp. 100-118.
- Eze, G. & Egoro, S., 2016. Electronic Banking and Profitability of Commercial Banks in Nigeria. *Journal of Finance and Economic Research*, 3(1), pp. 202-222.
- Imran, H., 2021. Effects of E-Banking Adoption on the Financial Performance of State-Owned Commercial Banks in Bangladesh. *Information Resources Management Journal*, 32(4), pp. 93-112.
- Jordan, T. I. o. E.-B. o. B. P. E. f., 2011. Husni Ali Khrawish. Issue 13.
- Kamel, S., 2006. Assessing the Introduction of Electronic Banking in Egypt Using the Technology Acceptance Model. p. 23.
- Kassem, N. M. & Sakr, A., 2018. The Impact of Bank-Specific Characteristics on the Profitability of Commercial Banks in Egypt. *Journal of Finance and Bank Management*, 6(2), pp. 76-90.
- Katusiime, L., 2021. COVID 19 and Bank Profitability in Low Income Countries: The Case of Uganda. *Journal of Risk and Financial Management*, 14(588).
- Le, H. T. T., Hoang, H. V. & Phan, N. T. H., 2023. The COVID-19 pandemic and financial stability in Vietnam: evidence from the interbank market. *International Journal of Social Economics*.
- Mahmoud, M. A., 2019. Gender, E-Banking, and Customer Retention. 15 May, pp. 269-287.
- Mawutor, J. K. M., 2014. Impact of E-Banking on the Profitability of Banks in Ghana. *Research Journal of Finance and Accounting*, 5(22), pp. 53-63.
- Mohammad, K. V. & Elham, B. B., 2014. The impact of electronic banking on profitability and market share: Evidence from banking industry. *Management Science Letters*, pp. 2531-2536.

-
- Nehad, H. Y., 2022. The Effect of Covid-19 Pandemic on Banks' Risk and Performance Indicators; Case of Egypt. *Scientific Journal for Financial and Commercial Studies and Researc*, 4(1), pp. 1001-1028.
- Nguyen, N. T. H., Kim-Duc, N. & Freiburghaus, T. L., 2021. Effect of digital banking-related customer experience on banks' financial performance during Covid-19: a perspective from Vietnam. *JOURNAL OF ASIA BUSINESS STUDIES*, 16(1), pp. 200-222.
- Nitsure, R. R., 2003. E-banking: Challenges and Opportunities. 27 12, 38(51/52), pp. 5377-5381.
- Rambocas, M. & A. S., 2012. Using diffusion of innovation theory to model customer loyalty for internet banking: A TT millennial perspective.. *International Journal of Business and Commerce*, 1(8), pp. 1-14.
- Rogers, E., 1983. The diffusion of innovations. *New York Free Press*.
- Rogers, E., 1995. Diffusion of innovations. *New York Free Press*, 14(3), pp. 213-223.
- Rogers, E., 2003. *Diffusion of Innovations*. 5th edition ed. New York : Free Press.
-