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# Determinants of Egyptian Banking Sector Profitability: Time-Series Analysis from 2004-2014

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**Abstract**

***Purpose*** *- The purpose of this paper is to examine the determinants of banking sector profitability in Egypt to shed light on the most influential variables that have a significant impact on the performance of this vital sector.*

***Design/methodology/approach -*** *The analysis includes a time series model of quarterly data from 2004 to 2014. The model utilizes Cointegration technique to investigate the long-run relationship between the return on equity as a proxy for bank profitability and several bank-specific variables including liquidity, capital adequacy, and percentage of non-performing loans. In addition, Vector Error Correction Model (VECM) is utilized to explore the short-run dynamics of the model and the speed of adjustment to reach the long-run equilibrium.*

***Findings -*** *The main findings of this work show that banking sector profitability is inversely related to capital adequacy, the percentage of loan provisions and the ratio of deposits to total assets. On the other hand, it is positively related to the size of the banking sector which implies that the banking sector exhibits economies of scale.*

***Research limitations/implications*** *- The implications of this work is that it helps reveal the major factors affecting bank performance in the short-run and long-run, and hence provide bank managers and monetary policy makers with beneficial insights on how to enhance bank performance. Since the banking sector represents one of the main engines of financing investment, enhancing the efficiency of this sector would contribute to economic growth and prosperity*

***Originality/value*** *- The Vector error correction model showed that about 4% of the disequilibrium is corrected each quarter to reach the long run equilibrium. In addition, all bank specific variables were found to affect profitability in the long-run only. This study would serve as a base that further work on Egyptian banking sector profitability can build on by incorporating more variables in the analysis or investigating other types of econometric models.*

**Key words**: Bank Profitability- Bank Performance- Determinants- Egypt- Time Series Analysis

**JEL Classification**: G21, C22

## 1. Introduction

Banks play a crucial role in the performance of the economy as a whole. This is particularly relevant in Egypt where the banking sector plays a significant role in the financial system. The Egyptian banking system represents one of the main channels of household savings. It is also a major source of financing public and private investments. Total deposits in local currency at banks reached 1009674 Million L.E. in 2014 as opposed to 255283 Million L.E. in 2004 with a growth rate of 295%. Similarly, domestic credit increased by 285% during the same period to reach 1625141 Million L.E. in 2014 as opposed to 422040 Million L.E. in 2004. These figures show the significant expansion of the banking sector activities as a major financial intermediary that channels household savings into investments. That said, the flourishing of the banking sector is necessary for macroeconomic stability and growth.

The study of bank profitability is crucial for several reasons. First, the study of bank profitability is a crucial determinant of employment and growth opportunities in the banking sector. An increase in profitability improves the financial status of banks making it easier to access sources of finance. This enables expansion of scale of operations and market growth which results in enhancing productivity, employment and growth of the banking sector (Ayanda et al., 2013).

Accordingly, it is crucial to identify the main variables that affect bank profitability in order to provide bank managers and monetary policy makers with beneficial insights on how to enhance bank performance. Since the banking sector represents one of the main engines of financing investment, enhancing the efficiency of this sector would contribute to economic growth and prosperity.

In addition, empirical findings prove that bank profitability is one of the early signals of financial crisis. Moreover, given imperfect capital markets, the fluctuations in banking sector profits affect the ability of banks to issue loans and finance investment, thereby depressing economic growth. In other words, a decline in profits will make it too costly to issue new shares due to transaction costs and tax disadvantages. As a result, banks will reduce lending to be able to meet regulatory reserve requirements. This is known as "bank capital

channel hypothesis" (Albertazzi and Gambacorta, 2009).

Given the importance of the study of profitability, this paper attempts to investigate the determinants of Egyptian banks profitability using time series analysis of quarterly data from 2004 to 2014. This will help determine the most influential variables that affect bank performance and hence provide insights on how to formulate policies and procedures to enhance bank profitability.

## 2. Literature Review

The study of the determinants of bank profitability dates back to Short (1979) and Bourke (1989). Short (1979) examined the relationship between commercial bank profits and bank concentration in addition to other explanatory variables. He found that greater market power lead to an increase in bank profits. Bourke (1989) continued to investigate the determinants of bank profitability based on Short's study. He found that capital ratios, liquidity ratios and interest rates are all positively related to the return on assets that was used as a proxy for profitability. While staff expenses were shown to have a negative impact on profitability. Finally, he reached similar findings to Short (1979) with respect to the positive impact of concentration on profitability. He further noted that higher levels of concentration are associated with lower levels of loan portfolio risks.

Following that, a number of empirical studies have been conducted to investigate the determinants of bank profitability. The existing literature divides the factors that affect bank profitability into endogenous variables that are related to bank specific characteristics and exogenous variables that are related to the macroeconomic environment. This work, however, focuses on bank-specific variables because it aims at identifying the impact on endogenous variables that are under the control of bank managers in order to provide policy implications at the bank level to maximize profits.

Another classification in literature is based on the number of countries investigated. Some studies on bank profitability used a panel of different countries while others focused on the banking sector of a single country. Examples of Panel data studies include Molyneux and Thornton (1992), Staikouras and Wood (2004), Goddard et al. (2004), Athanasoglou et al. (2006), Pasiouras and Kosmidou (2007), and Brissimis et al. (2008). The empirical findings of these studies are mixed. However, most of these studies found out that there is a significant positive relationship between equities/assets ratio and bank profitability implying that well- capitalized banks are more profitable. The ratio of loan loss provisions to total loans was found to be significantly negative as suggested by theory. As for liquidity, the results were mixed. Abreu and Mendez (2002) found that loans to assets ratios have a positive impact on profitability, while the results of Staikouras and Wood (2003) indicate that that loans to assets ratio is inversely related to banks' profitability. This implies that banks which invest in non-loan earning assets are more profitable than banks which rely more on loans.

Flamini et al. (2009) examined the factors affecting commercial bank profitability in Sub-Saharan Africa using a sample of 389 banks in 41 Sub-Saharan countries. They found that higher profitability is associated with larger bank size supporting the economies of scale hypothesis. Capital ratio also has a positive impact on profitability but only after a substantial lag indicating that any increase in capital is not reinvested immediately but takes some time to be reflected in profits. In addition, banks with more diversified activities tend to have higher levels of profits. Finally, they found that a stable macroeconomic environment represented in low inflation and output growth has a positive effect on bank performance.

Since this work focuses on a single country, namely Egypt, this survey of literature will present similar work in order to explore their findings and compare the empirical results. Numerous single country studies focused on the determinants of banking sector profitability in emerging countries as cited in Ben Naceur and Goaied (2008).

Most of these studies were conducted in Tunisia (Ben Naceur and Goaied, 2008), Nigeria (Ayanda et al., 2013), Columbia (Barajas et al., 1999), Malaysia (Guru et al., 2002) and Brazil (Afanasieff et al., 2002). Some of these studies investigated the impact of financial liberalization on bank profitability, and showed that liberalization measures affect profitability indirectly by influencing the variables behind interest rate spreads. Other studies focused on the endogenous and exogenous determinants of bank profitability. The results are similar to the findings of the studies conducted in developed economies. Macroeconomic variables represented in inflation rates, economic growth and required reserves are important determinants of bank profitability. As for endogenous factors, profitable banks were those who were able to increase their equity, had higher levels of deposits to asset ratios and who had more efficient internal management.

To conclude, the existing literature on bank profitability is comprehensive and has tackled different endogenous and exogenous variables related to profitability. However, to our knowledge, no study has investigated the profitability of Egyptian banking sector. The studies on the Egyptian banking system (Mohieldin, 2000, El-Shazly, 2001; Nasr, 2012; Herrara and Youssef 2013) focused on the market structure of the banking sector and sector developments and restructuring rather than the determinants of their profitability. Thus, this study attempts to fill this gap by investigating the determinants of profitability to provide insights to policy makers in order to enhance the performance of this vital sector. This study would also serve as a base that further work on Egyptian banking sector profitability can build on by incorporating more variables in the analysis or investigating other types of econometric models.

## 3. Model Specification

### 3.1 Data and Methodology

This study relies on quarterly data of banking sector indicators collected from various issues of monthly statistical bulletin published by the Central Bank of Egypt. The descriptive statistics of the selected variables is shown in Table 1. The variables that are included in the econometric model are:

***Dependent variable***: Return on Equity (ROE). ROE is defined as the ratio of net profits to total equity, expressed as a percentage. This measures the return to shareholders on their equity. Normally in literature, there are three variables that are used to measure profitability: return on average equity (ROE), return on average assets (ROA) and net interest margin (NIM). ROA measures the ratio of net profits to total assets, while NIM is defined as net interest income divided by total assets. In our analysis, we will rely on ROE as a measure of profitability. At first, pilot trials of the model were run using ROA as the dependent variable, however due to repeated observations in the available data set, near singular matrix error was found. Thus, ROE was selected to be the dependent variable in our model especially that empirical research findings (Goudrean and Whitehead (1989) and Uchendu (1995) as cited in Ayanda et al., 2013) show that the three proxies of profitability yield similar results, thus any one of them can be used as the dependent variable.

***Independent variables: Bank specific characteristics***

***EQ:*** The ratio of equities over total assets. This variable is used as a proxy for capital adequacy. A higher value of this ratio implies that the bank is more capable to absorb shocks since higher equity reduces the need to external funding. Moreover, well-capitalized banks face a lower risk of bankruptcy. Thus, it is expected that the higher the value of this ratio, the more profitable the banking sector is (Dietrich and Wanzenried, 2011; Kosmidou, 2008). On the other hand, some authors argue that higher equity to assets ratio suggest lower risk-taking by banks and hence lowers the expected return on equity and decreases profitability (Molyneux, 1993 as cited in Staikouras and Wood, 2004). Moreover, higher equity to assets ratio decreases tax shield provided by the deduction on interest payments and hence lowers after tax profits.

***LOANPROV***: This variable is defined as the percentage of loan provisions to total loans. This ratio denotes the banking sector asset quality. A higher value of this ratio means that the credit risk is higher and hence assets quality is poor. From one perspective, the risk-return hypothesis implies that the higher the risk, the higher the return. Thus, according to this hypothesis, it is expected that there is a positive relationship between this ratio and bank profitability. On the other side, poor asset quality increases the costs of financing and increases the possibility of default which results in a reduction of the interest and installments income paid to the bank. Hence, it is expected that a higher value of this ratio has a negative impact on profitability (Kosmidou, 2008; Dietrich and Wanzenried, 2011).

***DEPASSETS***: The ratio of deposits to total assets. This variable denotes the impact of funding source on bank profitability. In general, a higher volume of deposits leads to higher profitability as long as these deposits are channeled to interest-earning loans and profitable investments. However, if the deposits are not directed to loans, more deposits can depress profitability because in this case it will represent idle money (Vong and Chan, 2006).

***LOANSDEPOSITS:*** the ratio of loans to total deposits, which is used as a proxy for liquidity. A higher value of bank loans to total deposits denotes less liquidity because the bank is holding less reserves or liquid assets (Kosmidou, 2008; Vong and Chan, 2006). Banks tend to hold liquid assets to be able to meet liquidity requirements. However, liquid assets have a lower rate of return. Thus, a higher level of liquidity implies a lower level of loans to deposits ratio and hence lower level of interest bearing assets and lower profitability.

***BRANCHES***: This variable shows the total number of branches of banks operating in Egypt. It is used to measure banking sector size. It is expected that this variable will have a positive effect on profitability since the larger number of branches enables the banking sector to benefit from economies of scale and improve managerial operations.

To proceed with the analysis of the determinants of Egyptian banking sector profitability, a number of steps are taken. First, we will test for stationarity of the variables to avoid spurious regression resulting from using nonstationary variables entered at their level form. If all variables were found to be non-stationary but integrated of the same order, we will proceed to investigate whether there is a long run relationship between variables through Johansen test of cointegration. Finally, the Vector Error Correction Model (VECM) will be utilized if the variables are cointegrated to capture the short run dynamics of the model as illustrated in the next section.

**Table 1: Summary statistics of the variables**

| *Variable* | *ROE* | *EQ* | *DEPASSETS* | *LOANSDEPOSITS* | *LOANPROV* | *BRANCHES* |
|---|---|---|---|---|---|---|
| *Mean* | 13.14 | 5.82 | 73.16 | 52.43 | 12.84 | 3326.273 |
| *Median* | 13.70 | 5.70 | 73.25 | 52.65 | 13.70 | 3451.500 |
| *Maximum* | 17.70 | 7.10 | 79.40 | 65.70 | 16.50 | 3743.000 |
| *Minimum* | 9.10 | 4.80 | 67.40 | 40.40 | 8.60 | 2771.000 |
| *Std. Dev.* | 1.88 | 0.79 | 2.99 | 6.21 | 2.47 | 329.1380 |

Source: Author's calculation based on CBE data, Monthly statistical bulletin, different issues

### 3.2 Econometric modeling

#### 3.2.1 Stationarity tests of the variables

To test for stationarity, the Augmented Dickey Fuller test is utilized. This test takes the form shown in equation

$$\Delta Y_t = \alpha + B_t + \rho\, y_{t-1} + \sum_{j=1}^{p} \delta \Delta\, Y_{t-j} + E_t \quad (1)$$

where $Y_t$ is replaced by each variable of the model. In this equation the first difference of the variable is regressed on a constant, linear trend and first lag as well as other lags of the dependent variable. The null hypothesis of the ADF test is B=0, and $\rho$ =1 indicating that the variable is non stationary. If the absolute value of the ADF test statistic is greater than Mackinnon critical values, the null hypothesis is rejected indicating that the variable is stationary (El-Kawaga et al., 2013).

#### 3.2.2 Johansen test of cointegration

If all variables are integrated of the same order, we can proceed to apply the cointegartion test. If the variables are cointegrated, this implies that a linear combination of the variables is stationary. In this case, they can be used in regression at their level form without leading to spurious regression. In addition, cointegration implies that there exists a long-run relationship between the variables. There are numerous tests to test for the presence of cointegration among variables including the Engle-Granger procedure and the Johansen Maximum Likelihood test of cointegration. However, the Johansen test has been reported in literature to be more powerful than the Engle-Granger procedure (Shintai, 1994 as cited in Nazier and Essam, 2012). Moreover, it has the advantage of taking into account the presence of more than one cointegrating vector (El-Baz, 2014).

#### 3.2.3 Vector Error Correction Model

If all variables are cointegrated, it will be useful to proceed with VECM model. VECM model gives information about the short run dynamics of the model and the speed of adjustment at which the dependent variable reaches the long run equilibrium after a change in independent variables. Thus, VECM shows the short run properties of the cointegrated series. The VECM model can be represented by equation

$$\Delta Y_t = \propto_0 + \sum_{i=1}^{p} \propto_{1,i} Y_{t-i} + \sum_{i=1}^{p} \propto_{2,i} X_{t-i} + \theta ECT_{t-1} + E_{1t} \quad (2)$$

where: $\propto_{1,i}$ $and$ $\propto_{2,i}$ measure the short run relationship between the variables X and Y, the term $ECT_{t-1}$ refers to the error correction term which indicates the speed of adjustment towards equilibrium and the coefficient $\theta$ should be negative and significant (El-Baz, 2014).

## 4. Empirical Results and Discussion

### 4.1 Stationarity results

All variables were found to be non-stationary at level since the ADF test statistic was found to be lower than the critical values at all levels of significance. Thus, we cannot reject the null hypothesis of the presence of unit roots. However, after taking the first difference, the variables became stationary. This implies that all variables are integrated of order 1 as shown in Table 2.

**Table 2: Augmented Dickey Fuller test of stationarity**

| *Variable* | *At level* | | *First Difference* | |
|---|---|---|---|---|
| | ADF Test statistic | Critical values* | ADF Test statistic | Critical values* |
| *ROE* | -2.71 | -3.52 | -8.5 | -3.52 |
| *Equities/ Deposits* | -2.96 | -3.52 | -7.16 | -3.52 |
| *Deposits/ Assets*** | 0.66 | -1.95 | -2.45 | -1.95 |
| *Loan provisions /total loans* | -2.44 | -3.52 | -9.20 | -3.52 |
| *Loans/ Deposits* | -2.93 | -3.52 | -6.4 | -3.52 |
| *Branches* | -1.91 | -3.52 | -4.62 | -3.52 |

* The table shows critical values at 5% level of significance

**Trend and constant were not significant for deposits/assets variable

### 4.2 Johansen Cointegration test

Since all variables are integrated of the same order, we can proceed to apply the Johansen cointegration test to determine the number of cointegrating vectors. To identify the lag length of this model, the Schwarz information criterion and the Hannan-Quinn information criterion of the Unrestricted Vector Auto Regression model (VAR) were adopted. These two criteria recommend using 1 lag in the model.

In the Johansen cointegration test, two tests are utilized to determine the number of cointegrating equations: the trace test and the maximum Eigen Value test. The results, presented in Table 3, show that there is one cointegrating vector according to the trace test[1].

**Table 3: Johansen Cointegration Trace test results**

| *Hypothesized No. of CE(s)* | *Eigen Value* | *Trace Statistic* | *0.05 Critical Value* | *Prob.*** |
|---|---|---|---|---|
| **None *** | 0.60041 | 98.8691 | 95.7537 | 0.03 |
| **At most 1** | 0.40765 | 60.3417 | 69.8189 | 0.23 |
| **At most 2** | 0.30987 | 38.3478 | 47.8561 | 0.29 |
| **At most 3** | 0.27062 | 22.7712 | 29.7971 | 0.26 |
| **At most 4** | 0.14391 | 9.51777 | 15.4947 | 0.32 |
| **At most 5** | 0.06876 | 2.99208 | 3.84147 | 0.08 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

ROE= 181.7 -32.1 EQ -2.5 DEPASSETS

[1] When running the Johansen Cointegration test, it has been found that the trace test and the maximum Eigen Value test give different results. It has been suggested in literature (Alexander, 2001 as cited in Asari et al., 2011), that in these cases, the trace test results are preferred. Thus, the analysis presented relies on trace test results.

(-4.48) (-2.40)
- 4.4LOANPROV+0.34LOANDEPOSITS+0.064BRAN (3)
(-3.6) (0.497) (4.23)

Equation (3) represents the cointegrating equation. The numbers in parenthesis show the t-statistic for the cointegrating coefficients. At 5% significance all coefficients are significant except the ratio of loans to deposits.

Bank profitability was found to be inversely related to capital adequacy. Although this result contradicts most empirical research findings, it is consistent with economic theory that states that maintaining high capital levels is associated with lower risk taking activities and hence lower profitability. This implies that Egyptian banks do not manage their capital efficiently. This is also consistent with the results of Ayanda et al. (2013) and Berger and Mester (1997) who argued that the amount of equity capital requires a number of decades to be used to expand the asset portfolios of banks. Bank profitability was also negatively related to the percentage of loan provisions as consistent with other studies findings. As for the ratio of deposits to total assets, it is negatively related to profitability implying that there is a large volume of deposits that are not channeled to investments. The banking sector also exhibits economies of scale in the sense that expanding banking operations and increasing the number of branches lead to higher profits.

**4.3 Vector Error correction Model**

The results of the VECM are shown in equation (4) below.

$$\Delta ROE = -0.346\ \Delta ROE_{(t-1)} - 0.606\Delta EQ_{(t-1)} - 0.126\ \Delta DEPASSETS_{(t-1)} - 0.045\ \Delta LOANPROV_{(t-1)} + 0.008\ \Delta BRANCHES_{(t-1)} - 0.04\ \Delta EC_{(t-1)} \quad (4)$$

where $\mathbf{EC_{(t-1)}}$ is the error correction term. It is statistically significant at 5% level of significance and has the correct negative sign indicating that any short term fluctuations between the independent variables and the dependent variable are automatically corrected in the long run to provide a stable long run relationship. The error correction term shows that about 4% of the disequilibrium is corrected each quarter to reach the long run equilibrium. The remaining short term coefficients were found to be insignificant which implies that all bank specific variables affect profitability in the long-run. This is quite reasonable since it takes time for any change in those variables to be reflected in the profitability indicators.

## 5. Conclusion and Policy Implications

This paper investigated the determinants of Egyptian banking sector profitability using quarterly time series data from 2004 to 2014. The study utilized Cointegration technique and vector error correction model to explore the long-run relationship among banking sector variables in addition to the short-run dynamics. The results of this work show that bank profitability, as measured by the return on equities, is inversely related to capital adequacy, the percentage of loan provisions and the ratio of deposits to total assets. On the other hand, bank profitability is positively related to the size of the banking sector as measured by the number of branches which implies that the banking sector exhibits economies of scale. The Vector error correction model showed that about 4% of the disequilibrium is corrected each quarter to reach the long run equilibrium. In addition, all bank specific variables were found to affect profitability in the long-run only.

As a matter of policy implications, several procedures can be taken at the bank level to improve the profitability of the Egyptian banking sector. First, bank managers need to diversify their portfolios, enter new markets and increase their managed risk-taking activities instead of maintaining high capital ratios since our findings suggest that a higher equity to assets ratio lowers risk and hence lowers the return on equity. Second, banks need to maintain efficient credit departments to evaluate the credit risks associated with their loans since higher ratios of loan provisions to total loans has a negative impact on profitability. Finally bank managers should seek to channel deposits into profitable investments and enter as partners with investors, and benefit from economies of scale by increasing bank size.

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