

## **The Effect Of E-Banking On Bank's Profitability In Egypt**

تأثير الخدمات المصرفية الإلكترونية على ربحية البنوك في مصر

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### **Abstract:**

This study investigates the impact of electronic banking (e-banking) on bank profitability in Egypt, with a focus on the interplay between e-banking adoption and the economic disruptions caused by the COVID-19 pandemic. Utilizing panel data regression analysis, the research analyzes historical financial data from 16 Egyptian banks—encompassing both state-owned and private institutions—over a seven-year period (2017–2023). Financial metrics were sourced from annual reports to assess the relationship between e-banking dimensions (e.g., internet banking) and profitability indicators, while accounting for

control variables such as bank size and capital adequacy. Findings reveal that internet banking significantly enhances profitability, underscoring its role as a driver of financial performance. However, the pandemic introduced nuanced challenges: although e-banking sustained profitability growth during COVID-19, broader economic disruptions partially offset these gains. Additionally, bank-specific factors like size and capital adequacy were found to critically shape profitability outcomes. The study contributes to understanding how digital transformation and external shocks interact in emerging markets, offering insights for policymakers and financial institutions navigating technological adoption amid crises.

**Keywords:** E-Banking, Profitability, ROE, ROA, Covid-19, bank size, capital adequacy, Banks Egypt, Financial Performance.

### الملخص:

يهدف هذا البحث إلى تحديد تأثير الخدمات المصرفية الإلكترونية على ربحية البنوك في مصر. تدرس الدراسة عينة من ١٦ بنكاً عاملاً في مصر، بإطار زمني مدته سبع سنوات تمتد من ٢٠١٧ إلى ٢٠٢٣. تم استخلاص المعلومات المالية التاريخية من التقارير السنوية لـ ١٦ مؤسسة مصرفية مصرية. تشمل العينة بنوكاً مملوكة للدولة وبنوكاً خاصة. استخدمت الدراسة منهجية البيانات Panel. توضح النتائج تأثير المتغير المستقل، أبعاد الخدمات المصرفية الإلكترونية، على ربحية البنوك، بالإضافة إلى تأثير التفاعل بين كوفيد-١٩ والخدمات المصرفية الإلكترونية على ربحية البنوك في مصر. أشارت النتائج إلى أن الخدمات المصرفية عبر الإنترنت لها تأثير إيجابي كبير على ربحية البنوك. ومع ذلك، فإن تأثيرات التفاعل بين كوفيد-١٩ أدخلت تعقيدات. ففي حين أن الخدمات المصرفية الإلكترونية تعزز

الربحية بشكل عام، فإن الاضطرابات الاقتصادية الناجمة عن الجائحة أثرت سلباً على هذه الفوائد. تسلط الدراسة الضوء على أن المتغيرات الرقابية مثل حجم البنك وكفاية رأس المال تؤثر بشكل أكبر على نتائج الربحية.

**الكلمات المفتاحية:** الخدمات المصرفية الإلكترونية، الربحية، العائد على حقوق الملكية (ROE)، العائد على الأصول (ROA)، كوفيد-١٩، مصر، حجم البنك، كفاية رأس المال، البنوك، الأداء المالي.

## 1. Introduction

### 1.1. Introduction

The advancements in banking technology have not changed what banks do, but rather how those services are accessed (Khan, 2021). E-banking is a method of banking that allows customers to access and manage their banking information or financial transactions through using the internet without going physically to the banks, as well as providing them with a wide range of banking services at any time, and anywhere. ATM services, mobile banking, and Internet Banking are all examples of E-banking technology. In the modern era of web-based technologies, banks are facing brutal competition, as banks realized that E-Banking is a game changer in which they would be able to deliver all bank services cost-effectively while offering their clients 24/7 access to reliable and efficient banking services (Abdou, 2023).

### 1.2. Statement of the Problem

The banking sector in Egypt has undergone several transformations and adopted new practices and technologies to

cope with global trends (Abdou, 2023). Despite the huge advancements in technology and the introduction of E-Banking services in Egypt, the effectiveness of E-banking in improving operational efficiency and financial performance remains questionable. This is due to the lack of literature that has examined the impact of E-banking on banks' profitability in Egypt from a quantitative perspective. Despite the current literature discussing the impact of E-banking and banks' profitability in several countries in Africa, little to no literature has been conducted focusing on Egypt and the impact of COVID-19 as an interaction variable.

### **1.3. Research aims and objectives:**

This paper aims to quantitatively measure the impact of E-Banking implementation on banks' profitability in Egypt, especially when considering COVID-19 as an interaction value with E-Banking. Further, it will help provide insight into how digital Banking can transform the Egyptian financial sector, as it sheds light on the advantages and disadvantages of E-Banking.

The paper's main objectives are:

O1: To quantitatively assess the impact of E-Banking on the bank's profitability in Egypt.

O2: To analyze the effect of COVID-19 interaction with E-Banking on the bank's profitability in Egypt.

### **1.4. Research Questions:**

Q1: How does E-Banking's implementation influence the profitability of banks in Egypt?

Q2: In what ways does COVID-19 interaction with E-Banking affect the bank's profitability in Egypt?

## **2. Literature Review and Hypothesis Development**

### **2.1. Literature Review**

Jimoh (2019) examined the effect of electronic banking on the profitability of deposit money banks in Nigeria. The study aimed to provide insights into how these technological advancements could enhance banking operations and ultimately improve financial performance. Specifically, the research sought to assess the impact of various electronic banking channels, including Automated Teller Machines (ATMs), Point of Sale (POS) systems, internet banking, and mobile banking, on the profitability of these banks. To achieve this aim, the study employed a quantitative research methodology, utilizing secondary data collected from the annual reports of deposit money banks in Nigeria for the period from 2006 to 2015. The analysis was conducted using Ordinary Least Squares (OLS) regression to test the relationships between the independent variables (electronic banking channels) and the dependent variable (profitability). The study formulated several hypotheses to evaluate the significance of each electronic banking channel on bank profitability, allowing for a comprehensive

understanding of the dynamics at play. The results of the study indicated that while Internet banking did not have a statistically significant effect on the profitability of deposit money banks in Nigeria, other electronic banking channels such as ATMs and POS systems showed a positive and significant influence. Specifically, the regression analysis revealed that ATMs and POS systems contributed positively to the banks' profitability, leading to the acceptance of the alternate hypotheses for these channels. However, the study failed to reject the null hypothesis for Internet banking, concluding that it does not significantly impact profitability. Overall, the findings highlighted the importance of certain electronic banking channels in enhancing the financial performance of deposit money banks in Nigeria.

Another study by Le and Ngo (2020) investigated the role of information technology delivery channels such as bank cards, ATM, and POS terminals regarding bank performance across 23 countries from 2002 to 2016. The study analyzed its data using the system Generalized Method of Moments (GMM) adopted by the researchers to estimate results revealed that the number of bank cards, number of ATM stations, and POS terminals had a positive and significant influence over the level of bank profitability.

Aduaka and Awolusi (2020) aimed to investigate how various E-banking services, such as ATMs, POS, Internet banking, and Mobile banking, contribute to the bank's net interest margin and overall financial performance. Multiple regression analysis was

used to assess the relationship between the dependent variable and independent variables. Data was collected through a combination of self-administered questionnaires distributed to staff and customers of Access Bank, as well as secondary data from the bank's audited annual reports. A total of 150 questionnaires were distributed, with a response rate of 91.3%. The study incorporated inferential statistics to test the hypotheses and analyze the data collected over the period from 2010 to 2017. The results indicated a significant positive relationship between electronic banking and the profitability of Access Bank. It was found that electronic banking channels contributed to a notable increase in the bank's net interest margin, with card products and ATMs generating the most revenue. The study concluded that while electronic banking had a substantial impact on profitability, only 25% of the profit was derived from these services, suggesting the need for further development of other E-banking channels.

Hossain (2021) explored the impact of electronic E-banking adoption on the financial performance of state-owned commercial banks in Bangladesh. By examining the financial performance of these banks over a period from 2009 to 2018, the study provided insights that can support policymakers and bank management regarding the adoption and implementation of e-banking systems. Panel data was collected from four state-owned commercial banks that adopted e-banking during the specified period. A pooled Ordinary Least Squares (OLS) technique was

used to analyze the balanced panel data, measuring bank performance through three key proxies: Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM). Additionally, the study incorporated various control variables, such as bank-specific financial metrics and macroeconomic factors, to ensure a comprehensive analysis of the relationship between e-banking adoption and financial performance. The results indicated that e-banking has a significant impact on the financial performance of state-owned commercial banks in Bangladesh. The findings revealed a strong negative association between e-banking adoption and bank performance in the initial years following adoption. However, the long-term benefits of e-banking may lead to improved financial performance over time.

Another Study by Pasha & Elbages (2022) intended to examine that the increased Internet banking usage can lead to significant cost savings for banks through economies of scale by reducing operational costs, while also offering customers high levels of convenience. Numerous studies have investigated the impact of electronic banking on bank profitability, particularly in developed economies. Research across Europe revealed that while advanced Internet banking can ultimately decrease costs for banks, the initial impact on profitability may be negative. Studies showed that the significant positive impact of Internet banking on bank profitability often becomes evident after a period of implementation, despite the gradual reduction in overhead expenses associated with transactional



Internet banking. This paper examined the conflicting findings regarding the impact of Internet banking on bank profitability in developing markets which may be attributed to the methodologies employed in previous studies. These studies often failed to differentiate between the adoption of basic and transactional Internet banking services. In Egypt, internet banking was introduced relatively recently, around 2014. This limited timeframe has prevented Egyptian banks from implementing advanced Internet banking features simultaneously, as seen in developed countries. Consequently, basic Internet banking services are more prevalent in Egypt compared to advanced transactional e-banking systems; therefore, consequently, the impact of e-banking complexity, particularly the difference between basic and Advanced services, should be considered when assessing the influence of Internet banking on bank profitability in developing markets, such as Egypt.

To achieve this, the researchers employed a quantitative approach to collect data from 20 commercial banks operating in Egypt. The period of the study spans from 2009 to 2018. The 10-year sample period is chosen to consider the bank's performance before and after implementing Internet banking. The findings of the study demonstrated that advanced transactional E-banking significantly enhances bank profitability in Egypt after three or more years of implementation. In contrast, basic E-banking services showed no significant impact on profitability, regardless of the duration of implementation. The findings demonstrated the

crucial need to distinguish between basic and advanced E-banking when analyzing the impact of Internet banking on bank profitability in developing markets like Egypt, where advanced E-banking is not widely adopted.

A study examined by Hassan & Moharam (2023) seeks to examine how the COVID-19 pandemic has influenced the connection between the adoption of electronic banking services and the financial performance of commercial banks In Egypt listed on the EGX 90. The study emphasized the rapid advancements in communication and network technologies that have facilitated the development of mobile banking in Egypt, enabling convenient online banking access from any location. This emergence was increased by the Covid-19 pandemic, which accelerated the shift within the banking and finance industry resulting in many banks closing branches to prioritize efficient and remote banking services; However, the cultural factors in Egypt significantly influenced the adoption of Internet banking, as many people still prefer traditional paper-based transactions to digital services. Later, a study shows that public banks often prioritize funding public initiatives, promoting financial accessibility, and fostering economic growth. However, these socially driven commitments may affect their profitability, potentially necessitating adjustments in risk management strategies, investment methodologies, and operational focus.

The study highlights how such ethical mandates could reshape financial decision-making within these institutions, Abdou and Alarabi (2024).

The study used a panel linear regression analysis to examine the research hypotheses, collecting annual data for 10 years, from 2013 to 2022, from 17 commercial banks listed on the Egyptian Exchange (EGX 90). The results of the study indicated a direct significant but weak relationship between Internet Banking, Mobile Banking, short Message service, Loans to Assets, Deposits to Assets, and ROE and COVID-19. However, no significant, negative, or weak relationships were observed between ROE and any other variables.

## **2.2. Research Hypothesis**

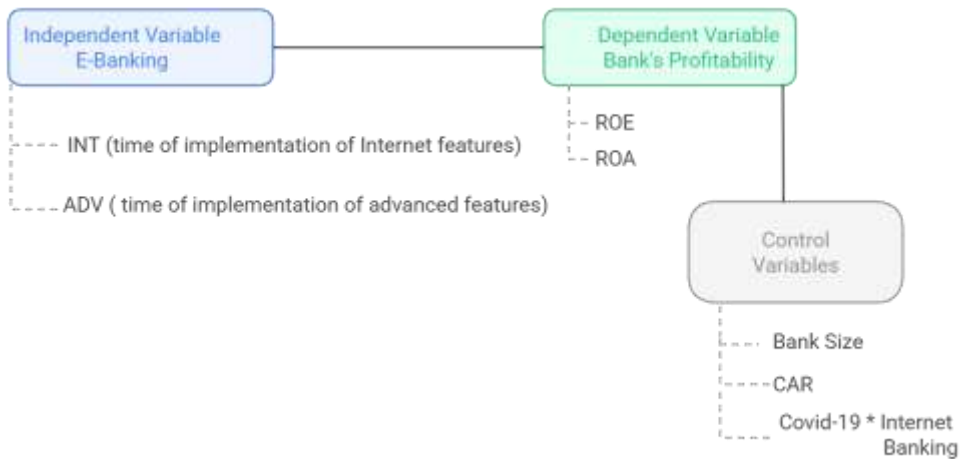
H1: There is a significant impact between E-banking and Banks' Profitability in Egypt.

H2: There is a significant impact between E-Banking and banks' Profitability in Egypt when considering the Covid 19 as an interaction variable.

### 3. Research Design and Methodology

#### 3.1. Research Conceptual Framework

**Figure 1: The relations between independent and dependent variables**



#### 3.2. Sample and population

The population of the study comprises the 37 banks operating in Egypt. The study examines a sample of 16 banks operating in Egypt, with a time frame of seven years of spamming from 2017–2023. Historical financial information was extracted from the annual reports of 16 Egyptian banking institutions. The sample encompasses both state-owned and private banks.

#### 3.3. Research Model

To test the research hypotheses:

H1: There is a significant impact between E-banking and Banks' Profitability in Egypt.

H2: There is a significant impact between E-Banking and banks' Profitability in Egypt when considering the Covid 19 as an interaction variable.

The researcher identifies the following empirical models:

$$ROA_{it} = \beta_0 + \beta_1 Internet\ Banking_{it} + \beta_2 CAR_{it} + \beta_3 Bank\ Size_{it} + \beta_4 Covid19_{it} * Internet\ Banking_{it} + \varepsilon_{it} \quad (1)$$

$$ROE_{it} = \beta_0 + \beta_1 Internet\ Banking_{it} + \beta_2 CAR_{it} + \beta_3 Bank\ Size_{it} + \beta_4 Covid19_{it} * Internet\ Banking_{it} + \varepsilon_{it} \quad (2)$$

### 3.4 Variables Measurement

Table 1: shows the variable's measurement and their abbreviation as follows:

**Table (1): Variables Measurement**

Variables	Abbreviation	Measurements
<b>Independent (E-Banking)</b>		
Internet	IN	Dummy variable, assigned 1 bank applying basic internet banking features and 0 otherwise.
Int	INT	Dummy variable. Variables are assigned depending on the time of implementation of internet features.
Adv	ADV	Dummy variable. Variables are assigned depending on the time of implementation of advanced features.
<b>Dependent (Bank's profitability)</b>		
Return on Assets	ROA	$\frac{\text{Net income}}{\text{Total assets}}$

Return on Equity	ROE	$\frac{\text{Net income}}{\text{Total equity}}$
<b>Control variables</b>		
Covid-19 Pandemic	Covid-19	Dummy variable: 0 if there is no Covid-19, 1 if there is Covid-19.
Capital Adequacy ratio	CAR	$\frac{\text{Tier 1 capital} + \text{Tier 2 capital}}{\text{Risk} - \text{weighted Assets}}$
Bank Size	BS	Log of total asset

#### 4. Empirical analysis and results discussion

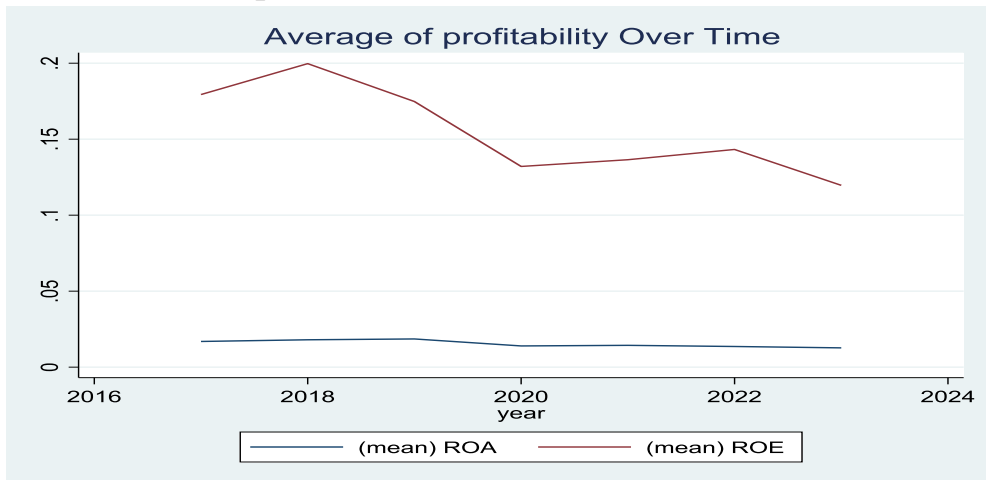
##### Descriptive Statistics

**Table (2): Descriptive measures for each of the variables in the study**

Variable	Obs	Mean	Std. dev.	Min	Max
ROA	112	0.0154524	0.010008	0.001237	0.054207
ROE	112	0.1550511	0.0924114	-0.02543	0.4048033
Internet banking	112	0.9905866	0.572667	0	1.4132
Bank size	112	9.493252	1.361237	7.601597	11.68787
CAR	112	0.1810132	0.041075	0.084333	0.3107

The average ROA was 1.5% in the sample from the year 2017 to 2023. There is a high variation ranging from 0.1% to 5.4%. The highest ROA was recorded for HSBC Bank. Therefore, the sample is approximately representative of the whole population in Egypt since the sample statistic is close to the average of the banking industry in Egypt. Observing the

ROE, the average in the sample was 15.5%. As for the ROA, there was a high variation in the ROE between the banks. It is evidenced by ranging from -2.5% to 40.48%. Observing the independent variables in the model, the independent variable formed after the exploratory factor analysis is Internet banking. It ranged as a value from zero to 1.4132. The average of the sample was 0.9905. It showed most of the sample had applied Internet banking features. Therefore, these recent years from 2017 till 2023 had witnessed high usage of internet banking. The average bank size was 9.49 with low variation. This shows there was homogeneity between the banks. This coincides with CAR with an average of 0.18 and also low variation. This shows again that banks in the sample had low variation between them.



**Figure (2): Line chart for the average of each profitability along the years**

The ROA witnessed an increasing trend from the year 2017 to 2019 from an average of 1.69% to 1.86%. This was followed by a sharp decline in 2020 due to the Covid-19 pandemic. As 2020 approached, the average of the ROA became 1.3%. The decline continued fiercely afterwards till it reached 1.27% in 2023. The ROE on the other hand had an alternating pattern. While it increased during the years 2017 and 2018 till it reached an average of 19.97%, it was followed by a decline in 2019 and 2020. In the year 2020, the ROE had an average in the banking sector of 13.2%. In the years 2021 and year 2022, ROE flourished such that the average of the year 2022 was 14.32%. However, this was followed by a decline again in 2023 of 11.96%, see Figure 2.

### Multicollinearity test

**Table (3): Multicollinearity test for the variables**

Variable	VIF	1/VIF
CAR	1.14	0.876163
Internet Banking	1.08	0.927038
Bank size	1.06	0.943078
Mean	1.09	

All the VIF values are well below the threshold of 3.3, indicating that there is no significant multicollinearity among the variables in this study (Daoud, 2017). The VIF values suggest that multicollinearity is not a concern for the variables in this study. The results are consistent with the Pearson correlation coefficient measure.



## Stationarity test

**Table (4): Stationarity test for variables in the phenomenon**

Variables	Test statistic	P-value
ROA	-5.0775	0.0000
GPM	-15.3005	0.0000
OPM	-5.955	0.0000
Internet Banking	-15.409	0.0000
Bank size	-3.3195	0.0005
Capital adequacy Ratio	-7.3173	0.0000

All the variables are found to be stationary as the p-value is less than 0.01. Therefore, at a 99% confidence level, the variables are stationary without taking lags.

## Heterogeneity Test

Regarding homogeneity, it was violated when the Modified Wald test for group-wise heteroscedasticity was tested where the null hypothesis was as follows (Stock & Watson, 2008)

$$H_0: \sigma_i^2 = \sigma^2 \text{ for all } i$$

Thus, when the p-value was found less than 0.01 for all the models, another model needed to be employed. Thus, the more generalized version which is the generalized least square model was chosen. As there will be heteroscedasticity within the panels, the feasible generalized least square model is deemed the most appropriate model. It deals with heteroscedasticity by estimating the Error Variance using the residuals from the OLS model to estimate the variance of the error terms. Then, it creates the

weighting matrix to adjust for the heteroscedasticity by giving different weights to different observations. Then finally, the weighting matrix is used to transform the original model and re-estimate the parameters (Garba et al., 2015).

### Model Building

To build the model, first, the random and fixed effect models were employed, where the Hausman test was lower than 0.1, thus, at a 90% confidence level the fixed effect model was deemed appropriate. Heteroscedasticity proved to be an issue when the Wooldridge test showed to be significant at a 99% confidence level. Therefore, feasible generalized least square models were employed.

**Table (5): Feasible Generalized Least Square Model of ROA in the study accounting for the COVID-19 interaction with Internet banking**

ROA	Coefficient	Std.	z	P>z	[95% conf. interval]	
Internet banking	0.004216	0.001764	2.39	0.017	0.000758	0.007674
Bank size	0.000999	0.000412	2.42	0.015	0.000191	0.001807
CAR	-0.00655	0.016398	-0.4	0.689	-0.03869	0.025586
Covid * internet banking	-0.00378	0.001405	-2.69	0.007	-0.00653	-0.00103
_cons	0.004615	0.004108	1.12	0.261	-0.00344	0.012666
Estimated covariances		16	Number of obs		112	
Estimated autocorrelation		0	Number of groups		16	
Estimated coefficients		5	Time periods		7	
Wald chi2(4)		14.29	Prob > chi2		0.0064	

The FGLS model was believed to be significant at a 99% confidence level. This is due to the Wald chi-square test statistic being 14.29 and having a p-value less than 0.01. The model examines the effects of Internet banking, the interaction between COVID-19 and profitability, bank size, and CAR on ROA. The results indicate that Internet banking has a positive significant effect on ROA at a 95% confidence level. As the Internet banking features offered by banks increased by 1 unit, the ROA increased by a value ranging from 0.076% and 0.767% at a 95% confidence level. This suggests that the increased adoption of Internet banking is associated with higher ROA, implying that as Internet banking expands, banks tend to become more profitable. Thus, the hypothesis is accepted.

The bank size had a positive significant impact on ROA. However, the CAR had no significant impact on the ROA at 0.1 level of significance. Observing the new interaction term, it is noticeable that it has a negative significant impact on ROA. This result will be interpreted by understanding the term. As COVID-19 occurred, the effect of Internet banking on profitability decreased. Specifically, for each unit increase in Internet banking features, the positive impact on ROA is reduced by 0.00378 during the covid-19 pandemic period, compared to the period before the pandemic. Although there is a direct positive impact of Internet banking on profitability, the profitability still will face

reductions due to the economic imbalance associated with the pandemic. Thus, the first and second hypotheses are accepted. To ensure the validity and robustness of the results, the model was conducted on other measures of profitability. The robustness of the model as mentioned would improve the credibility of the results. It will also ensure the reproducibility of the previous results by other scholars (Diakonikolas et al., 2021).

**Table (6): Feasible Generalized Least Square Model of ROE in the study accounting for the COVID-19 interaction with Internet banking**

ROE	Coefficient	Std.	Z	P>z	[95% conf. interval]	
Internet banking	0.043781	0.021482	2.04	0.042	0.001677	0.085886
Bank size	0.016372	0.00496	3.3	0.001	0.006651	0.026094
CAR	-0.54541	0.201506	-2.71	0.007	-0.94036	-0.15047
Covid * internet banking	-0.04663	0.017842	-2.61	0.009	-0.0816	-0.01166
_cons	0.098595	0.040077	2.46	0.014	0.020046	0.177144
Estimated covariances		16	Number of obs		112	
Estimated autocorrelation		0	Number of groups		16	
Estimated coefficients		5	Time periods		7	
Wald chi2(4)		20.25	Prob > chi2		0.0004	

The FGLS model was believed to be significant at a 99% confidence level. This is due to the Wald chi-square test statistic being 20.25 and having a p-value less than 0.01. The model examines the effects of Internet banking, the interaction between COVID-19 and profitability, bank size, and CAR on ROE. The results were consistent with the results obtained from the ROA

model. They indicate that Internet banking has a positive significant effect on ROE at a 95% confidence level. As the Internet banking features offered by banks increased by 1 unit, the ROE increased by a value ranging from 0.16% and 8.58% at a 95% confidence level.

This suggests that increased adoption of Internet banking is associated with higher ROE, implying that as Internet banking expands, banks tend to become more profitable. The bank size had a positive significant impact on ROE. Unlike the ROA, the CAR had a negative significant impact on the ROE at a 0.01 level of significance. Observing the new interaction term, it is noticeable that as the ROA model, it has a negative significant impact on ROE. As COVID-19 occurred, the effect of Internet banking on profitability decreased. Specifically, for each unit increase in Internet banking features, the positive impact on ROE is reduced by 0.04 during the covid-19 pandemic period, compared to the period before the pandemic.

## **5. Conclusion and Limitation**

### **5.1 Conclusion**

Conducting the panel data analysis, the results of the study showed that E-Banking has a positive significant impact on the bank's profitability in Egypt. This was proved through the significant positive of the ROA and ROE. However, the Interaction between COVID-19 and Internet banking showed a negative impact on bank's profitability in Egypt. The test results

support H1: There is a significant impact between E-banking and Bank's Profitability in Egypt and support H2: There is a significant impact between E-Banking and Bank's Profitability in Egypt when considering the Covid 19 as an interaction variable.

## 5.2 Limitation

This study acknowledges several limitations. The relatively small sample size of 16 operating banks within the Egyptian banking industry. The sample size was dictated by data availability and is further constrained by the nature of developing markets, where the number of banks operating, particularly those offering Internet banking, is typically smaller compared to developed economies. The study was also based on seven years, and this may limit the generalizability of the findings. A longer duration of the study would have given a more comprehensive understanding of the research problem. Furthermore, identifying a suitable model to effectively measure the impact of E-Banking on bank profitability proved challenging, requiring extensive research. Finally, the limited availability of existing research specific to the Egyptian context was an additional constraint.

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