

Analyzing the Relation Between E-Banking and Return on Equity on Commercial Banks: An Empirical Evidence from the Egyptian Banking Sector in the presence of Covid-19

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Abstract:

This research aims to determine the impact of the COVID-19 pandemic on the correlation between Electronic Banking and the profitability of commercial banks in the Egyptian Banking Sector. The research uses data from a sample of 17 listed banks on the Egyptian Stock Exchange, especially (EGX 90) for 10 years from 2013 till 2022. The study uses a panel linear regression model to test the research hypothesis. The findings explain the impact of independent variable dimensions on ROE in the presence of Covid-19 as a control variable. It is found that independent variable electronic banking has a significant impact on the dependent variable (ROE).

Keywords: Covid-19 Pandemic, Electronic Banking, Return on Equity, Egypt

تحليل العلاقة بين الخدمات المصرفية الإلكترونية وعائد على حقوق المساهمين على البنوك التجارية: دليل تجريبي من القطاع المصرفي المصري

الملخص :

يهدف هذا البحث إلى تحديد تأثير جائحة COVID-19 على العلاقة بين الخدمات المصرفية الإلكترونية وربحية البنوك التجارية في القطاع المصرفي المصري. يستخدم البحث بيانات من عينة من ١٧ بنك في البورصة المصرية، خاصة (EGX) لمدة ١٠ سنوات من ٢٠١٣ حتى ٢٠٢٢. تستخدم الدراسة نموذج تراجع خطي (90) لاختبار فرضية البحث. توضح النتائج تأثير الأبعاد المتغيرة المستقلة على عائد حقوق المساهمين في وجود Covid-19 كمتغير تحكم. فقد تبين أن للخدمات المصرفية الإلكترونية المتغيرة المستقلة أثراً كبيراً على المتغير المعتمد.

الكلمات الرئيسية: جائحة COVID-19، الخدمات المصرفية الإلكترونية، وعائد حقوق المساهمين، مصر

1. Introduction

Over the past decade, the rapid expansion of communication and network technologies has driven service providers, including financial institutions, to explore new approaches for delivering services, such as mobile banking (M-Banking) (Min & Chi, 2009). Because they make it possible to access information at any time, from any location, mobile devices are frequently used to access the internet. Flexible online browsing is now possible because of the development of mobile devices, the expansion of mobile telecoms infrastructure, and the availability of affordable, robust mobile gadgets. (Shrestha, 2007)

In Egypt, banking is one of the most important industries. Like other service providers, banks have come to understand the value of making technological investments to keep expenses under control, draw in business, and satisfy consumers' demands for ease and cutting-edge technology. Egypt has an excellent opportunity for the growth of retail banking operations because of the country's rapidly developing IT and telecommunications networks. (Badrawy, Aziz, & Fady, 2012)

Information technology (IT) innovation and rapid growth are essential elements for the future growth and development of the banking and finance industry. The COVID-19 pandemic, which has further altered our daily lives and left a lasting impact, has marked the year 2020. Governments implemented mitigation measures such as national quarantine measures, social distancing measures, and the complete closure of non-essential enterprises to contain the spread of the new COVID-19 pandemic. While many banks had to close branches because of the pandemic, they still had to play an important role in coping with the shock and continuing to provide efficient and remote banking services to their customers. This is why online banking is in high demand today, even in the least developed markets. Egyptian culture, like many other developing Middle Eastern countries, plays a role in the adoption of Internet banking. However, people are still relatively conservative in their e-banking. When it comes to money-related processes, most bank clients prefer paper

processes over e-services. In line with the business culture of MENA, most serious bank users (also known as businesses) would rather have a face-to-face interaction with their bank reps, even if they are able to access e-services. It allows them to leverage personal rapport and networking as well as boost client confidence. (Mosallamy & Metawie, 2022).

In this paper, we 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 EGX 90. It will be a panel study during COVID-19 to see how the COVID-19 pandemic affects the relationship between Electronic Banking and the profitability of commercial banks.

2. Literature Review and Hypothesis Development

In recent years, the literature has presented numerous definitions of E-banking. E-banking encompasses the entirety of online banking services provided to customers via the Internet. (Daniel, 1999) In E-banking, in simple terms, refers to the provision of banking goods and services using electronic means. Electronic banking, encompassing Automated Teller Machines (ATMs) and telephone transactions, has existed for a considerable duration. The internet, a novel conduit that has enabled banking transactions for both customers and banks, has recently revolutionized it. Customers favor the Internet because of its expedited accessibility, enhanced convenience, and round-

the-clock availability, irrespective of geographical location. It is a very efficient and economically advantageous conduit for banks. (Nitsure, 2003), which customers formerly frequented to visit banks. The banking business has seen a revolution in service quality due to developments in information communication and technology and its numerous uses (Mahmoud, 2019).

The study of (Lai & Li, 2004) examine the technology acceptance model (TAM) which has been utilized in various scenarios involving a broad spectrum of information technologies (IT) and has already established a cumulative tradition within this field of study. Most TAM studies have been empirical inquiries that have achieved notable accomplishment through the utilization of the survey methodology. The TAM model was developed and subsequently confirmed in several contexts. However, it was necessary to experimentally assess its consistency among different respondent subgroups to verify that the results were not negatively affected by differences in sample characteristics. Regrettably, most of the TAM research has not demonstrated this. In the context of accepting Internet banking, various levels of invariance analysis were applied to the TAM construct. A total of 312 business graduate students from a renowned university in Hong Kong were given questionnaires, and 247 of them were returned. Merely 24.6% of the participants in our survey expressed disagreement or strong disagreement when asked to rate their IT skills on a Likert scale ranging from

one to five. In contrast, 51.6% of the respondents agreed or strongly agreed with the statement.

However, the study of (DRIGĂ & ISAC, 2014) Conduct a thorough examination of the electronic banking service, specifically emphasizing the key attributes of e-banking. The primary objective of this study was to provide a comprehensive overview of the electronic banking service, with a specific focus on highlighting the essential aspects of e-banking. While e-banking offered numerous advantages to both corporate and individual clients, it also raised issues over security and customer interests. To achieve client acquisition, retention, and growth in bank profitability, banks must prioritize customer satisfaction and efficient service delivery. Thanks to recent technological advancements, banks are now able to offer services and assistance to customers not just in physical branches but also through online platforms, accessible at any time and through various delivery channels of their choice. Customers were reducing their branch visits due to the convenience of digital channels, opting instead to utilize internet and mobile technology for their banking requirements. Although the popularity of physical bank branches has considerably diminished, the growth of online and mobile banking has been rapid. Nevertheless, as it pertains to obtaining banking guidance, individuals still exhibit a preference for branch banking. While not completely replacing traditional channels, the internet and mobile devices have progressively become the predominant means through which customers interact

with their banks. Hence, there is little doubt that electronic banking will undoubtedly exceed traditional banking soon.

While the study of (Elkmash, 2022) Assess the efficacy of Egyptian banks considering the expansion of fintech. The paucity of research in this domain in Egypt has raised the paper's worry. The financial statement data from the CBE Egyptian bank, in partnership with Fintech, were utilized for the period spanning from 2014 to 2020. The article titled "The Impact of Financial Technology on Banking Sector: Evidence" is being referred to. To evaluate the efficiency of banks using the DEA technique, three different models were created that consider various combinations of inputs and outputs. These models focus on production, profitability, and intermediate dimensions. The results indicated that the implementation of financial technology did not lead to a significant improvement in the efficiency of Egyptian banks, except for deposits and total loans. This study contributed to the existing body of knowledge regarding the level of acceptance of Fintech services in Egypt and its influence on the efficiency of banks. Egyptian financial institutions must develop innovative strategies to accelerate the transition towards a cashless society. This study is significant as it provided empirical evidence that the implementation of financial technology did not significantly enhance the efficiency of Egyptian banks, except for deposits and total loans. Furthermore, it emphasized the urgent need to transition

Egyptian society into a non-monetary society as a crucial component of Egypt's 2030 Sustainable Development Plan.

Whereas the study of (Jordan, 2011) analyze the influence of banks' internet-based e-banking services on their financial gain between 2000 and 2009. The study sample comprised all domestic banks in Jordan, categorized into three groups: non-internet service providers, recent adopters of the service, and early adopters of the service. The impact on profitability was assessed using ratios such as Return on Assets, Return on Equity, and Interest Margin. The independent variables used were market share, overhead ratio, deposits/assets, and loans/assets. Regression analysis is employed to assess the impact of e-banking services on profit. The regression analysis indicated that the utilization of e-banking services did not have a statistically significant impact on the profitability of banks that recently adopted these services, as measured by their return on assets (ROA) and return on equity (ROE). The data revealed the significant expenditures and prices linked to utilizing these services. In contrast to the margin, it was significantly impacted by e-banking services. Early adopters experienced much superior outcomes compared to late adopters, however the impact on these banks' profitability remained insignificant. Due to the novelty and dynamic nature of Internet banking, the outcomes of empirical research on this subject can differ greatly based on factors such as sample size and analytical approach.

As well as the study of (Josiah Aduda, 2012) examine the correlation between electronic banking (e-banking) and the overall efficiency and effectiveness of Kenya's banking sector. The study examined the potential correlation between the dependent variable, which is measured by return on assets, and the independent factors, which include e-banking investments, ATMs, and debit cards supplied to clients as a representation of e-banking. The study utilized secondary data. The data was collected from the target organizations' annual reports and the Kenyan Central Bank. The researchers employed both descriptive and inferential statistics to examine the data. To summarize, the study discovered that e-banking had notable incremental impacts on asset returns in Kenya's banking industry. Consequently, there was a positive correlation between e-banking and bank performance. Overall, electronic banking has enhanced the convenience of financial transactions by providing services near customers, hence enhancing the efficiency of the banking industry.

Unlike, the study of (Meihami, Varmaghani, & Meihami, 2013) Analyze the impact of electronic banking, including automated teller machines, bank cards, online banking, telephone banking, and point of sale systems, on increasing bank revenues. The research sample size was determined to be 147 using the Cochran formula. Data for the study was collected using financial statements, a questionnaire consisting of 42 questions, and an interview. The data were analyzed using descriptive statistics,

including diagrams and frequency distribution tables, as well as inferential statistics, such as the ANOVA test, T-test, multiple regressions, Scheffe's test, and T-Test. The research indicates a strong and positive correlation between electronic banking and bank earnings, specifically with its five components: automated teller machines, bank cards, online banking, telephone banking, and point of sale. Based on the data, there was no clear impact observed between the independent variables and the dependent variables.

Along the same line, the study of (Ibekwe, 2018) Conduct a study on the Returns on Equity and Returns on Asset of Guaranty Trust Bank after the implementation of E-banking in Nigeria, specifically focusing on Guaranty Trust Bank Plc from 2014 to 2017. The primary objective of the study was to examine the influence of e-banking on the profitability of commercial banks in Nigeria, with a specific focus on Guaranty Trust Bank (GTBank) plc. One of the precise objectives is to assess the impact of e-banking on Return on Assets (ROA). Three hypotheses and three research questions were formulated. The study was conducted retrospectively. The source of the information is the annual report of Guaranty Trust Bank plc. Regression analysis was employed to analyze the data. The study was carried out utilizing the Statistical Package for Social Sciences (SPSS). One of the conclusions of this study indicates that e-banking does not have a significant effect on Return on assets. Conclusively, our analysis determined that the

implementation of e-banking did not enhance GT Bank's Return on Equity or Return on Assets.

As well as the study of (Sharul Islam, Rabiul, Safa, & Sovan, 2019) assess whether there is a disparity in the performance between banks that have implemented internet banking and those that have not. An analysis will also be conducted to determine if there is a significant disparity in bank performance prior to and following the implementation of internet banking. The performance of a company was evaluated using the metrics of Return on Asset (ROA) and Return on Equity (ROE), with a specific focus on ROE. The annual reports of all 30 listed banks in Bangladesh were used to collect secondary data. The results indicated that banks that offer online banking services exhibit higher Return on Assets (ROA) and Return on Equity (ROE) compared to banks that do not provide online banking. The outcomes, meanwhile, were inconsequential. In addition, the introduction of internet banking resulted in a statistically significant decrease in both return on assets (ROA) and return on equity (ROE). The lack of widespread adoption of internet banking may be attributed to the initial investment allocated for infrastructure development. Consequently, despite the investment, the desired outcome could not be attained during the initial phases of implementing online banking.

On the contrary, the study of (Jichang, et al., 2020) examined the influence of Internet finance on commercial banks. This paper primarily investigates the theoretical mechanism by which Internet finance impacts commercial banks. Afterwards, factor analysis is used to create the Internet finance index and integrated performance index for commercial banks. The impact of Internet finance on the profitability, security, liquidity, growth, and overall business performance of commercial banks was investigated using an experimental analysis utilizing both static and dynamic panel models. The study investigated the diverse impacts of Internet finance on city commercial banks, joint-stock banks, and government-owned commercial banks. The findings demonstrated that the expansion of Internet finance had a favorable effect on the profitability, security, and growth of commercial banks, while having an adverse influence on their liquidity. Moreover, Internet finance has facilitated the enhancement of commercial banks' overall business performance.

Also, the study of (Imran, 2021) examine the relationship between the implementation of electronic banking services and the financial success of government-owned commercial banks in Bangladesh. The panel data from the sample banks was examined using the pooled ordinary least squares (OLS) estimate. The empirical data indicate that the adoption and implementation of e-banking had a substantial adverse effect on banks' profitability in the year of adoption, as seen by a decrease in return on assets,

return on equity, and net interest margin. Nevertheless, the results indicate that the implementation of e-banking had a noteworthy and favorable effect on the return on assets during the initial year.

Whereas the study of (Nguyen, Kim-Duc, & Freiburghaus, 2021) The objective was to gain a deeper comprehension of customer experience (CE) and its correlation with intermediate elements, in order to analyze the impact of digital banking (DB) on banks' financial performance (FP) before to Covid-19 and during the Vietnam Lockdown. The research findings were derived from a consumer survey conducted in Vietnam. Email surveys were conducted in the fourth quarter of 2018 and the second quarter of 2020, targeting samples of 238 and 218 customers from 20 Vietnamese commercial banks, respectively. Prior to the Covid-19 pandemic and throughout the period of lockdown, the calculation of FP relied on the banks' quarterly financial records. Prior to the Covid-19 pandemic, the combination of customer experience (CE) with database (DB) had a notable and favorable influence on financial performance (FP) by enhancing customer satisfaction. However, the two other intermediary factors, namely word-of-mouth (WoM) and trust, showed minimal or no statistical significance. Amidst the lockdown, only the Women of Movement (WoM) had a favorable influence on the financial performance (FP). The findings indicated that customer satisfaction with DB services

resulted in increased financial performance for the bank prior to the Covid-19 pandemic when clients had easy access to the bank through various communication channels. Nevertheless, within the lockdown, DB assumed the role of the main point of contact for the customer and the CE-FP link, replacing WoM.

Based on prior research, the researcher has observed that profitability and E-banking services are significant variables that have attracted the interest of numerous researchers. Moreover, there is a lack of adequate research on the factors employed. Nevertheless, it is important to acknowledge that E-banking services are a recent concept in the Arabian region. Therefore, further research is necessary to obtain sufficient results by evaluating various combinations of variables, especially considering the COVID-19 pandemic.

This study establishes a connection between two variables: the independent variable being E-banking services, and the dependent variable being profitability. Moreover, doing an analysis of the influence of COVID-19 on the correlation between electronic banking and the profitability of commercial banks in Egypt by testing the study hypothesis that developed as follows:

H_a : There is a statistically significant impact of electronic banking on ROE in the presence of Covid-19 virus as a control variable.

3. Technology Acceptance Model (TAM)

TAM stands for “Technology Acceptance Model,” a theoretical framework that describes how users adopt new technologies. Davis first proposed this model in 1989, arguing that an individual’s perception of the utility and ease of technology adoption is the most important factor in their adoption. TAM has been used in a wide range of contexts to explain user adoption of technology in industrialized and emerging economies, including Egypt. (Abdelkader & Farouk, 2016)

The widespread use of social media, increased internet penetration, and proliferation of mobile devices show how Egypt's access to technology has improved over time. However, despite this increase, the digital divide in Egypt persists as people from lower socio-economic backgrounds do not have access to technology. This may affect their willingness to adopt innovative technologies. (Khamis, 2023)

In addition, studies show that Egyptian users tend to be more cautious when it comes to adopting new technologies. This is due to cultural and social expectations that focus more on face-to-face communication than virtual interactions. This makes the use of the TAM model even more relevant in Egypt, as it is in line with the country’s tendency to adopt new technologies with caution. (Farahat, 2012)

TAM has been extensively used in several research projects in Egypt, and the model has proven to be a useful tool in

understanding user adoption of a variety of technologies, including mobile banking and e-commerce, telemedicine, etc. For example, a study by (Awad & Dessouki, 2017) focused on the factors that influence consumers' intention to adopt mobile banking in Egypt and found that perceived utility and ease of use had a significant impact on users' adoption of mobile banking.

To sum up, the TAM is a useful theoretical framework for understanding user adoption of new technologies in Egypt, especially in the context of COVID-19. TAM can be adapted to support the successful adoption of newer technologies in Egypt by understanding the factors that shape user adoption. Thus, technologies that conform to cultural and social standards and are seen as beneficial and easy to implement have a higher likelihood of success in Egypt.

4. Research Design and Methodology

4.1 Research Conceptual Framework

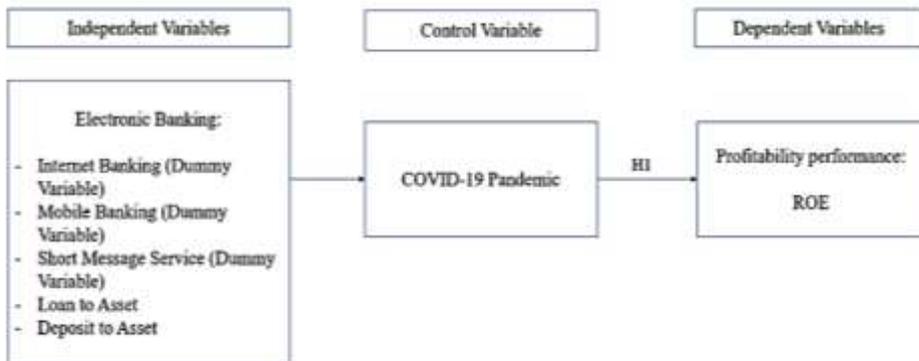


Figure 1: The relations between independent and dependent variables

Source: prepared by the researchers

4.2 Sample Size

The researcher collected annual data for 10 years from 17 commercial banks listed in **EGX90**, so the total final number of the applied study sample is 170 observations. The data were obtained using annual reports such as board of directors' reports, corporate governance reports, and financial statements that are published on companies' websites. Investing website (www.investing.com), and the Egyptian Stock Exchange website (www.egx.com.eg)

4.3. Research Model

For testing the relation between electronic banking and profitability performance of commercial banks in the presence of Covid-19 virus as a control variable, the researcher will test the following Hypothesis:

H_a : There is a statistically significant impact of electronic banking on ROE in the presence of Covid-19 virus as a control variable.

For this Hypothesis, the researcher will apply the following linear panel regression.

$$ROE = \widehat{\beta}_0 + \widehat{\beta}_1 IM_{it} + \widehat{\beta}_2 MB_{it} + \widehat{\beta}_3 SMS_{it} + \widehat{\beta}_4 LA_{it} + \widehat{\beta}_5 DA_{it} + \widehat{\beta}_6 covid - 19_{it} + \varepsilon_{it}$$

ROE: Return on equity proxy for the bank's financial performance measured by net income/total equity.

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 : Mobile banking and is calculated as a Dummy variable: 0 if there is no MB, 1 if there is MB.

β_3 : SMS and is calculated as a Dummy variable: 0 if there is no SMS, 1 if there is SMS.

β_4 : 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_5 : 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_6 : 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.

4.4 Variables Measurement

Table 1: shows the variables measurement and their abbreviation as follows:

Table (1): Variables Measurement

Variables	Abbreviation	Measurements
Independent		
Internet Banking	IB	Dummy variable: 0 if there is no IB, 1 if there is IB.
Mobile Banking	MB	Dummy variable: 0 if there is no MB, 1 if there is MB.
Short Message Service	SMS	Dummy variable: 0 if there is no SMS, 1 if there is SMS.
Loan to Asset	LA	$= \frac{\text{Total Debts}}{\text{Total Assets}}$
Deposit to Asset	DA	$= \frac{\text{Total Deposits}}{\text{Total Assets}}$
Dependent		
Return on Equity	ROE	$= \frac{\text{Net Income}}{\text{Total Equity}}$
Control		
Covid-19 Pandemic	Covid-19	Dummy variable: 0 if there is no Covid-19, 1 if there is Covid-19.

Source: prepared by the researchers

5. Empirical analysis and results discussion

5.1 Descriptive Analysis

The main study variables will be analyzed to determine measures of central tendency like mean, maximum and minimum values, and their measures of dispersion, standard deviation, and coefficient of variation for each variable.

Table (2): Variables descriptive analysis.

Variable	N	Minimum	Maximum	Mean	Standard Deviation	Coefficient of Variation
Internet Banking	170	0.00	1.00	0.84	0.37	0.44
Mobile Banking	170	0.00	1.00	0.84	0.37	0.44
Short Message Service	170	1.00	1.00	1.00	0.00	0.00
Loans to Assets	170	-0.12	0.84	0.33	0.15	0.46
Deposits to Assets	170	-0.29	1.06	0.69	0.28	0.41
Covid-19	170	0.00	1.00	0.40	0.49	1.23
Return on Equity	170	-0.18	0.75	0.19	0.12	0.60

Source: prepared by the researcher from E-views software output.

From table (2) it is concluded that:

- All study variables have 170 observations which mean that there is no missing data.
- The independent variable Internet Banking variable has a minimum value of 0.00 and maximum value of 1.00 with an arithmetic mean of 0.84, and its standard deviation is 0.37 and coefficient of variation of 44% which indicates a low level of dispersion of values around the arithmetic mean.
- The independent variable Mobile Banking variable has a minimum value of 0.00 and maximum value of 1.00 with an arithmetic mean of 0.84, and its standard deviation is 0.37 and coefficient of variation of 44% which indicates a low level of dispersion of values around the arithmetic mean.

- The independent variable Short Message Service variable has a minimum value of 0.00 and maximum value of 1.00 with an arithmetic mean of 1.00, and its standard deviation is 0.00 and coefficient of variation of 00% which indicates there is no level of dispersion of values around the arithmetic mean.
- The independent variable Loans to Assets variable has a minimum value of -0.12 and maximum value of 0.84 with an arithmetic mean of 0.33, and its standard deviation is 0.15 and coefficient of variation of 46% which indicates a low level of dispersion of values around the arithmetic mean.
- The independent variable Deposits to Assets variable has a minimum value of 0.00 and maximum value of -0.29 with an arithmetic mean of 1.06, and its standard deviation is 0.28 and coefficient of variation of 41% which indicates a low level of dispersion of values around the arithmetic mean.
- The Control variable Covid-19 variable has a minimum value of 0.00 and maximum value of 1.00 with an arithmetic mean of 0.40, and its standard deviation is 0.49 and coefficient of variation of 123% which indicates a high level of dispersion of values around the arithmetic mean.
- The Dependent variable Return on Equity variable has a minimum value of -0.18 and maximum value of 0.75 with an arithmetic mean of 0.19, and its standard deviation is 0.12 and coefficient of variation of 188% which indicates a high level of dispersion of values around the arithmetic mean.

5.2 Correlation Matrix

After applying test of normality for the main dimensions of the independent, control and the dependent variables of study and founding the study variables don't follow the normal distribution, So Spearman correlation coefficient will be the most appropriate coefficient for determining the relation strength and direction between each two variables, then the correlation coefficient is tested by a t-test which its null hypothesis states that correlation does not exist if the test *p-value* is greater than 0.05.

Table (3): Spearman correlation coefficient matrix

Dimension	IB	MB	SMS	LA	DA	Covid-19	ROE
IB	1						
P-value	-						
MB	0.998	1					
P-value	0.000	-					
SMS	0.000	0.000	1				
P-value	0.000	0.000	-				
LA	-0.031	-0.031	0.000	1			
P-value	0.687	0.687	0.000	-			
DA	-0.088	-0.088	0.000	-0.275	1		
P-value	0.254	0.254	0.000	0.000	-		
Covid-19	-0.355	-0.355	0.000	-0.079	-0.107	1	
P-value	0.000	0.000	0.000	0.309	0.166	-	
ROE	0.200	0.200	0.000	0.262	-0.072	-0.102	1
P-value	0.009	0.009	0.000	0.001	0.352	0.027	-

Source: prepared by the researcher from E-views software output.

From Matrix (3) it is concluded that:

- There is a significant, direct, and weak relation between ROE and Internet Banking of correlation coefficient value 0.200 and *P-value* 0.009.
- There is a significant, direct, and weak relation between ROE and Mobile Banking of correlation coefficient value 0.200 and *P-value* 0.009.
- There is an insignificant, direct, and weak relation between ROE and Short Message Service of correlation coefficient value 0.000 and *P-value* 0.000.
- There is a significant, direct, and weak relation between ROE and Loans to Assets of correlation coefficient value 0.262 and *P-value* 0.001.
- There is an insignificant, inverse, and weak relation between ROE and deposits to Assets of correlation coefficient value -0.072 and *P-value* 0.352.
- There is a significant, inverse, and weak relation between ROE and Covid-19 of correlation coefficient value -0.102 and *P-value* 0.07.

5.3 Testing the impact of electronic banking on ROE:

After diagnostics of the three linear panel regression models, it is concluded that the pooled panel model is the most fitted model to explain the impact of the independent variable dimensions on ROE in the presence of Covid-19 as a control variable.

Table (4): The pooled panel model of ROE for the second hypothesis.

Model	Stepwise Pooled Panel	Dependent variable		ROE	VIF Test
		Coefficient	t-ratio	p-value	
Constant	0.0713276	2.127	0.0349	Significant	
Internet Banking	0.0859290	3.505	0.0006	Significant	1.042
Loans to Assets	0.198000	3.393	0.0009	Significant	1.041
Deposits to Assets	-0.0270537	-8.625	<0.0001	Significant	1.052
Covid-19	-0.0418699	-2.282	0.0238	Significant	1.060
Adjusted R-squared			21.8746%		
F-test	6.693065		p-value	0.000051	
Overall test of Heteroscedasticity	2.91275		p-value	0.0591434	
Ramsey RESET overall Test	7.4515		p-value	0.0557365	
Chi-square test of Normality	7.2496		p-value	0.2101006	

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

From table (4) it is concluded that:

- The overall pooled panel model is significant as the overall F-test for significance has a value of 6.693065 and *P-value* 0.000051 which is less than 0.05, with adjusted R-squared value of 21.8746% which means that (internet banking, loans to assets, deposits to assets, and Covid-19) explain the change in the ROE by 21.8746%.
- (Internet banking and loans to assets) have a direct and insignificant impact on ROE.

- (Deposits to assets and Covid-19) have an inverse and insignificant impact on ROE.
- Mobile banking has a high level of collinearity with internet banking, so that the stepwise linear panel regression dropped it from the model.
- Short Message Service has zero level of variability, so that the stepwise linear panel regression dropped it from the model.
- The above table shows that the chi-squared test has a *p-value* greater than 0.05 which means accepting the alternative hypothesis which means that the study model does not suffer from the problem of random error instability.
- The above table shows that *P-value* for the F test is greater than 0.05, which means that the study model does not contain any inappropriate variables included in the model.
- From the previous table it is concluded that there is no variable that suffers from multi-collinearity as the VIF values do not exceed 10.
- From the previous table shows that the chi-square test of normality its *p-value* is greater than 0.05 which means that residuals are normally distributed.
- The overall equation for forecasting the ROE is:

$$\widehat{ROE} = 0.0713276 + 0.0859290 IM_{it} + 0.198000 LA_{it} - 0.0270537 DA_{it} - 0.04$$

5.4 The conclusion of the Hypothesis:

It is found that the independent variable electronic banking has a significant impact on the dependent variable (ROE), so the researcher will accept the hypothesis by which there is a significant impact of electronic banking on Return on Equity in the presence of control variable in the presence of Covid-19 as a control variable.

6. Conclusion

The rapid expansion of communication and network technologies has led to the development of mobile banking (M-Banking) in Egypt, allowing for flexible online browsing from any location. The country's rapidly developing IT and telecommunications networks present an excellent opportunity for retail banking operations growth. The COVID-19 pandemic has further impacted the banking and finance industry, with many banks closing branches to provide efficient and remote banking services. However, Egyptian culture plays a role in the adoption of internet banking, with most clients preferring paper processes over e-services. This paper aims to investigate the impact of the pandemic on the relationship between electronic banking and the profitability of commercial banks in the Egyptian banking sector listed in EGX 90. The study explores the relationship between profitability and E-banking services in the Arabian region, highlighting the need for further research. It establishes a connection between E-banking services and profitability and analyzes the impact of COVID-19 on the

correlation between electronic banking and profitability in commercial banks in Egypt.

This paper examines the factors that affect the Banks' profitability performance, so the dependent variable is ROE, and the independent variables are Internet Banking (IB) (Dummy), Mobile Banking (MB) (Dummy), Short Message Service (SMS) (Dummy), Loan to Asset (LA), and Deposit to Asset (DA) in the presence of the control Variable which is Covid-19 pandemic.

The Technology Acceptance Model (TAM) is a theoretical framework that explains user adoption of new technologies. It was first proposed in 1989 and has been used in various contexts, including Egypt. Despite improved access to technology, the digital divide persists, especially among lower socio-economic groups. Egyptian users are more cautious about adopting new technologies due to cultural and social expectations. TAM has been used in Egypt's research projects, revealing that perceived utility and ease of use significantly impact users' adoption of technologies like mobile banking. TAM can be adapted to support successful adoption in Egypt, as technologies that conform to cultural and social standards are more likely to succeed.

The study analyzes the central tendency of Internet Banking, Mobile Banking, Short Message Service, Loans to Assets, Deposits to Assets, Covid-19, and Return on Equity. With 170 observations, the variables show low dispersion, with a mean of 0.84 and a standard deviation of 0.37. Mobile Banking has a mean of 0.84 and a standard deviation of 0.37. Short Message Service has a mean of 1.00 and a standard deviation of 0.00. Loans to Assets has a mean of 0.33 and a standard deviation of 46%. Deposits to Assets has a mean of 1.06 and a standard deviation of 41%. The Control variable Covid-19 has a mean of 0.40 and a standard deviation of 123%.

The study uses Spearman correlation coefficient to determine the strength and direction of relationships between independent, control, and dependent variables. The results show a significant, direct, and weak relationship between ROE and Internet Banking, Mobile Banking, Short Message Service, Loans to Assets, Deposits to Assets, and Covid-19. However, there are no significant, inverse, or weak relationships between ROE and other variables.

The pooled panel model is the most fitting to explain the impact of independent variable dimensions on ROE in the presence of Covid-19 as a control variable. The model is significant, with an adjusted R-squared value of 21.8746%. Internet banking, loans to assets, deposits to assets, and Covid-19 explain the change in ROE by 21.8746%. Mobile banking has a high level of collinearity with internet banking, so it was dropped

from the model. The chi-squared test has a p-value greater than 0.05, which means that residuals are normally distributed.

The Result of this paper is consistent with the results of the selected sample ((Elkmash, 2022); (Josiah Aduda, 2012); (Jichang, et al., 2020)) studies as the agreed that the results show a significant, direct, and positive relationship between bank profitability and E-banking. Whereas the result of (Sharul Islam, Rabiul, Safa, & Sovan, 2019); (Imran, 2021)) studies shows that there is significant, and negative relationship between bank profitability and E-banking. While the result of (Jordan, 2011); (Meihami, Varmaghani, & Meihami, 2013); (Badrawy, Aziz, & Fady, 2012); (Ibekwe, 2018)) studies shows that there is no significant relationship between bank profitability and E-banking.

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