

The Effect of Financial Inclusion On Banking Performance

Extracted from a PHD Thesis titled:

**The relationship between Financial Inclusion, Investment
diversification and Banking Performance: A Proposed Model
(An Applied Study on the Egyptian Banking Sector)**

إعداد

الباحث/ معاذ صفوت محمد صديق
Prof.moaaz.elshahid@gmail.com

إشراف

الأستاذ الدكتور / أبو بكر فؤى مصطفى
أستاذ ورئيس قسم إدارة الأعمال بالكلية
وعميد كلية السياسة والاقتصاد السابق

الأستاذ الدكتور / أحمد موسى الخواص
أستاذ إدارة الأعمال بالكلية
ووكيل الكلية لشؤون التعليم والطلاب سابقاً

٢٠٢٢-٥١٤٤٣م

Abstract

The main objective of this research is to investigate the effect of financial inclusion on banking financial performance. The researcher used the deductive and quantitative method to present the conceptual framework for financial inclusion and Egyptian banking performance. The researcher used Two-stage least-squares regression to analyze data collected the annual reports of the Egyptian Central bank related to the banking sector. The population for this study comprised of the 38 banks in Egypt. Secondary data was obtained from the reports published by the Central Bank of Egypt (CBE) which aggregates the financial soundness indicators of the Egyptian banking sector in the period from 2011 till December 2020. The results of the study showed that there is a significant positive effect of the financial inclusion indicators in terms of number of Branches, Number of Debit Cards, Number of Credit Cards, Number of ATMS, and Banking Density, on the dependent variable of the Profitability construct, at a significant level less than (0.05), but we have also a significant negative effect of the financial inclusion indicators in terms of Number of Debit Cards, Number of Credit Cards, Number of ATMS, and Number of Points of Sale on the dependent variable of the Liquidity construct, at a significant level less than (0.05). This validates partially the research hypothesis; There is a significant effect of the financial inclusion on banking performance in terms of the Profitability and Liquidity Indicators.

Key words: Financial inclusion, Banking Financial performance, Egyptian Banking Sector

ملخص البحث

الهدف الرئيسي من هذا البحث هو دراسة تأثير الشمول المالي على الأداء المالي المصرفي. استخدم الباحث المنهج الكمي والاستنباطي لعرض الإطار المفاهيمي للشمول المالي والأداء المصرفي المصري. استخدم الباحث انحدار المربعات الصغرى على مرحلتين لتحليل البيانات المجمعة للتقارير السنوية للبنك المركزي المصري المتعلقة بالقطاع المصرفي. يتألف مجتمع هذه الدراسة من ٣٨ بنكاً في مصر. تم الحصول على البيانات الثانوية من التقارير الصادرة عن البنك المركزي المصري والتي جمعت مؤشرات السلامة المالية للقطاع المصرفي المصري في الفترة من ٢٠١١ حتى ديسمبر ٢٠٢٠. أظهرت نتائج الدراسة أن هناك تأثيراً إيجابياً معنوياً لمؤشرات

الشمول المالي من حيث عدد الفروع، وعدد بطاقات الخصم، وعدد بطاقات الائتمان، وعدد أجهزة الصراف الآلي، والكثافة المصرفية، على المتغير التابع الربحية، عند مستوى معنوية أقل من (٠.٠٥)، ولكن لدينا أيضًا تأثير سلبي كبير لمؤشرات الشمول المالي من حيث عدد بطاقات الخصم، وعدد بطاقات الائتمان، وعدد أجهزة الصراف الآلي، وعدد نقاط البيع على المتغير التابع السيولة عند مستوى معنوية أقل من (٠.٠٥). وهذا يتحقق فرضية البحث جزئيًا؛ وبالتالي توصلت الدراسة الى أن هناك تأثير كبير للشمول المالي على الأداء المصرفي من حيث مؤشرات الربحية والسيولة.

الكلمات المفتاحية: الشمول المالي، الأداء المالي المصرفي، القطاع المصرفي المصري

1.1. Research introduction

The health of the financial system has important role in the country as its failure can disrupt economic development of the country (Das, Ghosh, 2007, P.28). The strength of the banking industry is an important prerequisite to ensure the stability and growth of economy (Halling, Hayden, 2006, p.48). Consequently, the assessment of banks' financial condition is a fundamental goal for regulators (Halling, Hayden, 2006, p.48). Banks represent a vital link in the transmission of government's economic policies particularly monetary policy to the rest of the economy (Musau et al., 2018, P.203). Bank lending is very crucial for it makes possible the financing of agricultural, industrial, and commercial businesses of the country (Uwuigbe et al., 2015, P.27). Moreover, Banks play a vital role in promoting emerging economies like Egypt. Well-functioning banks promote economic growth, while poorly functioning commercial banks are a barrier to economic progress and aggravate poverty (Joseph et al., 2012, P.468).

Financial inclusion is one of the most important concepts that recently attracted the attention of international organizations and central banks in general. Egypt has succeeded in significantly expanding the reach of financial services during the last years. Financial inclusion is the increasing access to formal financial services including having bank accounts, using credit and savings facilitated through the banks

(Musau et al., 2018, P.203). Musau et al., (2018) stated that over the years financial inclusion has grown beyond physical branch as ICT is revolutionizing the access and use of bank services globally. The Central Bank of Egypt (CBE) participated in several regional and global initiatives to improve financial inclusion in Egypt. In July 2017, Egypt was chosen, along with China and Mexico, as a model country in a new Financial Inclusion Global Initiative launched by the World Bank Group. There are several factors that have contributed to this greater level of inclusion: first, Expanding reach of the major types of financial providers. Second, the identification of financial inclusion as a national priority in Vision 2030 and three is the accessibility brought about by financial innovations. According to the World Bank, Egypt has the potential to bring a large number of people into the formal financial sector (more than 44 million adults).

Therefore, the current study will contribute to the financial inclusion literature, through open a new field of research regarding cover a new novel of the financial inclusion. Further, this study presents global evidence about the relationship between financial inclusion, Investment diversification and the bank's performance. Also, the study linked the financial inclusion as the vital key to development and poverty alleviation with the bank's activities. Therefore, policymakers can develop the national agenda in cooperation with banks managers to enhance financial inclusion in line with bank's target.

1.2. Research problem

Banks are dominant financial institutions and any changes in performance and structure have far-reaching impacts on the economy (Mwangi, 2012, P.9). Schumpeter (1911) posted those banks enable an economy to grow by providing efficient markets for funds. Goldsmith (1969), Mckinnon, (1973), Levin and Zervos (1996) emphasized the positive role of financial systems in economic growth as cited by Musau et al., (2018).

Based on literature, Financial Inclusion is characterized by entry of new, inexperienced, and numerous customers into the formal financial sector including Commercial Banks. This creates a challenge in the

debt market because lenders have difficulties in determining whether the customer is a good risk, and this threatens financial performance and hence stability. Therefore, it becomes difficult for banks to establish whether financial inclusion is a low-risk good investment or otherwise.

Most of the early studies (Shihadeh al., 2018; Oranga and Ondabu, 2018; Mokaya and Omagwa, 2018; Al-Adwey, 2019; Almaleeh, 2020) established that increased financial inclusion improves asset quality of the banking sector. However, other studies have revealed potential threats caused by financial inclusion. Studies that have been conducted by (Gokhale, 2009; Allen et al., 2012; Khan, 2011; Barik and Pradhan, 2021) found that Lending to those previously excluded from the formal banking sector revealed that new customers were not credit worthy and were a threat to banks stability. Another stand of research posits that financial inclusion and financial stability have a relationship and that synergies between the two exist (Adasmeet al., 2008; Vo et al., 2020; Kumar et al., 2021). In the same way, some studies found that financial inclusion and financial performance have a relationship and that synergies between the two exist (Dittaa and Saputrab, 2020; Shihadeh, 2020; Jajah et al., 2020). On the other hand, (Ikram &Lohdi, 2015; Bhattacharyya et al., 2019; Estu et al., 2019) found insignificant relationship between financial inclusion and financial performance. This has created two divergent schools of thought with one claiming the financial inclusion-stability effect and the other claiming financial inclusion-instability outcome.

Growing financial inclusion gives households easier access to saving and borrowing products due to consumption smoothing. It makes maintaining price stability an easier job for a central bank since output volatility is no longer a major problem. Furthermore, increasing financial inclusion means a higher proportion of economic activity that relies on interest rates, leading to the likely higher relevance of interest rates in monetary transmission. This tends to improve the effectiveness of monetary policy, implying more financial sustainability.

On the other hand, growing financial inclusion means a greater number of financial transactions covered by the same existing

intermediaries. This higher intensity of participation in the financial markets can expand the social costs of individual institutional imperfections. Consequently, the occurrence of social and moral hazard will likely increase, and thus endanger financial stability. In this regard, it would be more desirable to have a greater number of financial intermediaries if it is accompanied by proper governance and an adequate structure of financial regulation and supervision (. Otherwise, the increased number of local institutions, such as cooperatives or rural banks, presents higher risks in the financial markets, making them more vulnerable to natural disasters and recessions.

In Egypt, the concept of financial inclusion has been combined with the goals of poverty alleviation and general economic growth as envisaged in the vision 2030, the country's economic blueprint (Government of Egypt, 2016). Egyptian banks responded to the initiative by opening doors and developed products and services for the previously unbanked population. Moreover, Egyptian Central Bank made numerous important reforms and structural changes: increased bank and branch network, shift from brick and mortar outlets, innovations in product development, use of information communication and technology (ICT) and emergence of non-bank financial institutions.

According to CBE (2018) the country's banking sector has undergone substantial transformation between 2014 and 2018 was the number of deposit accounts went up from 1.43 trillion to 3.569 trillion while loan accounts increased from 1.13 trillion to 1.646 trillion. Also, the population of adult population totally excluded from financial services declined from 66% in 2014 to 54 % in 2018. It's therefore important to analyze the influence these changes have had on financial performance of banks in Egypt.

In a nutshell, a number of studies have suggested that financial inclusion could affect financial stability in both positive and negative ways. Meanwhile, in the range of knowledge of the researcher, all the local and Arab studies have leaned heavily towards the various tools, techniques, practices, of financial inclusion, in particular, from theoretical perspective. This study attempted to address the following

central research question: **What is the effect of financial inclusion on banking performance.** This thesis is an endeavor to find the answer.

1.3. Research significance

Research captures its significance from many issues as follows:

- This research comes at a critical time because Egyptian government has combined the concept of financial inclusion with the goals of poverty alleviation and general economic growth as envisaged in the vision 2030, the country's economic blueprint.
- The significance of the relationship between financial inclusion and banking financial performance to be considered as a complementary for previous studies. So, it could be considered as an addition to the Arabic library because of rare Arabic studies in this area.
- The study will be applied on one of the more important financial sectors in Egypt to investigate the relationship between financial inclusion and banks performance and whether these findings will support the previous studies or not.
- The value of this study comes from the fact that assessing an accurate level of financial inclusion will help policy makers in Egypt to direct their attention to the sources of the problems associated with obstacles and barrier to formal financial services and try to impose polices that eradicate or at least decrease these barriers in order to improve the level of financial inclusion.

1.4. Research objectives

The main objective of the research is to study and analyze the effect of financial Inclusions on banking performance. Based on this main objective, the research seeks to achieve the following:

- Study and analyze the effect of Total Number of Branches on banking performance
- Study and analyze the effect of Number of Points of sale on banking performance

- Study and analyze the effect of Number of Debit cards on banking performance
- Study and analyze the effect of Number of Credit cards on banking performance
- Study and analyze the effect of Number of ATMs on banking performance
- Study and analyze the effect of Banking Density on banking performance

1.5. Research hypothesis

The study hypotheses are formulated in line with the research problem and literature review.

These hypotheses are stated in as follows:

1. **Hypothesis 2:** Total Number of Branches has a significant effect on banking performance
2. **Hypothesis 3:** Number of Points of sale has a significant effect on banking performance
3. **Hypothesis 4:** Number of Debit cards has a significant effect on banking performance
4. **Hypothesis 4:** Number of Credit cards has a significant effect on banking performance
5. **Hypothesis 5:** Number of ATMs has a significant effect on banking performance
6. **Hypothesis 6:** Banking Density has a significant effect on banking performance

1.6. Research methodology

This section deals with the methodology employed in the research analysis. it includes the following elements:

1.6.1. Research approach

The method of our research is quantitative. I used Two-stage least-squares regression to analyze data collected the annual reports of the Egyptian Central bank. Based on the regression

outputs, I conducted the analyses and answer my research question. The analyses are presented by using descriptive approach

1.6.2. Research population and Sample

The population for this study will be comprised of the 38 banks in Egypt. Secondary data will be obtained from the reports published by the Central Bank of Egypt (CBE) which aggregates the financial soundness indicators of the Egyptian banking sector in the period from 2011 till December 2020

- Banks are profit-making organizations acting as intermediaries between borrowers and lenders attracting excess funds from business and individual customers as well as granting loans for those in need of financial support. The Egyptian banks represent a large part of the Egyptian banks (38 banks) registered at the Egyptian central bank at 31/12/2021. The Egyptian banking system currently consists of 38 banks, divided into 10 government banks, 6 private banks with Egyptian-Arab joint capital and 21 Arab and foreign banks.
- The objective of the study is to empirically examine the relationship between financial inclusion and banking performance. over 10 years (2011-2020). According to the nature of the variables included in this research, definitely financial inclusion, the research is applied on Egyptian Banking population at the macro level due to the following reasons:
 - a) Considering financial inclusion as a new phenomenon in the Egyptian banking environment, and consequently some banks still have not made great strides in this matter, while other banks have achieved a great effort towards implementing financial inclusion strategies
 - b) The non-availability of consistent data over the defined period concerning financial inclusion indicators for each

bank separately. While data are available on indicators of financial inclusion at the level of the Egyptian banking sector as a whole as published by the Egyptian central bank.

1.6.3.Data Collection

Recorded and published secondary data was used for the study. The data source for our study is Reports of Egyptian Central bank over 10 years (2011-2020), Reports of Monthly Statistical Bulletin, Financial soundness indicators. The data was analyzed by using the profitability ratios (ROA, ROE & Net Interest margin), Liquidity ratios (Average liquidity ratio in local currency, Average liquidity ratios in Foreign currency, Deposits to assets ratio & loans to deposits ratio) , Identifying financial inclusion proxies (Total number of banks, Number of points of sale, Number of debit cards, Number of ATMS, Banking Density & Number of debit cards), as calculated and published by the Egyptian central bank.

1.6.4.Reliability and validity

For reliability considerations, in our research, we have collected the data from scientific articles, journals, books, the published annual reports and monthly Statistical Bulletins prepared and published by the Egyptian central bank. The reliability of the E-Views results has been proved by many researchers in their studies. we have used the statistical analysis tool E Views to obtain results and conduct an analysis of the regression model that we have adopted in our study.

For validity considerations, the researcher has selected the most common indicators of financial inclusion (Total number of banks, Number of points of sale, Number of debit cards, Number of ATMS, Banking Density & Number of debit cards); (ROA, ROE & Net Interest margin) as proxies for profitability performance; (Average liquidity ratio in local currency, Average liquidity ratios in Foreign currency, Deposits to assets

ratio & loans to deposits ratio as proxies for liquidity performance and (Loans and Discount Investment ratio, & Securities investment ratio) as proxies for investment diversification as revealed by literature review. All the above proxies are taken from reports of financial soundness indicators that are calculated and published by the Egyptian central bank.

1.7. Research variables measurement

The research is based on Two basic variables, financial inclusion, and banking performance, based on literature review.

1.7.1. Financial Inclusion

Based on literature review, the researcher has chosen seven variables namely: Total number of branches, Number of points of sale, Number of debit cards, Number of ATMs, Banking density, Number of Credit Cards as indicators for measuring financial inclusion which affect the performance of banks measured by profitability and Liquidity indicators. These variables as indicators for financial inclusion have been used and tested in many studies as (Iqbal and Sami, 2017; Shihadeh et al., 2018; Jimoh et al., 2019; Sackey and Li, 2019; Bhattacharyya et al., 2019; Jajah et al., 2020; Shihadeh, 2020; Vo et al., 2020; Almaleeh, 2020; Ramzan et al., 2021; Kumar et al., 2021; Barik and Pradhan, 2021)

1.7.2. Banking performance (Profitability and liquidity Performance)

The researcher used ratios of (ROE, ROA, and Net interest Margin, Average liquidity ratio in local currency, Average liquidity ratios in foreign currency, Deposits to assets ratio & loans to deposits ratio) as indicators of the banking performance in the regression analysis because They have been widely used in earlier research. These indicators have been used and tested as indicators of banking profitability performance in many studies as (Mulwa and Kosgei, 2016; Brahmana et al., 2017; Oranga and Ondabu, 2018; Al-Adwey, 2019; Almaleeh, 2020;

Jajah et al., 2020; Dittaa and Saputrab, 2020; Ramzan et al., 2021; Kumar et al., 2021)

1.8. Research concepts

1.8.1. Financial inclusion

- Financial inclusion is generally defined as the process of ensuring timely access to financial services and adequate credit where needed by vulnerable groups, such as disadvantaged segments and low-income groups at an affordable cost (Rangarajan, 2008; Vo et al., 2020).
- Meanwhile, Financial inclusion is a process that guarantees the ease of access, availability, and use of the facilities of formal financial institutions for all walks of life (Sarma and Pais, 2008; Dittaa and Saputrab, 2020; Sisharini et al., 2020; Pati, 2015)
- Furthermore, Financial inclusion is known as an increase in the quantity, quality and efficiency of financial brokerage institutions that can help improve the level of society life and strengthen the economy (Babajide et al., 2015; Le et al., 2019).

1.8.2. Banking Performance (Profitability & Liquidity Performance)

- Financial performance is “a subjective measure of how well a bank can use assets from its primary mode of business and generate revenues” (Mwangi, 2010; Mwangi, Murigu, 2015).
- Furthermore, Lyman and Carles (1978) defined it as “the operational strength of a firm in relation to its revenue and expenditure as revealed by its financial statements, in any organization commercial banks in particular, financial performance is affected by credit risk”.
- **Profitability** is an index of the firm's overall efficiency and effectiveness of financial performance, it's usually used as a measure of earnings generated by the company during a period of time based on its level of sales, assets, capital

employed, net worth and earnings per share (Kabajeh, et al.,2012).

- **Liquidity:** According to Ibe (2013) liquidity as a financial term simply means the amount of capital that is available for investment. Alshatti (2015) argues that liquidity is the ability of banks to meet the financial needs of their increased assets and meeting liabilities as and when they fall due without the occurrence of unforeseen losses.

1.9. Findings of Statistical analysis of data

1.9.1.Exploratory factor analysis for research constructs

The researcher used (EFA) to explain the relationships among several difficult correlated variables for each research construct in terms of Profitability and Liquidity Indicators to produce a few conceptually meaningful, relatively independent factors to get the percent of variance accounted for by each specific factor or component, relative to the total variance in all the variables, to validates the research hypotheses, as the following:

Table 4.7 Rotation Sums of Squared Loadings

1.Exploratory factor analysis in terms of Profitability indicators			
No	Indicator variables	Communalities	Rotated Component Matrix
1	ROA	0.921	0.975
2	ROE	0.951	0.960
3	NIM	0.791	0.890
KMO=0.677 Bartlett's test of sphericity=131.643 sig<0.001 Eigen values=2.664 % Of Variance=88.8			
2.Exploratory factor analysis in terms of Liquidity Indicators			
1	LIQ1	0.896	0.946
2	LIQ2	0.642	0.942
3	LIQ3	0.887	-0.801

4	LIQ4	0.186	-0.431
KMO=0.700 Bartlett's test of sphericity=88.333 sig<0.001 Eigen values=2.610 % Of Variance=65.256			

According to Rotation Sums of Squared Loadings in table 4.7, it can be concluded that:

- Kaiser-Meyer-Olkin Measure of Sampling Adequacy, KMO, for sampling adequacy, should be greater than 0.50 or equal. KMO MSA < .50 indicates that a matrix is “unacceptable” for factoring. However, using Kaiser & Rice’s (1974) terminology, the factorability of a matrix can be considered with the following ranges in mind: .50’s (miserable), .60’s (mediocre), .70’s (middling), .80’s (meritorious), .90’s (marvelous).
- Bartlett's test of sphericity indicates whether your correlation matrix is an identity matrix, which would indicate that your variables are unrelated. The significance level gives the result of the test. Very small values (less than 0.05) indicate that there are probably significant relationships among variables.
- Communalities indicate the amount of variance in each variable that is accounted for; Initial communalities are estimates of the variance in each variable accounted for by all components or factors. For principal components analysis, this is always equal to 1.0 (for correlation analyses) or the variance of the variable (for covariance analyses). Extraction communalities are estimates of the variance in each variable accounted for by the factors (or components) in the factor solution. Small values indicate variables that do not fit well with the factor solution and should possibly be dropped from the analysis.
- in the Pattern Matrix for varimax rotations reports the factor loadings for each variable on the components or factors after rotation. Each number represents the partial correlation between the item and the rotated factor at minimum correlation coefficient (0.50).
- Eigen values represent the amount of variance accounted for by a factor by sum of squared loadings for a factor at the optimum value greater than one.
- The "% of Variance" gives the percent of variance accounted for by each specific factor or component, relative to the total variance in all the variables while the optimum value for Cumulative Rotation Sums of Squared Loadings (0.50) at least.

- Profitability and Liquidity indicators represent (65-89%) from the Total Variance Explained.

1.9.2. Correlation analysis

Table 4.8 Pearson correlation matrix to measure a significant linear relationship between the constructs of financial inclusion and banking performance in terms of the Profitability and Liquidity Indicators

Variables	Profitability construct	Liquidity construct	number of Branches	Number of Debit Cards	Number of Credit Cards	Number of ATMS	Banking Density	Number of Points of Sale
Profitability construct	1	-0.571***						
number of Branches	0.646***	-0.728***	1					
Number of Debit Cards	0.683***	-0.438***	0.833***	1				
Number of Credit Cards	0.933***	-0.661***	0.609***	0.633***	1			
Number of ATMS	0.531***	-0.574***	0.878***	0.775***	0.524***	1		
Banking Density	0.576***	-0.072	0.268	0.456**	0.536***	0.347*	1	
Number of Points of Sale	0.320*	-0.323*	0.755***	0.692***	0.329*	0.869***	0.271	1

*** Significant at a level less than (0.001). ** Significant at a level less than (0.01). * Significant at a level less than (0.05).

According to the table 4.8, it can be concluded that:

- There are significant positive linear relationships between the dependent variables in terms of Profitability construct, and the independent variable of the financial inclusion in terms of number of Branches, Number of debits, Cards, Number of Credit Cards, Number of ATMS, Number of ATMS, Banking Density, and Number of Points of Sale, at a significant level less than (0.05).

- There are significant negative linear relationships between the dependent variables in terms of Liquidity construct, and the independent variable of the financial inclusion in terms of number of Branches, Number of debits, Cards, Number of Credit Cards, Number of ATMS, Number of ATMS, and Number of Points of Sale, at a significant level less than (0.05).
- There are significant negative linear relationships between the dependent variables in terms of the Profitability and Liquidity constructs, at a significant level less than (0.05).

1.9.3. Two-Stage Least Squares

Table 4.9 Two-Stage Least Squares to measure the effect of the financial inclusion on banking performance in terms of the Profitability and Liquidity Indicators

1- Two-Stage Least Squares to measure the effect of the financial inclusion on the Profitability construct					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	VIF
FAC1_1(-1)	0.292802	0.164442	1.780580	0.0848	8.782868
number of Branches: X1	0.000441	0.000188	2.345745	0.0192*	9.504553
Number of Debit Cards: X2	5.13E-08	2.48E-08	2.068548	0.0489*	4.212270
Number of Credit Cards: X3	4.77E-07	8.61E-08	5.548061	0.001***	4.624247
Number of ATMS: X4	1.53E-05	6.90E-06	2.217391	0.0223*	7.611837
Banking Density: X5	0.227470	0.106017	2.145599	0.0231*	1.978522
Number of Points of Sale: X6	4.78E-06	5.61E-06	0.852491	0.4005	5.140493
C	-8.735255	4.272884	-2.044346	0.0495*	--
R ² =91.8% F-test= 49.9 sig=0.001*** RMSE=0.279 U= 0.146 DW=1.58 JB=6.94 SIG=0.03 BGSC Ftest=2.62 SIG=0.12 Heteroskedasticity Test: ARCH F-test=0.153 Sig=0.69 Ramsey RESET Test F test=1.42 Sig=0.24 J-stats=1.53 sig=0.22 Cragg-Donald F-stat=16.95 with Stock-Yogo TSLs critical values =13.91(5%)					
FAC1_1 = 0.292801625007*FAC1_1(-1) + 0.000440776701455*X1 + 5.13209774953e-08*X2 + 4.7745835519e+07*X3 + 1.53071283777e-05*X4 + 0.227470265527*X5 + 4.7805176274e-06*X6 - 8.7352545518					
2- Two-Stage Least Squares to measure the effect of the financial inclusion on Liquidity construct					
FAC1_2(-1)	0.732214	0.081765	8.955130	0.001***	4.478794
number of Branches: X1	-0.000550	0.000461	-1.192262	0.2422	7.243454
Number of Debit Cards: X2	-1.23E-07	3.67E-08	3.353529	0.0021*	4.235651
Number of Credit Cards: X3	-2.08E-07	6.11E-08	-3.394631	0.0019**	2.456053
Number of ATMS: X4	-8.70E-05	3.30E-05	-2.631774	0.0131*	8.170842
Banking Density: X5	0.020497	0.127376	0.160915	0.8732	1.728695
Number of Points of Sale: X6	-7.75E-06	2.03E-06	3.817734	0.0016**	4.728229
C	0.847123	3.148923	0.269020	0.7897	--
R ² =95.4% F-test= 91.6 sig=0.001*** RMSE=0.215 U= 0.109 DW=2.75 JB=1.06 SIG=0.59 BGSC Ftest=2.74 SIG=0.06 Heteroskedasticity Test: BPG F-test=0.65 Sig=0.71 Ramsey RESET Test F test=0.026 Sig=0.87 J-stats=0.009 sig=0.93 Cragg-Donald F-stat=23.98 with Stock-Yogo TSLs critical values =13.91 (5%)					
FAC1_2 = 0.732214380571*FAC1_2(-1) - 0.00054971621696*X1 - 1.23240550696e-07*X2 - 2.07559219897e-07*X3 - 8.69727457699e-05*X4 + 0.020496725395*X5 - 7.74559684534e-06*X6 + 0.847123476571					

According to table 4.9, it can be concluded that:

- The coefficient of determination:** The predictor Variables in terms of financial inclusion indicators explain (92-95%) from total variation of dependent variables of the banking performance in terms of the Profitability and Liquidity Indicators, and the rest percent due to either the random error in the Two-Stage Least Squares regression

model or other Independent Variables excluded from regression model.

- 2- **F test:** Since the value of "F test" is significant at a level less than (0.05), then the researcher concludes that the predictor Variables in terms of financial inclusion indicators have been affected on the level of dependent variables of the banking performance in terms of the Profitability and Liquidity Indicators.
- 3- **t-test:** There is a significant positive effect of the financial inclusion indicators in terms of number of Branches, Number of Debit Cards, Number of Credit Cards, Number of ATMS, and Banking Density, on the dependent variable of the Profitability construct, at a significant level less than (0.05), but we have also a significant negative effect of the financial inclusion indicators in terms of Number of Debit Cards, Number of Credit Cards, Number of ATMS, and Number of Points of Sale on the dependent variable of the Liquidity construct, at a significant level less than (0.05). This validates partially the second research hypothesis; There is a significant effect of the financial inclusion on banking performance in terms of the Profitability and Liquidity Indicators.
- 4- **VIF: The variance inflation factors:** The variance inflation factors are usefully measures of multicollinearity. The larger the variance inflation factors, the more severe the multicollinearity. Some authors have suggested that if any variance inflation factors exceed 10, then multicollinearity is a problem. Other authors consider this value too liberal and suggest that the variance inflation factors should not exceed 4 or 5. As shown on the above table, the value of VIP less than 4, therefore the model has not suffered from the multicollinearity problem.
- 5- **The Jarque-Bera Test:** Since the significance value of the Jarque-Bera test statistic (<0.05) in the first equation of Two-Stage Least Squares regression model, then we would reject the null hypothesis (H_0): Errors are normally distributed. Since the Pearson skewness coefficient is less than or equal (1) or greater than or equal (-1), it can be concluded that the data are not significantly skewed. (Allan G. Bluman, 2012), but we have insignificance value of the Jarque-Bera test statistic (>0.05) in the second equation of Two-Stage Least

Squares regression model, then we would accept the null hypothesis (H0): Errors are normally distributed.

- 6- Theil's inequality coefficient U:** U Theil's inequality to measure the accuracy of the estimates of the Two-Stage Least Squares regression model. it lies between zero and one, where zero indicates a perfect fit. Since a value range (0.11-0.15) indicating the goodness of fit of the Two-Stage Least Squares regression model, at a percent of not less than (85%) for the last two models.
- 7- The Durbin-Watson test statistic:** The Durbin-Watson test statistic tests the null hypothesis that the residuals from an Ordinary least-squares regression are not autocorrelated against the alternative that the Residuals follow an AR1, positive first-order autocorrelation, process. The Durbin-Watson statistic ranges in value from 0 to 4. A value near 2 indicates non-autocorrelation; a value toward 0 indicates positive autocorrelation; a value toward 4 indicates negative autocorrelation. Since the test statistic value (1.58-2.75) was greater than dU, we would not reject the null hypothesis.
- 8- Breusch-Godfrey Serial Correlation LM Test:** The Breusch-Godfrey serial correlation LM test is a test for autocorrelation in the errors in a regression model. It makes use of the residuals from the model being considered in a regression analysis, and a test statistic is derived from these. The null hypothesis of the LM test is that there is no serial correlation up to lag order p , where p is pre-specified integer. The test is more general than the Durbin-Watson statistic (or Durbin's h statistic), which is only valid for nonstochastic regressors and for testing the possibility of a first-order autoregressive model (e.g., AR (1)) for the regression errors. The BG test has none of these restrictions and is statistically more powerful than Durbin's h statistic. Since the significance value of the BGSC test statistic (≥ 0.05) ;(0.06-0.12), then we would not reject the null hypothesis (H0): there is no serial correlation up to lag order $p(2)$.
- 9- Heteroskedasticity Test:** When using some statistical techniques, such as Two-Stage Least Squares regression model, several assumptions are typically made. One of these is that the error term has a constant variance (Homoskedasticity). If the error terms do not have constant variance, they are said to be heteroskedastic. This

might not be true even if the error term is assumed to be drawn from identical distributions. By conducting the Heteroskedasticity Test: ARCH and Breusch-Pagan-Godfrey for the residuals values of the multiple regression model, it revealed that the level of significance for the tests: F-statistic, Obs * R-squared, is greater than (0.05) ;(0.69-0.71),, which indicates the acceptance of the null hypothesis which provides for the Homoskedasticity of error term.

- 10- Ramsey RESET Test:** The Ramsey Regression Equation Specification Error Test (RESET) test is a general specification test for the linear regression model. More specifically, it tests whether non-linear combinations of the fitted values help explain the response variable. The intuition behind the test is that if non-linear combinations of the explanatory variables have any power in explaining the response variable, the model is mis-specified in the sense that the data generating process might be better approximated by a polynomial or another non-linear functional form. Missing Variables. Some regression explanatory variables are not specified. Correlation between the X factor and random model component, that can be caused by factors measurements errors, equation systems analysis or other reasons. Since the significance value of the t-statistic (F-statistic (Likelihood ratio test statistic (≥ 0.05)) ;(0.24-0.87), then we would not reject the null hypothesis (H0): The functional form is correct, no omitted variables (extra terms are statistically not significant).
- 11- J-statistic:** This J-statistic may be used to carry out hypothesis tests from GMM and two stage least squares estimation. A simple application of the J-statistic is to test the validity of overidentifying restrictions. Under the null hypothesis that the overidentifying restrictions are satisfied or valid. Since the significance value of the J-statistic (≥ 0.05) then we would not reject the null hypothesis (H0): that the overidentifying restrictions are satisfied or valid, i.e., the predictor variables in terms of financial inclusion indicators are treated as exogenous variables.
- 12- Weak Instrument Diagnostics:** The Weak Instrument Diagnostics view provides diagnostic information on the instruments used during estimation. This information includes the Cragg-Donald

statistic, the associated Stock and Yugo critical values, and Moment Selection Criteria (MSC). The Cragg-Donald statistic and its critical values are available for equations estimated by TSLS, GMM or LIML, but the MSC are available for equations estimated by TSLS or GMM only. The Cragg-Donald statistic is proposed by Stock and Yugo as a measure of the validity of the instruments in an IV regression. Instruments that are only marginally valid, known as weak instruments, can lead to biased inferences based on the IV estimates, thus testing for the presence of weak instruments is important. The null hypothesis (H0) is that the instruments are weak, and the alternative hypothesis (H1) is that the instruments are not weak. Since the Cragg-Donald F-statistic greater than Stock-Yogo critical values at level (5%), then we would reject the null hypothesis that the instruments are weak.

1.10. Conclusion

The research aimed to empirically study and analyze the effect of financial Inclusions on Financial performance of Egyptian banks over the period (2011 – 2020). The results of regression analysis using Two-Stage Least Squares found that there is a significant positive effect of the financial inclusion indicators in terms of number of Branches, Number of Debit Cards, Number of Credit Cards, Number of ATMS, and Banking Density, on the dependent variable of the Profitability construct, at a significant level less than (0.05), but we have also a significant negative effect of the financial inclusion indicators in terms of Number of Debit Cards, Number of Credit Cards, Number of ATMS, and Number of Points of Sale on the dependent variable of the Liquidity construct, at a significant level less than (0.05). This validates partially the second research hypothesis; There is a significant effect of the financial inclusion on banking performance in terms of the Profitability and Liquidity Indicators.

References

1. Al-Adwey, L. (2019). Does Financial Inclusion Improve the Financial Performance of Commercial Banks in Egypt? : Pooled OLS Approach. Available at: <https://abj.journals.ekb.eg/>, 1 – 28
2. Al-Adwey, L. (2019). Does Financial Inclusion Improve the Financial Performance of Commercial Banks in Egypt? : Pooled OLS Approach. Available at: <https://abj.journals.ekb.eg/>, 1 – 28
3. Almaleeh, N.M.S. (2020). Financial Inclusion in Egypt: Does It Affect Banks' Profitability and Liquidity?. **International Finance and Banking**, 7 (1), 73 – 91
4. Alshatti, A. S.(2015).The effect of credit risk management on financial performance of the Jordanian commercial banks. **Investment Management and Financial Innovations**, 12(1), 338-345.
5. Barik, R. & Pradhan, A.K. (2021). Does financial inclusion affect financial stability: evidence from BRICS nations. **The journal of developing areas**, 55 (1), 341 – 356
6. Bhattacharyya, A., Wright, S. & Rahman, M.L. (2019). Is better banking performance associated with financial inclusion and mandated CSR expenditure in a developing country?. **Accounting and Finance Association of Australia and New Zealand**, available at <https://onlinelibrary.wiley.com/doi/10.1111/acfi.12560>, 1 – 37
7. Brahmana, R., Kontesa, M. & Gilbert, R. (2017). Income diversification and bank performance: evidence from Malaysian banks. **Economics Bulletin**, 38 (2), 799 – 809.
8. DAS, S. (2015). Factors affecting financial inclusion: A study in Rourkela. **A Master thesis of Business Administration**. School of Management, National Institute of Technology, Rourkela
9. Dittaa, A.S.A. & Saputrab, A. (2020). Financial Inclusion and Banking Performance in Indonesia. **Journal of accounting, finance and auditing studies**, available at : DOI: 10.32602/jafas.2020.010 , 50 – 68
10. Estu, W., PindyKurnia, S. & Nunik, N. (2019). Role of Financial Inclusion to Stability: The Case of Indonesia's Sharia Banking. **HOLISTICA**, 10(1), 7-15

11. Halling, M. & Hayden, E. (2006). Bank Failure Prediction: A Two-Step Survival Time Approach. Available at <http://ssrn.com/abstract=904255> or <http://dx.doi.org/10.2139/ssrn.904255>.
12. Ikram, I. & Lohdi, J. (2015). Impact of Financial Inclusion on Banks Profitability: An Empirical Study of Banking Sector of Karachi, Pakistan. **International Journal of Management Sciences and Business Research**, 4 (10), 88 – 98
13. Iqbal, B.A. & Sami, S. (2017). Role of banks in financial inclusion in India. **Contaduría y Administración**, 62, 644 – 655
14. Jajah, Y.I., Anarfo, E.B. & Aveh, F.K. (2020). Financial inclusion and bank profitability in Sub-Saharan Africa. **wileyonlinelibrary.com/journal/ijfe**, available at :DOI: 10.1002/ijfe.2135, 1- 13
15. Jajah, Y.I., Anarfo, E.B. & Aveh, F.K. (2020). Financial inclusion and bank profitability in Sub-Saharan Africa. **wileyonlinelibrary.com/journal/ijfe**, available at :DOI: 10.1002/ijfe.2135, 1- 13
16. Jimoh, A.T., Shittu, A.T. & Attah, J.A. (2019). Impact of Financial Inclusion on Performance of Banks in Nigeria. **Fountain University Osogbo Journal of Management**, 4 (3), 84-96
17. Joseph, M.T., Edson, G., Manuere, F., Clifford, M. & Michael, K. (2012). Non Performing loans in Commercial Banks: A case of CBZ Bank Limited In Zimbabwe. **interdisciplinary Journal of contemporary research in business**, 4(7), 467-488
18. Kabajeh, M.A.M., Nu'aimat, S.M.A.A & Dahmash, F.N.(2012). The Relationship between the ROA, ROE and ROI Ratios with Jordanian Insurance Public Companies Market Share Prices. **International Journal of Humanities and Social Science** , 2 (11) ,115-120
19. Khan, H. R. (2011). **Financial Inclusion and Financial Stability: are they two sides of the same coin**. Address by Shri Khan, Deputy Governor of the Reserve Bank of India, at BANCON.
20. Kumar, V., Thrikawala, S. & Acharya, S. (2021). Financial inclusion and bank profitability: Evidence from a developed market. **Global Finance Journal**, available at ScienceDirect, 1-12
21. Lyman, A.K. & Carles E.G.(1978). **Introduction to Business Enterprise**. 4th Edition, Keong Printing Company PTE Limited, Republic of Singapore

22. Mokaya, R.N. & Omagwa, J. (2018). Financial inclusion tools and profitability of selected commercial banks in Kenya. **International Journal of Scientific and Education Research**, 2 (6), 42 – 60
23. Mulwa, J.M. & Kosgei, D. (2016). Commercial Bank Diversification and Financial Performance: The Moderating Role of Risk. **Journal of Finance and Investment Analysis**, 5(2), 31 – 52
24. MUSAU. S.M. (2014). Financial Inclusion and Stability of Commercial Banks in Kenya. **A PHD thesis of Business Administration**, School of Business, KENYATTA University.
25. Mwangi, M. & Murigu, J.W.M. (2015). The determinants of financial performance. **European Scientific Journal**, 11(1), 288-297
26. Oranga, O.J. & Ondabu, I.T. (2018). Effect of Financial Inclusion on Financial Performance of Banks Listed At the Nairobi Securities Exchange in Kenya. **International Journal of Scientific and Research Publications**, 8 (5), 624 – 649
27. Ramzan, M., Amin, M. & Abbas, M. (2021). Effects of CSR on financial performance, stability, and inclusion in the banking sector: Evidence from Pakistan. **Research in International Business and Finance**, 55 , 1-9
28. Sackey, P.A.V. & Li, J.H. (2019). Financial Inclusion and Banks Performance: An Empirical Study of 10 West African Countries Using Panel Cointegration FMOLS Regression Methodology. **European Journal of Business and Management**, 11 (21), 33 -42
29. Sarma, M. 2008. Index of Financial Inclusion. Indian Council for Research on International Economic Relations **Working Paper** No. 215.
30. Shihadeh, F. (2020). The influence of financial inclusion on banks' performance and risk: new evidence from MENAP. **Business perspectives, Banks and Bank Systems**, 15 (1), 59 – 71
31. Shihadeh, F.H., Hannon, A (M.T), Guan, J. Haq, I.U. & Wang, X. (2018). Does Financial Inclusion Improve the Banks' Performance? Evidence from Jordan. **Global Tensions in Financial Markets**, Volume 34, 117–138
32. Shihadeh, F.H., Hannon, A (M.T), Guan, J. Haq, I.U. & Wang, X. (2018). Does Financial Inclusion Improve the Banks' Performance? Evidence from Jordan. **Global Tensions in Financial Markets**, Volume 34, 117–138

- 33.Uwuigbe, U., Uwuigbe, O.R. & Oyewo, B. (2015). Credit Management and Bank Performance of Listed Banks in Nigeria. **Journal of Economics and Sustainable Development** , 6(2), 27-32