“Does the efficiency of banks adversely affect financial stability? A comparative study between traditional and Islamic banks: Evidence from Egypt”

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DOES THE EFFICIENCY OF BANKS ADVERSELY AFFECT FINANCIAL STABILITY? A COMPARATIVE STUDY BETWEEN TRADITIONAL AND ISLAMIC BANKS: EVIDENCE FROM EGYPT

Abstract

The efficiency of banks is an important factor that effectively contributes to the stability of the world financial system, thus reducing financial failure rates of banks and international financial crises that leads to the stability of the global financial system. This study aims to investigate whether the efficiency of Egyptian banks adversely affects financial stability. A sample of 30 banks operating in Egypt was selected to answer this question using the data envelopment analysis (DEA) approach and financial ratios. This study enables the Central Bank of Egypt to identify which banking system (Islamic banks or traditional banks) is more efficient and contributes significantly to boost economic growth. Results revealed that the efficiency of banks is a core factor to affect financial stability. The statically explanatory power of this effect is significant but weak at 14.1% for all Egyptian banks, 6.3% for traditional banks, strong for traditional banks with Islamic window at 22%, and stronger for Islamic banks at 55%. Consequently, the Islamic banking system in Egypt is more efficient compared to traditional banks and has a greater impact on financial stability as one of the pillars of financial inclusion to boost economic growth in Egypt.

Keywords operating efficiency, conventional banks, financial stability, Egyptian banks, DEA

JEL Classification G01, G21, G28

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INTRODUCTION

Since the emerging of the Covid-19 pandemic, the risks associated with banks' loan portfolios and profitability have increased. The Central Bank of Egypt is seeking to provide relief to affected borrowers and ensuring a stable flow of credit to the real economy while maintaining financial stability. This will mandate financial and price stability and strengthen its governance, financial structure, operational and institutional autonomy.

The concept of efficiency refers to the link between input and output. It is defined by the production function. Efficiency in the banking sector is a concept that entails the optimal use of capital. It can be used to boost credit growth in the banking industry, which contributes to economic development and growth. The ratio of input-output, or generated quantity by the input used, is a common definition of efficiency. Efficiency in banking is a metric used to assess bank performance. The ratio of inputs to outputs is referred to as technical efficiency (Brown et al., 2007). Banks are technically efficient if a Decision-Making Unit generating maximum feasible output from the set of inputs that are included, or if it uses fewer inputs to achieve a given number of out-

puts (Kamarudin et al., 2014). Pure technical efficiency describes how an economic unit's resources are managed, because technical efficiency decides whether a production unit is operating at an optimal scale. The efficiency of Egyptian banks contributes to the success of adopted macroeconomic policies, which results in long-term development, economic growth, social welfare, and becomes more resilient to shocks during crisis.

The financial stability in general is defined on the basis that it is the general framework that governs the functioning of the market and the financial infrastructure that enables the smooth performance of the financial system in Egypt and works to achieve sustainable development and raise economic growth rates (CGAB, 2017). There is no doubt that Egyptian banks have an effective pivotal role in supporting the financial stability of the financial system as a whole in Egypt.

1. LITERATURE REVIEW

So far, there is no much applied research on whether the efficiency of banks – as an influence on the financial stability of the global financial system worldwide – effectively affects financial stability of the financial system in Egypt.

Saqib (2013), examined the impact of financial efficiency and development on economic growth with a real GDP per capita as an indicator using a sample of 50 developing countries. Results suggested a positive and significant influence of the financial efficiency on the growth of economy for developing countries. The study highlighted the importance and value of the financial development for the economic growth and the efficiency on the sustainable growth performance for developing countries. The results confirmed the absence of statistically significant causality between financial efficiency and economic growth. Economic growth is compounded by the lack of deep and efficient financial markets. The measurement of financial development using five financial development sectors are:

- Information producing regarding potential investment and capital allocation.
- Investment observing and enforcing corporate governance following financing.
- Trade management, diversification, and risk management.
- Savings mobilization.
- The ease of exchanging goods and services.

Helmy (2015) examined the factors that affect the inefficient use of savings and its causes in Egypt. Egyptians focus on spending their money instead of saving it as their wage rate is lower than the substance level. In addition, the financial system in Egypt does not play a significant role in enhancing the efficiency of savings use, since the effect of the managerial performance and financial institution to organize and direct savings to have capital accumulation is stronger. The results revealed that:

1) There was a major inefficiency in using foreign exchanges, it was consumed rather than used for production purposes. This leads to lacking economic development process.

2) Strong clues were found that mark the existence and growth of informal financial systems in the economy (black market), which adversely affects the efficient use of savings.

Poshakwale and Qian (2011) investigated the impact of financial reforming on efficiency and competitiveness of the Egyptian banking sector. Moreover, how it affected the economic growth during the interim period from 1992 till 2007. Studies were divided into two different categories; one showed a positive relationship between the both as the reforming of finance better improves bank efficiency, which achieves economic growth. While the other one showed that the reforming causes the financial system to be more vulnerable, which can be the reason behind economic crisis. The performance of Egyptian banks is improved, since the efficiency of production and the competitiveness are improved as well and this is reflected in an economic growth rate over the short term.

Alber (2015) examined the impact of bank size, age and ownership on the efficiency of Egyptian banks using Data Envelopment Analysis. The au-

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thor analyzed ten Egyptian banks during the period from 1984 to 2013. The results revealed that the efficiency of the banks' score changes significantly, depending on "size", "age" and "ownership", as smaller and older banks and in addition to the private sector's banks happen to be more efficient than bigger, younger, and public banks. The efficiency level is 95.3% for small banks and 89.3% for bigger ones; 89.18% and 94.88% for younger and older banks; 86.48% for public banks and 95.74% for private banks.

Shrieves and Dahl (1992) employed the data envelopment analysis model to examine the efficiency of traditional banks versus Islamic banks in Bangladesh using a sample of 37 banks during and following the financial crisis. Results revealed that capital and risk have a negative impact on bank efficiency, while depositors covered by a flat premium are exposed to risk. As a result, having enough cash could help to mitigate higher risk. It has been found that traditional banks in Bangladesh have more cost management efficiency.

Miah and Sharmeen (2015) stated that by improving "risk adjusted rates of return", the traditional financial system is the best mechanism for achieving prosperity and generating economic growth. Egypt's banking sector has the potential for additional development, expansion, and inclusiveness.

Hafez (2018) analyzed the interrelationship between the bank efficiency and capital adequacy ratio. He found that high-efficiency banks increase capital in positive correlation with the level of efficiency. The larger the capital ratio, the greater the risk, which has no bearing on the possibility of financial failure. The lower capital banks, the higher the capital, the lower the cost.

Hafez and Halim (2019) analyzed the operational and pure efficiency before and after the financial crisis through the application of data envelopment analysis. Findings revealed that traditional banks are more efficient before the financial crisis, however, Islamic banks are more efficient than traditional banks after the international financial crisis; this is due to the efficiency of management. The study revealed that Islamic banks play very vital and essential role in supporting and boosting economic growth in Egypt.

There is a gap in efficiency between traditional and Islamic banks. This suggests that Islamic banks' intermediation function is inadequate and that they were not able to maximize the management of input and output. Traditional banks that are classed as large banks receive a high degree of efficiency with a flat trend, but Islamic banks, categorized as small-capacity banks, have an annual efficiency gain. Because the number of traditional banks decreases every year, the efficiency of traditional banks has not increased. Islamic Banks, on the other hand, have seen an increase in the number of banks from a year to another, indicating the increase in their efficiency.

2. AIMS AND HYPOTHESES

The purpose of this study is to investigate if banks efficiency have an impact on its financial stability and, therefore, boosts economic growth in Egypt. Also, it aims to further examine if there is a significant difference between the categories of bank systems? operating in Egypt when addressing the impact of the efficiency of banks on financial stability of the financial system in Egypt.

The research hypotheses are as follows:

H_0: *The efficiency of Egyptian banks adversely affects financial stability of the financial system in Egypt.*

H_1: *The efficiency of Egyptian banks has a positive impact on financial stability of the financial system in Egypt*

H_2: *There is no significant difference between traditional and Islamic banks in Egypt when to measure the efficiency of Egyptian banks on the financial stability of the financial system in Egypt*

3. RESEARCH METHODOLOGY

3.1. Sample

Financial statements of Egyptian banks are listed in the Bankscope database. This study covers the period from 2005 to 2020 and divides Egyptian banks into:

- Group (A): traditional banks; 21 banks;
- Group (B): traditional banks with Islamic windows; 4 banks;
- Group (C): Islamic banks; 5 banks.

Accordingly, four different models of analysis have been conducted.

3.2. Economic efficiency index

Data envelopment analysis is based on the linear programming used to build non-parametric piecewise frontier over the sample data to compute the efficiency index of Egyptian banks. The production function is not known of the fully efficient bank. The updated model CCR as per unit orientation of the data envelopment analysis is used to compare between small and large banks. The economic efficiency index of Egyptian banks includes operational efficiency and allocative efficiency. Operational efficiency measures how Egyptian banks are efficient to maximize outputs from a given set of inputs. However, allocative efficiency addresses how to maximize the use of certain input. The technical efficiency is commonly measured by *TE*1 = 0Q/0P, which equals 1 – (QP/0P) ranges from 0 to 1. If the technical efficiency of a bank is 1, the bank is fully efficient. Moreover, the allocative efficiency of a bank operating is AE_1 = 0R/0Q. As a result, the total economic efficiency of any Egyptian bank is EE_1 = 0R/0P. A measure of the ratio of all outputs over all inputs across all Egyptian banks is obtained, namely ($u'y_i/v'x_i$) where u is an M×1 vector of outputs weights, and v is a K×1 vector of input weights. Taking the highest value of the weighted outputs into the weighted inputs, the technical efficiency of Egyptian banks is obtained. Multiple input and output of Egyptian banks is to be reduced to one input and output by obtaining the optimal weighting. The allocative efficiency of a bank is calculated as:

$$\begin{aligned} &\text{Max}_{u,v}\left(u'y_i / v'x_i\right), \\ &\text{where } u'y_j / v'x_j \le 1, \\ &j = 1,2, \ \ldots, n, \quad u,v \ge 0. \end{aligned} \tag{1}$$

The values of *u* and *v* are necessary to calculate the maximized values of the economic efficiency. The main constraint is the value of bank efficiency ≤ 1; as a result, there is an infinite number of solutions. In order to solve this statistical obstacle, a constant constraint is put, that $v'x_i$ = = 1 and the following formula is obtained (Farrell, 1957):

$$\begin{aligned} &\text{Max}_{\mu,v}\left(\mu' y_i\right), \\ &\text{where } v'x_i = 1, \\ &\mu' y_j - v'x_j \le 0, \\ &j = 1,2, \ \ldots, \ n, \quad \mu,v \ge 0. \end{aligned} \tag{2}$$

The equivalent envelopment of the linear programming problem is obtained as follows:

$$\begin{aligned} &\text{Min}_{\theta,\lambda}\theta, \\ &-y_i + Y\lambda \ge 0, \\ &\theta x_i - X\lambda \ge 0, \ \lambda \ge 0, \end{aligned} \tag{3}$$

Where θ is a scalar and λ is an N x 1 vector of constant. The value of θ is the value of bank efficiency. It has to be solved N times according to the number of banks included in the study sample. The minimum requirement to conduct the DEA analysis is the rule n ≥ max {m×s,3(m + s)}. The cutoff point rule stating that (2 inputs ×2 outputs, 3(2+2)) is exist to apply data envelopment analysis (Coelli, 1996). We conclude that the number of variables used in this study are reliable to conduct an efficient analysis.

3.3. The calculated economic efficiency index

Table 1 shows the efficiency index calculated by the researcher and divided into pure efficiency and scale efficiency, taking into account the banks' classification in the Egyptian market: traditional banks, traditional banks with Islamic windows, and Islamic banks.

3.4. Model specification

$$\begin{aligned} &Financial\ Stability = \beta_0 + \beta_1\left(BZ\right) + \\ &+\beta_2\left(NIM\right) + \beta_3\left(NNIM\right) + \beta_4\left(NOM\right) + \\ &+\beta_5\left(AME\right) + \beta_6\left(Efficiency\ Index\right) + \\ &+\varepsilon i = 1.8\ t = 1.9, \end{aligned}$$

where dependent variable: Financial stability (Z-score) – "Y_i"; β_0 = Intercept; X_1: Bank size (BZ);

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Table 1. Efficiency index

Year	The efficiency index	Egyptian banks	Traditional banks	Islamic windows	Islamic banks
2005	The Efficiency Index:	0.892	0.820	0.895	0.929
	Operational Efficiency	0.923	0.899	0.939	0.924
	Pure Efficiency	0.967	0.913	0.954	0.978
2006	The Efficiency Index:	0.049	0.907	0.859	0.874
	Operational Efficiency	0.975	0.935	0.910	0.917
	Pure Efficiency	0.938	0.970	0.945	0.954
2007	The Efficiency Index:	0.809	0.852	0.824	0.878
	Operational Efficiency	0.994	0.945	0.923	0.954
	Pure Efficiency	0.971	0.902	0.893	0.921
2008	The Efficiency Index:	0.909	0.862	0.836	0.893
	Operational Efficiency	0.898	0.956	0.932	0.960
	Pure Efficiency	0.970	0.901	0.897	0.931
2009	The Efficiency Index:	0.716	0.693	0.781	0.777
	Operational Efficiency	0.884	0.869	0.879	0.890
	Pure Efficiency	0.811	0.798	0.889	0.874
2010	The Efficiency Index:	0.601	0.592	0.685	0.726
	Operational Efficiency	0.785	0.764	0.778	0.885
	Pure Efficiency	0.764	0.775	0.881	0.821
2011	The Efficiency Index:	0.720	0.691	0.704	0.724
	Operational Efficiency	0.834	0.821	0.830	0.860
	Pure Efficiency	0.864	0.842	0.849	0.842
2012	The Efficiency Index:	0.790	0.718	0.741	0.740
	Operational Efficiency	0.892	0.825	0.840	0.886
	Pure Efficiency	0.886	0.871	0.883	0.836
2013	The Efficiency Index:	0.765	0.734	0.749	0.740
	Operational Efficiency	0.870	0.852	0.861	0.879
	Pure Efficiency	0.880	0.862	0.871	0.843
2014	The Efficiency Index:	0.790	0.769	0.784	0.781
	Operational Efficiency	0.883	0.873	0.882	0.895
	Pure Efficiency	0.895	0.882	0.890	0.873
2015	The Efficiency Index:	0.797	0.769	0.793	0.798
	Operational Efficiency	0.887	0.872	0.881	0.904
	Pure Efficiency	0.899	0.882	0.901	0.883
2016	The Efficiency Index:	0.782	0.759	0.874	0.891
	Operational Efficiency	0.884	0.876	0.998	0.994
	Pure Efficiency	0.885	0.867	0.876	0.897
2017	The Efficiency Index:	0.703	0.771	0.808	0.885
	Operational Efficiency	0.881	0.891	0.912	0.948
	Pure Efficiency	0.798	0.865	0.886	0.934
2018	The Efficiency Index:	0.778	0.783	0.841	0.875
	Operational Efficiency	0.885	0.875	0.934	0.911
	Pure Efficiency	0.880	0.895	0.901	0.961
2019	The Efficiency Index:	0.787	0.758	0.816	0.879
	Operational Efficiency	0.886	0.874	0.899	0.922
	Pure Efficiency	0.889	0.867	0.908	0.954
2020	The Efficiency Index:	0.781	0.706	0.808	0.905
	Operational Efficiency	0.885	0.866	0.893	0.943
	Pure Efficiency	0.883	0.815	0.905	0.960

X_2: Net interest margin (NIM); X_3: Net non-interest margin (NNIM); X_4: Net operating margin (NOM); X_5: Asset management efficiency (AME); X_6: The efficiency index; ε: Error term; β_0 is a constant; (β_1: β_6) are the parameters for explanatory variables; (ε_i) is the unobservable individual heterogeneity, and v_{it} is the remainder disturbance in the regression model.

3.5. Definition of variables

Table 2. Variables' definitions

Dependent variable	
Financial stability (Z)	$Z = \frac{ROA + E/A}{\sigma \cdot ROA} \cdot 100$
Independent Variables (The efficiency of Egyptian Banks)	
Net Interest Margin (NIM)	$\frac{Interest\ income\ from\ loans\ and\ security\ investments\ - \ Interest\ expense\ on\ deposits\ and\ on\ other\ debt\ issued}{Total\ Assets}$
Net Non-Interest Margin (NNIM)	$\frac{Noninterest\ revenues\ -\ Noninterest\ expenses}{Total\ Assets}$
Net Operating Margin (NOM)	$\frac{Total\ operating\ revenues\ -\ Total\ operating\ expenses}{Total\ Assets}$
Asset Management Efficiency (AME)	$\frac{Non\ Interest\ Expenses}{Operating\ Income - Loan\ Loss\ \mathrm{Pr}ovision}$
The Efficiency Index Score	Through the application of (DEA)
Bank Size (controllable variable)	Log total assets

4. RESULTS

The analysis was carried out at four levels, such as all Egyptian banks, Islamic banks, conventional banks and conventional banks with Islamic windows, using the application of DEA and certain financial ratios expressing the efficiency of Egyptian banks.

4.1. Model (A): All banks operating in Egypt

Table 3 illustrates the descriptive statistics of the study variables; dependent and independent ones. As shown from the tables above, all variables are asymmetrical. Especially skewness is positive for all variables except for bank size and net interest margin. Kurtosis value of all variables also indicates data is not normally distributed because values of kurtosis are deviated from 3.

Table 4 shows the correlation of coefficients between dependent and independent variables by the application on all Egyptian banks.

The efficiency index of Egyptian banks was calculated using data envelopment analysis and financial ratios, namely: net interest margin, net non-interest margin, net operating margin, and the efficiency of management were used as an approach to measure the efficiency of Egyptian banks. Most of the independent variables have either a significant positive or negative relationship with financial stability except bank size, net interest margin and net non-interest margin.

Table 3. Descriptive statistics (Model A)

Islamic banks	Min	Max	Mean	Median	Skewness	Kurtosis	SD	Jarque-Bera
Dependent variable								
Financial stability	–0.983	54.998	19.730	0.1901	1.145	3.243	11.637	187.379
Independent variables								
The Banks Efficiency index	0.725	0.818	0.726	0.719	1.4051	2.978	0.067	411,873
Bank Size	6.3019	9.207	7.607	0.468	1.3798	5.621	0.559	332.05
Net Interest Margin	0.687	7.0352	3.565	0.2326	1.709	30.891	1.188	14222.02
Net Non-Interest Margin	4.845	10.792	0.6191	0.4351	3.912	1.451	1.379	67.1432
Net Operating Margin	3.1873	9.575	2.842	0.052	.615	66.207	1.517	70322.01
Asset Management Efficiency	0.0183	12.906	3.948	0.045	4.706	80.111	2.550	152037
Observations	180	180	180	180	180	180	180	180

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Table 4. Correlation matrix for Model A

Correlation matrix	Financial stability	Size	NIM	Net NIM	NOM	Management efficiency	Efficiency Index Score
Financial stability	–	–.192	0.315	0.595	–0.915*	0.493*	0.254**
Bank size	–	–	.215	.310	.772	.241	0.245*
Net interest margin	–	–	–	–.0609	.891	0.673	0.533
Net non-interest margin	–	–	–	–	–.321	–0.675*	0.324
Net operating margin	–	–	–	–	–	0.601*	0.409*
Management efficiency	–	–	–	–	–	–	0.512*
The Banks Efficiency Index	–	–	–	–	–	–	–

Note: ** significance level at 0.01 (2-tailed); * significance level at 0.05 (2-tailed).

The efficiency index score and the management efficiency have a positive and significant relationship with financial stability at a significance level of 0.01 and 5%, respectively. However, net operating margin has a negative relationship with financial stability at a 0.01 significance level.

The efficiency of Egyptian banks (using financial ratios and the efficiency index score) has a significant positive impact on financial stability. A panel regression analysis using Eviews software is conducted by classifying Egyptian banks into three categories; traditional banks, traditional banks with Islamic windows and Islamic banks.

Table 5 shows a panel regression analysis using the Eviews software. The analysis was conducted on all Egyptian banks in order to further examine the interrelationship between the efficiency of Egyptian banks and financial stability. The efficiency index score of Egyptian banks and other explanatory independent variables explains the variability in financial stability by very weak percent at 14.1%.

4.2. Model (B): Traditional banks

Table 6 illustrates the descriptive statistics of the study variables; dependent and independent variables by the application on traditional banks. As shown from the tables above, all variables are asymmetrical. Especially skewness is positive for all variables except for bank size and net interest margin. Kurtosis value of all variables also indicates data is not normally distributed because values of kurtosis are deviated from 3.

Table 7 illustrates the correlation of coefficients between dependent and independent variables by the application on traditional banks in Egypt. Findings revealed that majority of independent variables have no significant relationship with financial stability except the efficiency index score of Egyptian banks. The efficiency index score has a positive significant impact on financial stability at a significance level of 0.01.

Table 5. Analysis output for Model A

Independent variables Bank Efficiency	Beta	t	Sig.	Significant at 10%	Collinearity statistics	
					Tolerance	VIF
(Constant)	–	–.689	.492	–	–	–
The banks Efficiency Index	0.218	0.043	0.713	Significant	0.791	3.671
Bank size	–.293	–.163	.871	Insignificant	.7041	2.165
Net interest margin	.258	.272	.786	Insignificant	.657	3.289
Net non-interest margin	.118	.129	.898	Insignificant	.691	4.519
Net operating margin	–.796	–.282	.778	Insignificant	.529	5.634
Asset management efficiency	.958	.268	.789	Insignificant	.778	2.162
Statistics fitness						
R^2	0.128					
Adjusted R^2	0.141					
F-equation	5.879					
Prob. (F-statistics)	0.003					

Table 6. Descriptive statistics for Model B

Islamic banks	Min	Max	Mean	Median	Skewness	Kurtosis	SD	Jarque-Bera
Dependent variable								
Financial stability	–0.599	53.448	21.015	1.2910	1.014	3.432	10.764	181.379
Independent variables								
The index of bank efficiency	0.679	0.713	0.654	0.731	4.573	24.712	0.054	35,415
Bank size	6.301	8.587	7.415	0.5157	–1.2794	4.721	0.461	837.15
Net Interest Margin	1.067	7.035	3.609	0.2541	–1.690	39.190	1.282	15,615.12
Net Non-Interest Margin	4.254	6.019	0.599	0.5307	4.905	1.607	0.939	76.2143
Net Operating Margin	3.187	7.168	2.934	0.096	0.779	67.317	1.471	69,232.01
Asset Management Efficiency	0.018	9.469	3.223	0.1561	5.607	89.179	2.799	149,032

Table 7. Correlations matrix for Model B

Correlation matrix	Financial stability	Bank size	NIM	Net NIM	NOM	Management efficiency	Efficiency index score
Financial stability	–	.179	–0.217	0.431	0.818	0.612	0.221*
Bank size	–	–	.314	.219	.673	.309	0.432
Net Interest Margin	–	–	–	.0804	.918	0.775	0.532**
Net Non-Interest Margin	–	–	–	–	–.405	–0.711	0.449*
Net Operating Margin	–	–	–	–	–	0.641*	0.456*
Management efficiency	–	–	–	–	–	–	0.613
The Banks Efficiency Index	–	–	–	–	–	–	–

Note: ** significance level of 0.01 (2-tailed); * significance level of 0.05 (2-tailed).

Table 8. Analysis output for Model B

Independent variables banks efficiency	Beta	t	Sig.	Significant at 10%	Collinearity statistics	
					Tolerance	VIF
(Constant)		.641	.523			
The Banks Efficiency Index	0.081	0.459	0.661	Insignificant	0.721	0.457
Bank size	.074	.594	.554	Insignificant	.689	2.254
Net interest margin	–.491	–1.910	.059	Significant	.782	4.345
Net non - interest margin	.019	.141	.888	Insignificant	.675	4.904
Net operating margin	.337	1.226	.223	Insignificant	.537	5.437
Asset management efficiency	.065	.562	.576	Insignificant	.715	2.260
Statistics Fitness						
R^2				0.041		
Adjusted R^2				0.063		
F-equation				0.003		
Prob (F-statistics)				0.996		

Table 8 shows a panel regression analysis using the Eviews software. The analysis was conducted on all traditional Egyptian banks in order to further examine the interrelationship between the efficiency of Egyptian banks and financial stability.

Results revealed that the index of bank efficiency and other independent variables managed to explain the variability in financial stability by only 6.3%. This means that there are other external variables that affect the financial stability of banks in Egypt.

4.3. Model (C): Traditional commercial banks with Islamic windows

Table 9 illustrates the descriptive statistics of the study variables; dependent and independent variables by the application on traditional banks with Islamic windows. As shown from the table above, all variables are asymmetrical. Especially skewness is positive for all variables except for bank size and net interest margin. Kurtosis value of all variables also indicates data is not normally distributed because values of kurtosis are deviated from 3.

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Table 9. Descriptive statistics for Model C

Islamic banks	Min	Max	Mean	Median	Skewness	kurtosis	SD	Jarque-Bera
Dependent variable								
Financial stability	0.70535	0.782	0.745	0.1312	1.013	2.345	11.98	191.830
Independent variables								
The Bank Efficiency Index	0.0030	0.5140	0.1321	0.1211	1.2056	3.257	0.0.065	189,045
Bank Size	7.692	9.207	8.377	0.7132	–1.2122	4.531	0.4190	824.05
Net Interest Margin	0.687	5.037	3.106	0.1321	–1.123	26.870	1.0275	11213.02
Net Non-Interest Margin	1.386	0.614	0.525	0.4351	2.219	1.223	0.495	73.13290
Net Operating Margin	1.0067	4.455	2.581	0.043	.613	64.702	0.915	68221.01
Asset Management Efficiency	2.053	6.048	4.179	0.024	5.607	79.201	1.188	142036
Observations	180	180	180	180	180	180	180	180

Table 10. Correlations matrix for Model C

Correlation matrix	Financial stability	Bank size	NIM	NNIM	NOM	Management efficiency	The Efficiency Index Score
Financial stability	–	–.081	–0.345	0.541	–0.891*	–0.592*	0.037**
Bank size	–	–	.521**	.181*	.387*	–.146*	0.421*
Net interest margin	–	–	–	–.079*	.712**	0.635*	0.521
Net non-interest margin	–	–	–	–	–.213*	–0.536**	0.816
Net operating margin	–	–	–	–	–	.721**	0.713*
Management efficiency	–	–	–	–	–	–	0.652**
The Banks Efficiency Index	–	–	–	–	–	–	–

Note: ** significant level of 0.01 (2-tailed); * significance level of 0.05 (2-tailed).

Table 10 illustrates the correlation of coefficients between dependent and independent variables by the application on traditional commercial banks with Islamic windows in Egypt.

Table 11 shows a panel regression analysis using the Eviews software. The analysis was conducted on all traditional commercial banks with Islamic windows in Egypt to further examine the interrelationship between the efficiency of Egyptian banks and financial stability.

The results proved that the efficiency index score of Egyptian banks and other independent variables explain the variability in financial stability by 22.2%.

4.4. Model (D): Islamic banks

Table 12 illustrates the descriptive statistics of the study variables; dependent and independent variables by the application on Islamic Banks. All variables are asymmetrical. Skewness is positive for all variables except for bank size and net interest

Table 11. Analysis output for Model C

Independent variables Banks Efficiency	Beta	t	Sig.	Significant at 10%	Collinearity statistics	
					Tolerance	VIF
(Constant)	–	–3.769	.001	–	–	–
The Banks Efficiency Index	0.521	1.623	0.023	Significant	0.635	3.817
Bank size	.394	3.469	.002	Significant	.6040	2.907
Net interest margin	3.44	4.662	.000	Significant	.559	3.982
Net non-interest margin	–1.05	–3.203	.003	Significant	.591	3.915
Net operating margin	–5.88	–4.718	.000	Significant	.410	4.536
Asset management efficiency	–.988	–3.351	.002	Significant	.472	2.625
Statistics fitness						
R^2	0.1938					
Adjusted R^2	0.222					
F-equation	16.79					
Prob (F-statistics)	0.0001					

Table 12. Descriptive statistics for Model D

Islamic banks	Min	Max	Mean	Median	Skewness	kurtosis	SD	Jarque-Bera
Dependent Variable								
Financial stability	–0.983	32.133	12.155	0.1433	1.103	2.651	9.62	211.138
Independent Variables								
The Banks Efficiency Index	0.0040	0.4065	0.1452	0.1120	1.9801	2.321	0.071	211,002
Bank size	6.883	8.018	7.477	0.6572	–1.5465	7.295	0.307	924.05
Net interest margin	1.127	5.965	3.820	0.1572	–1.553	28.378	0.932	12443.03
Net non-interest margin	4.845	10.792	0.744	0.5350	3.192	1.618	2.410	81.91329
Net operating margin	1.298	9.575	2.816	0.0651	.858	68.207	1.934	71110.01
Asset management efficiency	1.969	12.906	5.618	0.015	6.707	100.792	1.730	153949
Observations	180	180	180	180	180	180	180	180

Table 13. Correlations matrix for Model D

Correlation Matrix	Financial stability	Bank Size	NIM	NNIM	NOM	Management Efficiency	Efficiency Index Score
Financial stability	–	.065	0.257*	0.457	0.798*	–0.687	0.045**
Bank Size	–	–	.431**	.079	–.286**	–.135*	0.423*
Net Interest Margin	–	–	–	–.069*	.619**	0.532*	0.321
Net Non-Interest Margin	–	–	–	–	–.172*	–0.625**	0.761
Net Operating Margin	–	–	–	–	–	.535**	0.612*
Asset Management Efficiency	–	–	–	–	–	–	0.712**
The Banks Efficiency Index	–	–	–	–	–	–	–

Note: ** significance level of 0.01 (2-tailed); * significance level of 0.05 (2-tailed).

margin. Kurtosis value of all variables also indicates data is not normally distributed.

Table 13 illustrates the correlation of coefficients between dependent and independent variables by the application on Islamic banks in Egypt.

Table 14 shows a panel regression analysis using the Eviews software. The analysis was conducted on Islamic banks in Egypt to further examine the interrelationship between the efficiency of Egyptian banks and financial stability. The efficiency index score of Egyptian banks and other independent variables explain the variability in financial stability by 55.3%.

The relationship between financial stability and independent variables (bank size, net interest margin, net non-interest margin, asset management efficiency) is linear variables are directly proportional to each other and represent a straight line.

Table 14. Analysis output for Model D

Independent Variables Bank Efficiency	Beta	t	Sig.	Significant at 10%	Collinearity Statistics	
					Tolerance	VIF
(Constant)	–	.934	.356	–	–	–
The banks' efficiency index	0.721	1.211	0.006	Significant	0.431	2.987
Bank size	–.170	–.724	.473	Insignificant	.540	1.709
Net interest margin	.385	1.895	.066	Significant	.652	1.219
Net non-interest margin	.364	1.988	.054	Significant	.498	2.929
Net operating margin	.671	1.873	.069	Significant	.340	3.635
Asset management efficiency	–.953	–3.029	.004	Significant	.371	3.526
Statistics fitness						
R^2	0.372					
Adjusted R^2	0.553					
F-equation	3.11					
Prob. (F-statistics)	0.557					

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4.5. Result summary

Table 15. Results summary of the statistical model

Variables	Financial stability across different categories of banks			
	Model of all banks	Model of traditional banks	Model of traditional banks with Islamic window	Model of Islamic banks
The efficiency index score	Insignificant	Insignificant	Significant at 1%	Significant at 10%
Bank size	Insignificant	Insignificant at 10%	Significant at 1%	Insignificant
Net interest margin	Insignificant	Insignificant at 10%	Significant at 1%	Significant at 10%
Net non-interest Margin	Insignificant	Significant at 10%	Significant at 1%	Significant at 10%
Net operating margin	Insignificant	Insignificant at 10%	Significant at 1%	Significant at 10%
Asset management efficiency	Insignificant	Insignificant at 10%	Significant at 1%	Significant at 10%

Hypothesis test: Failure to reject H0 is linear.

Financial stability was measured by z-score. Explanatory variables managed to explain the change in financial stability by only 55.3 %, representing a strong fit model, and p-value is equal to 0.055, which is statistically significant at 10%.

- In the case of the model of all Egyptian banks – the size of the bank, net interest margin, net non-interest margin, net operating margin and the efficiency of asset management have no impact on financial stability.
- In the case of the model of conventional banks – only net non-interest margin has an impact on financial stability at a significance rate 10%.
- In the case of the model of traditional banks with Islamic windows – all financial ratios used in this study as a measure of efficiency have a significant impact on financial stability of Egyptian banks at a significance rate 1%.
- In the case of the model of Islamic banks – only bank size compared to other explanatory variables does not have any impact on financial stability.

Results showed that the efficiency index score of Egyptian banks has a very weak and significant impact on financial stability of Egyptian banks, therefore, the null hypothesis H_0 stating that the relationship between the efficiency of Egyptian banks and financial stability is zero can be accepted. However, for the model of Islamic and traditional banks with Islamic windows, the efficiency index score has a positive strong impact on financial stability of Egyptian banks at a significance rate 1% and 10%, respectively; this means that the null hypothesis can be rejected, the first alternative hypothesis H_1 is accepted, and the second alternative hypothesis H_2 is rejected; this means that there is a significant difference between traditional banks and Islamic banks in Egypt when considering the efficiency of Egyptian banks in relation to financial stability.

CONCLUSION

Only a few studies have investigated how bank efficiency affects financial stability of Egyptian banks and accordingly boosts economic growth. Moreover, financial stability of Egyptian banks is significant because it shows a stable financial system, which is vital as it encourages trust in the system and prevents destabilizing occurrences.

Empirical results showed that the efficiency of Egyptian banks has an impact on financial stability. However, the degree of impact varies based on the applicable banking system. Results revealed a positive, significant, and strong relationship between the efficiency of Islamic and traditional banks with Islamic windows and financial stability.

The majority of Egyptian banks are traditional banks with a percentage of 70%. Islamic and traditional banks with Islamic windows are more efficient than traditional banks, since traditional banks do not

apply Islamic moods of finance and investment. Less efficient banks are exposed to lower credit risk, since they do not provide more loans and do not build more provisions as a cushion against non-performing loans. Ultimately, this will lead to lower profitability, and the capital will result in less financial stability and afford less risk.

As long as banks are not efficient, they do not accept additional risk, this in turn reduces capital base to generate sufficient income. The lower the financial stability, the lower the banks' capabilities to support economic growth and development in Egypt. Conversely, as the level of efficiency increases, Egyptian banks accept higher risk to increase profitability rates and financial stability to support economic growth. Different finance and investment patterns of Islamic banks allow banks to accept lower risk rather than other banking systems. This shows how efficient Islamic banks are compared to other banks operating in Egypt.

The efficiency of operating rates of Egyptian banks represents an essential and vital element of financial stability, which directly contributes to reducing unemployment rates, which is the ultimate goal for any country. Islamic banks are more distinguished in terms of efficiency rates compared to other bank systems operating in Egypt.

The relationship between the efficiency level of Egyptian banks (three categories of banks) and financial stability is significant but very weak. On the contrary, the efficiency of Islamic and traditional banks with Islamic windows increases and has a positive and high significant impact on financial stability. Efficient banks accept risky assets with higher credit risk and build more provisions to generate higher returns for shareholders. The higher the risk, the higher the revenues and profits generated. Islamic banks increase capital to compensate the given high risk and enhancement the banks's capital base to increase the capital adequacy ratio and financial stability.

Alternative hypothesis is accepted stating that the efficiency index score of Egyptian banks has a positive significant impact on financial stability. This supports the adoption of the Islamic banking system to increase financial stability, as well as increase the financial inclusion and boost economic growth as a major requirement to the Egyptian economic, especially after the pandemic.

AUTHOR CONTRIBUTIONS

Conceptualization: Hassan Mohamed Mohamed Hafez.
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APPENDIX A

Table 1A. The study sample

No.	Bank name	Bank type
1	Commercial International Bank	Traditional bank
2	Societe Arab International De Banque (SAIB)	Traditional bank
3	Suez Canal Bank	Traditional bank
4	Arab African International Bank	Traditional bank
5	Principal Bank for Development and Agricultural Credit	Traditional bank
6	Arab International Bank	Traditional bank
7	Export Development Bank of Egypt	Traditional bank
8	Housing and Development Bank	Traditional bank
9	Industrial Development and Workers Bank of Egypt	Traditional bank
10	Arab Investment Bank	Traditional bank
11	Arab Bank Corporation (ABC)	Traditional bank
12	Bank Audi	Traditional bank
13	Bloom Bank Egypt	Traditional bank
14	Egyptian and Arab Land Bank	Traditional bank
15	Credit Agricola Egypt	Traditional bank
16	HSBC Bank	Traditional bank
17	African Export and Import Bank	Traditional bank
18	Bank of Alexandria and San Polo	Traditional bank
19	Banque Misr	Traditional bank
20	National Bank of Egypt	Traditional bank
21	Mashreq Bank – Egypt	Traditional bank
22	Banque du Caire	Traditional with Islamic window
23	Egyptian Gulf Bank (EG Bank)	Traditional with Islamic window
24	Misr Iran Development Bank	Traditional with Islamic window
25	Qatar National Bank Al Ahly (QNB ALAhli)	Traditional with Islamic window
26	Faisal Islamic Bank	Islamic bank
27	Al Baraka Bank, Egypt	Islamic bank
28	Federal Arab Bank for Investment and Development	Islamic bank
29	United Bank – Egypt	Islamic bank
30	Union National Bank Egypt (UNB – E)	Islamic bank

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