# The Determinants of the Tunisian Banking Performance: A Panel Data Analysis

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## Abstract

This paper aims to empirically analyze the determinants of the Tunisian banking performance for the period 2003–2012. Our findings reveal that the increase of the capitalization's level of these banks results in superior performance, quotation in stock exchange and size positively affect the performance of the studied Tunisian banks, in addition private banks outperform their public counterparts. And finally, the performance of Tunisian banks was negatively affected by the revolution of 14 January 2011.

**Keywords:** bank performance, determinants of bank performance, Tunisian banks, panel data

## 1. Introduction

Performance in a bank is all that helps to improve the torque value for money. Thus, it is defined as the ability to achieve the objectives while minimizing costs; it comes down to these two concepts: efficiency and effectiveness covering two good instincts and complementary aspects of the performance. According Mouzas (2006), efficiency and effectiveness are key terms in evaluation and measurement of business performance, but the challenge is to balance this past efficiency with effectiveness. The first relates to the means used and to the results obtained. As to the second, it relates to the objectives and results.

Facing the new financial and international architecture, the banking profitability was impacted by the financial liberalization. Indeed, the various measures of the latter have increased interbank competition. Our present study consists to search the basic factor able to improve the banking performance and to being capable to support the environment competition.

The main objective of this study is to empirically analyze the determinants of the Tunisian banking performance over the period 2003–2012. We will try to resolve this question:

What are the factors that explain the performance of Tunisian banks?

The articulation of this paper is presented as follow: firstly we will discuss the major empirical studies on the determinants of bank performance, secondly we will deal with the adopted research methodology and finally, we will present the empirical results found along with their interpretations.

## 2. The Determinants of Bank Performance: A Literature Review

Studies that have investigated the determinants of performance of the banking sector are quite numerous. In this context, risk management is an endogenous factor in the banking firm, thus it is sometimes suggested as the cause of the variability of the performance of credit institutions. The association of risk to the bank performance is explained by the nature of the intermediation activity, which carries intrinsic to multiple risk factors. In this regard, low asset quality and a lower level of liquidity are the two major causes that lead to bank failures, it is for this reason that the majority of empirical studies give particular importance to credit risk and liquidity.

In this context, Molyneux and Thornton (1992) show a negative and statistically significant relationship between the level of liquidity (as measured by credit / total assets ratio) and bank performance. The level of liquidity has a statistically significant effect and it is positively related to the performance of domestic banks, concerning the foreign banks, this variable is also significant but with a negative sign; this result is founded by Pasiouras and Kosmidou (2007). For the impact of credit risk on bank performance, as showing in Athanasoglou et al. (2008)

work, is clearly negative.

The capital is one of the internal determinants of performance of credit institutions which was the subject of several empirical studies. Indeed, the link between bank performance and capitalization ratio (equity / total assets) was demonstrated by Ben Naceur and Goaid (2001), Abreu and Mendes (2002) and Ben Nasser (2003). Ben Naceur and Goaid (2001) argue that the most performant banks are those that have fought to improve the productivity of labor and capital, and those who were able to strengthen their capital. As for Abreu and Mendes (2002) and Ben Nasser (2003), they agree on the fact that highly capitalized banks don't need for external financing, bank failures are less pronounced and costs financing are lower. These result in improved performance of credit institutions.

In the banking market, the income of non-traditional activities continues to grow and to make a significant improvement in net banking income to traditional activities include the raising of resources, the distribution of credits and the provision of payment methods, and which began recording a decline induced by increased competition between banks.

Indeed, the interest margin is seemed to be decreased due to the level of competition between banks after the adoption of the financial reforms. Consequently, the financial establishments have been oriented to non-traditional activities such as equity in the capital of undertakings, services on deposit accounts and the sale of insurance products.

In this context, according to Stiroh and Rumble (2006) who carried out a study on the banks performance in the United States during 1997–2002, diversification into non-traditional activities can improve their performance.

Lozano-Vivas and Pasiouras (2008) conducted a study on a sample of 87 countries in transition, and demonstrate a statistically significant and positive impact of non-traditional banking activities on the performance of banks in different countries measured by their efficiency cost.

More recently, Chien-Chiang Lee et al. (2014) studied the impact of income diversification on the performance of banks in 2372 belonging to 29 countries in Asia Pacific, covering the period between 1995 and 2009. Their results confirm the assumption that the performance of these banks can be improved through diversification.

The ultimate goal of any bank is growing its wealth. At the time of globalization and open borders, this goal is often hampered by the lack of capital necessary for the implementation of development strategies of banks. Securties listing is then a real opportunity for them. It responds to various reasons:

- Raise funds, this financial transaction is the main motivation for any introduction. Indeed, the quotation in capital market is an alternative source of funding.

- An enlargement willingness of the shareholders. In this context, the quotation in capital market can find investors willing to buy shares at a fixed reference price on the market.

- Increase awareness of the bank. Indeed, the quotation in capital market allows a bank to consolidate its reputation by supplying credibility and trust. Its image emerges as strengthened one at national and international level.

- Benefit from substantial tax incentives. Indeed, the quotation in capital market of a bank allows the latter to receive special and favorable tax status.

In this context, according to Dermirguc-Kunt and Levine (1996), the stock market's liquidity allows shareholders to sell their shares and allows business financing, so these last have a constant access to capital. Thus, a capital market allows companies to minimize the risk of liquidity and reduce transaction costs.

The stock market liquidity facilitates the less risky and more attractive investments; this result is founded by Levine and Zervos (1996).

The relationship between size and performance is an important part of the firm theory. Indeed, in the context of maximizing profits there is the problem of the optimal size of a company. If the relative size of a firm increases its market power and its profit: this is the market power assumption. It also refers to the Structure-Conduct-Performance (SCP) which states that the growth effect of size on bank performance is significantly positive.

In the estimates, the introduction of size is often justified on the issue of the existence or non-existence of scale economies. Thus, by performing regressions on panel data, the assumption that bank performance is positively correlated with size, is founded by Molyneux and Thornton (1992) and Goddard et al. (2004). However, this conclusion does not coincide exactly with that of Ben Naceur and Goaied (2001) for which the size is by no

means a source of cost savings, indeed studying the performance of Tunisian deposit banks for the period 1980–1995, these authors found that the size is not statistically significant.

Inflation is defined as a loss of purchasing power of a currency which results in a general and sustained increase in prices. To be more precise, it is the excessive increase in the money supply relative to the volume of production. Regarding the effect of inflation on the performance of credit institutions, Perry (1992) distinguishes between two situations:

- The first is when inflation is properly anticipated and interest rates are adjusted so as incomes rise faster than the costs of credit institutions, in this case it will have a positive effect on bank performance.

- The second situation is when inflation is not properly anticipated and banks are not able to adjust interest rates, in this case the cost of credit institutions exceed the income and inflation will a negative effect on the bank performance.

In this regard, Molyneux and Thornton (1992) have clarified the link may exist between the performance of banks and inflation, their empirical results show a positive relationship background, suggesting that the increase in inflation would favor increased profits of credit institutions. Similarly, Demirguç-Kunt and Huizinga (1999), who carried out a study on the empirical analysis of the determinants of bank performance concerning 80 developed and developing countries over the period of 1989–1995, shows a positive correlation between inflation and bank margins. Pasiouras and Kosmidou (2007), founded that the inflation is positively related to the performance of domestic banks, as well as they point out that during the period of study (1995–2001), the levels of inflation were highly anticipated by them, giving them the opportunity to properly adjust interest rates and therefore earn high profits. With regard to foreign banks, they found a completely opposite result, that is to say that inflation has had a negative effect on the performance of foreign credit institutions. To this end, these authors argue that these mixed results could be attributed to different levels of knowledge concerning the conditions of macroeconomic countries as well as the expectations for the inflation rate between domestic and foreign banks.

In the banking literature, ownership of credit institutions is considered as an important determinant of bank performance. Indeed, as public banks have been privatized by the sale of their shares to foreign owners using the most modern technologies, then these foreign banks are more performent than the former especially in developing countries. In this context, Claessens et al. (2001) studied the impact of foreign bank entry on the performance of domestic credit institutions. These authors found that in developing countries the foreign banks have higher profits than the second, and that the presence of the former banks leads to a reduction in the performance of the latter's profits.

Omran (2007) studied the performance of 12 Egyptian banks during the period of 1996–1999. The empirical results show that banks with a large private property are more performant than public banks.

The Tunisian Revolution of 2010–2011 sometimes called "Jasmine Revolution", is a revolution through a series of demonstrations and sit-ins, has led to the departure of the Tunisian president Zin el-Abidin Ben Ali in office since 1987. It should be noted that the Tunisian economy has faced after the revolution unprecedented difficulties arising from political instability. This has had a negative impact on the Tunisian banking sector. Indeed, it faced difficulties, particularly in terms of profitability deterioration.

We'll be interested in what follows, to determine the factors that Tunisian banks can act to improve their performance and follow the requirements of an increasingly more competitive environment.

## 3. Empirical Study: Regression Model

We study the determinants of the banking performance during the period 2003–2012; in this study, data are collected from the annual report of considered banks (Association Professionnelle Tunisienne des Banques et des Etablissements Financiers). The sample consists of 19 banks.

Panel data have two dimensions: one for individuals and one for time. They are generally indicated by the index respectively i and t. This double dimension can be interpreted as the double dimension of information available: a single dimension (individuals differ from each other) and a temporal dimension (the situation of each individual varies from one period to another). It is common to translate these two components of the information provided in terms of variance decomposition comments. Thus, it's assume that we have observations on N individuals assumed to be observed on the same set of periods, t = 1, ..., T.

The double dimension of panel data is a decisive advantage over other types of data, time series and cross sections. It makes it possible to simultaneously realize the dynamic behavior and their possible heterogeneity,

which is not possible with the time series or cross-sections.

In total, the panel data technique is considered as the most efficient method to estimate the determinants of the Tunisian banking performance. It takes the two dimensions which are the individual and the temporal axes, provides insight different determinants could explain this bank performance.

Many factors can be considered able to explain the performance of the Tunisian banks. In this study, we have chosen the most relevant determinants to explain the performance of Tunisian banks. The function to be estimated is as follows:

$$ROA_{i,t} = \alpha + \beta_1 LA_{i,t} + \beta_2 KA_{i,t} + \beta_3 NET_{i,t} + \beta_4 NON_{i,T} + \beta_5 LIST_{i,t}$$
$$+ \beta_6 logTA_{i,t} + \beta_7 Inf_t + \beta_8 OWN_{i,t} + \beta_9 REV_t + \varepsilon_{i,t} \tag{1}$$

With:

**-$ROA_{i,t}$**: it's question of the variable reflecting the performance of bank i in the year t, measured by return on assets. ROA = net income / total assets.

**-$LA_{i,t}$**: a variable that reflects the quality of the assets of bank i in year t. It is measured by the current credit / total ratio.

**-$KA_{i,t}$**: a variable that refers to the degree of capitalization of the bank i in year t, it is the ratio of equity / total assets. A high ratio of KA is an indicator of a high bank capitalization that can positively affect bank efficiency. As a positive sign of the coefficient of this variable is expected.

**-$NET_{i,t}$**: (Net interest income)*:* a variable that refers to the share of interest income in net banking income of bank i in year t. We can appreciate the financial base of traditional intermediation record tracing the evolution of the share of net interest in the Net Banking Tunisian banks. So, it is measured by the ratio: Interest and similar / Net Banking Income.

An overview of the theoretical and empirical literature has shown that a high ratio of NET means that banks pay more attention to traditional activities primarily related to the collection of deposit and credit distribution. This can positively affect bank performance. Thus we expect that the coefficient on this variable is positive.

**-$NON_{i,t}$**: (Non-interest income)*:* a variable that refers to the share of non-interest income in net banking income of bank i in year t. It is measured by the ratio [(Commissions (in products) + gains on commercial securities portfolio and financial operations + income investment portfolio)] / Net Banking Income.

A high ratio of NON reflects the improved diversification of banks in non-traditional activities or market. In other words, this variable reflects the role of the intervention of banks in different markets in order to improve their performance. Thus, a positive coefficient for this variable is expected.

**-$LIST_t$**: a dummy variable indicating the status of the stock exchange listing of bank i in year t. It takes the value 1 if it is listed and 0 otherwise.

Trading banks in exchange has several advantages: their reputation is greatly increased with their customers and suppliers, this reputation can leverage future success. Indeed, the main advantage of the rating of a bank is also the possibility to appeal to markets for financing (issuance of new shares and / or capital increase, issuance of bonds, etc.) And achieve of acquisitions. Thus we expect that the coefficient on this variable is positive.

**-$logTA_{i,t}$**: This variable refers to the size of the bank i in the year t measured by the logarithm of total assets. It is included in the model to account for differences in bank efficiency caused by the size effect. More specifically, it is used to confirm if it is related to economies or diseconomies of scale. Thus the coefficient of logTA can show a positive (presence of economies of scale) or a negative (presence of diseconomies of scale). Thus, the expected sign is ambiguous.

**-$Inf_t$**: This is a variable reflecting the inflation in year t. We can distinguish between two situations: the first is when inflation is properly anticipated and interest rates are adjusted so as incomes rise faster than the costs of credit institutions, in this case it will have a positive effect on bank performance. The second situation is when inflation is not properly anticipated and banks are not able to adjust interest rates, in this case the cost of credit institutions exceed the income and inflation will have a negative effect on the bank performance. Therefore, the expected sign is ambiguous.

**-$OWN_{i,t}$**: a dummy variable for the ownership structure of the bank i in year t. It takes the value 0 for state banks and the value 1 for private banks. Several theoretical and empirical studies have shown that private banks and privatized institutions are considered more efficient than public banks because of their greater capacity to reduce costs. Thus, a positive sign for the coefficient of this variable is expected.

**-$REV_i$**: a dummy variable indicating the Tunisian revolution in year t. It takes the value of 1 in the presence of revolution and the value 0 otherwise.

Due to insufficient equities, Tunisian banks are unable to increase their lending volumes and then they are unable to improve their performance. Thus, a negative sign of the coefficient on this variable is expected.

**-$\varepsilon_{i,t}$**: the error terms.

## 4. Empirical Results and Interpretations

Before presenting the empirical results and interpretation of the factors explaining the performance of Tunisian banks, we present in this part of the descriptive statistics and the results from univariate tests on the studied variables.

*4.1 Descriptive Statistics*

The table below shows the descriptive statistics of the variables used in the study.

Table 1. Descriptive statistics for quantitative variables

| Variable | Mean | Std. Dev | Min | Max |
|---|---|---|---|---|
| ROA | 0.0078229 | 0.0167747 | -0.1669338 | 0.0918319 |
| LA | 0.8048085 | 0.0964936 | 0.3711483 | 0.9582487 |
| KA | 0.1490988 | 0.1892429 | -1.332326 | 0.8307791 |
| NET | 1.495458 | 4.56531 | -6.521852 | 63.09678 |
| NON | 0.4671589 | 0.634322 | -1.044225 | 8.608871 |
| logTA | 13.86859 | 1.298918 | 11.14439 | 15.88465 |
| Inf | 3.8 | 1.015593 | 2 | 5.5 |

On average, the performance of the assets (ROA) of Tunisian banks studied over the period 2003–2012 is 0,007%, the performance is relatively low. The standard deviation of this variable is also small; it is of the order of 0,016%. Furthermore, the minimum performance is -0,166% and the maximum performance is 0,091%.

On average, the quality of the asset or liquidity (LA) Tunisian banks studied over the period 2003–2012 is of the order of 0,804%. Its standard deviation is equal to 0,096%, the minimum value is 0,371% and the maximum value is equal to 0.958%.

For its part, the average funding ratio (KA) Tunisian banks studied over the period 2003–2012 is 0,149%. Its standard deviation is of the order of 0,189%, its minimum value is -1, 33% and the maximum value is equal to 0,830%.

Moreover, the average traditional activities (NET) Tunisian banks studied over the period 2003–2012 is 1,495%. The standard deviation of this variable is equal to 4,565%, its minimum value is -6,521% and the maximum value is equal to 63,096%.

As for the average non-traditional activities (NON) Tunisian banks studied over the period 2003–2012 is 0,467%. The standard deviation of this variable is equal to 0, 634%, the minimum value is -1,044% and the maximum value is equal to 8,608%.

Average size (logTA) Tunisian banks studied over the period 2003–2012 is 13,868. The standard deviation of this variable is of the order of 1,298. Moreover, the minimum size is 11,144 and the maximum size is 15,884.

The average value of inflation (Inf) in Tunisia over the period 2003 to 2012 is about 3,8%. Its minimum value is equal to 2 and its maximum value is equal to 5,5%. The increase in inflation in 2012 is one of the implications of the Tunisian revolution of 14 January 2011.

Table 2. Frequency of binary variables

| | 0 | 1 | Total |
|---|---|---|---|
| LIST | 42,10 % | 57,89 % | 100% |
| OWN | 15,78 % | 84,21 % | 100% |
| REV | 80% | 20% | 100% |

From the table above, 42, 10% of the banks are not listed and 57, 89% are listed. 15, 78% of banks are public and 84, 21% are private.

The period of this study is the period between 2003–2012. Thus, we are 80% of the time in the absence of revolution and 20% of this period in the presence of revolution.

*4.2 The Analysis of Correlation between the Explanatory Variables*

To avoid obtaining biased estimators in econometric modeling, it is necessary to ensure the absence of multicollinearity problems. This problem occurs when some explanatory variables are correlated, causing instability of the estimated coefficients and an increase in their standard deviations.

We checked the absence of multicollinearity problems between the explanatory variables through the Spearman correlation matrix and VIFs (Variance Inflation Factor).

Table 3. Correlation matrix

|  | roa | la | ka | net | non | list | logta | inf | rev | own |
|---|---|---|---|---|---|---|---|---|---|---|
| roa | 1.0000 | | | | | | | | | |
| la | -0.2739 | 1.0000 | | | | | | | | |
| ka | 0.4199 | -0.1858 | 1.0000 | | | | | | | |
| net | -0.2136 | 0.1752 | -0.1537 | 1.0000 | | | | | | |
| non | -0.0209 | -0.3736 | -0.2218 | -0.1725 | 1.0000 | | | | | |
| list | 0.2718 | -0.0058 | -0.2179 | 0.1357 | 0.0369 | 1.0000 | | | | |
| logta | 0.1263 | -0.0276 | -0.3973 | 0.0717 | 0.1544 | 0.7996 | 1.0000 | | | |
| inf | 0.0682 | 0.0127 | -0.1052 | -0.1475 | 0.0904 | 0.0000 | 0.1776 | 1.0000 | | |
| rev | -0.1316 | 0.1235 | -0.1447 | -0.1914 | 0.0439 | 0.0000 | 0.2133 | 0.2611 | 1.0000 | |
| own | 0.0948 | -0.0334 | 0.2211 | -0.304 | 0.2126 | -0.3693 | -0.5513 | 0.0000 | 0.0000 | 1.0000 |

The realization of a correlation matrix allows analysis pairwise correlations between variables. Positive coefficients (negative) indicate a positive relationship (negative) between them. According to Jolibert and Jourdan (2006), obtaining correlation coefficients greater than 0, 7 is indicative of a problem of multicollinearity between the independent variables included in the model.

In our study, the results of the Spearman correlation matrix indicated the presence of a problem of multicollinearity between variables LIST and logTA since cor (LIST, logTA) = 0, 7996> 0, 7.

To confirm this result, we also used the statistics VIF (Variance Inflation Factor). This index measures the degree of increase in the standard error generated by the correlation of a variable with others. According to Evrard and al (2003), when the VIF is greater than 4 we can assume the presence of a multicollinearity problem. In our tavail VIF = 30, 02> 4, we have a serious problem of multicollinearity and then it should be treated. Indeed, the VIF variable logTA = 85.72> 4, VIF variable LA = 66.45> 4, VIF variable NON = 22.54> 4, VIF variable Inf = 16.89> 4 and VIF variable NET = 15.44> 4.

So after checking the existence of problems of multicollinearity between the explanatory variables through VIFs, we use the models for which the VIF is less than 4. We can then perform a simple in its presentation, the model is in the form of 6 equations:

$$ROA_{i,t} = \alpha + \beta_1 KA_{i,t} + \beta_2\ NET_{i,t} + \beta_3 LIST_{i,t} + \beta_4 OWN_{i,t} + \beta_5\ Inf_t + \varepsilon_{i,t} \tag{2}$$

$$ROA_{i,t} = \alpha + \beta_1 KA_{i,t} + \beta_2 NON_{i,t} + \beta_3 LIST_{i,t} + \beta_4 OWN_{i,t} + \beta_5 Inf_t + \varepsilon_{i,t} \tag{3}$$

$$ROA_{i,t} = \alpha + \beta_1 LA_{i,t} + \beta_2 KA_{i,t} + \beta_3 NET_{i,t} + \beta_4 LIST_{i,t} + \beta_5 OWN_{i,t} + \beta_6 REV_t + \varepsilon_{i,t} \tag{4}$$

$$ROA_{i,t} = \alpha + \beta_1 LA_{i,t} + \beta_2 KA_{i,t} + \beta_3 NON_{i,t} + \beta_4 LIST_{i,t} + \beta_5 REV_t + \varepsilon_{i,t} \tag{5}$$

$$ROA_{i,t} = \alpha + \beta_1 logTA_{i,t} + \beta_2 NET_{i,t} + \beta_3 OWN_{i,t} + \beta_4 REV_t + \varepsilon_{i,t} \tag{6}$$

$$ROA_{i,t} = \alpha + \beta_1 logTA_{i,t} + \beta_2 NON_{i,t} + \beta_3 OWN_{i,t} + \beta_4 REV_t + \varepsilon_{i,t} \tag{7}$$

*4.3 Tests on Panel Data*

In what follows, we present for models 2, 3, 4, 5, 6 and 7 the VIFs, the homogeneity test, the Hausman test, the heteroscedasticity test, autocorrelation test, test of normality of residuals and of the contemporaneous correlation test.

4.3.1 The VIFs

We used the statistics VIF (Variance Inflation Factor) to check the problem of multicollinearity between the independent variables studied introduced in the same model.

Table 4. The VIFs

|  | Model 2 | model 3 | model 4 | model 5 | model 6 | model 7 |
|---|---|---|---|---|---|---|
| VIFs | 3.4 | 3.53 | 3.96 | 2.26 | 3.2 | 3.38 |

According to the table above for models 2, 3, 4, 5, 6 and 7, VIF <4 so there is not a problem of multicollinearity.

4.3.2 Homogeneity Test

The very first thing that should be checked is the homogeneous or heterogeneous data specification in this context particular attention is paid to the statistics Fischer. When the latter is significant (Prob> F <5%), the data have a heterogeneous structure

Table 5. Statistics fischer

|  | Model 2 | model 3 | model 4 | model 5 | model 6 | model 7 |
|---|---|---|---|---|---|---|
| Statistics Fisher | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

From the table above, Fischer statistics for models 2, 3, 4, 5, 6 and 7 shows that our data structure as a heterogeneous Prob> F = 0.0000 <5%.

4.3.3 Hausman Test

Since the data have a heterogeneous structure, it is necessary to model the individual effects is fixed in random effects or effects, thereby testing Hausman specification is necessary. When the statistic is chi2 significant (Prob> chi2 <5%), the fixed effects model is most appropriate.

Table 6. Hausman test

|  | Model 2 | model 3 | model 4 | model 5 | model 6 | model 7 |
|---|---|---|---|---|---|---|
| Hausman Test | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0022 | 0.0075 |

From the table above, we have for models 2, 3, 4, 5, 6 and 7 Prob> chi2 <5%, so the fixed effects model is most appropriate.

4.3.4 Heteroscedasticity Test

The concept of heteroscedasticity opposes that homoscedasticity which corresponds to the case where the variance of the residuals is constant. Conversely, when we speak of heteroscedasticity the variance of the residuals is not considered constant. In our work we use the Wald test for testing the presence of heteroskedasticity. When the statistic is chi2 significant (Prob> chi2 <5%), there is a problem of heteroscedasticity.

Table 7 Heteroscedasticity test

|  | Model 2 | model 3 | model 4 | model 5 | model 6 | model 7 |
|---|---|---|---|---|---|---|
| Heteroscedasticity test | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0022 | 0.0075 |

From the table above, we have Prob> chi2 = 0.0000 <5% for models 2, 3, 4, 5, 6 and 7, so there is a problem of heteroscedasticity.

4.3.5 Autocorrelation Test

The autocorrelation of errors occurs mainly in the time series models where the influence of an error from one period to another is plausible. When the Fisher statistic is significant (Prob> F <5%), there is a problem of

autocorrelation. We use the autocorrelation test Wooldridge on stata which $H_0$ is the absence of autocorrelation.

Table 8. Autocorrelation test

|  | Model 2 | model 3 | model 4 | model 5 | model 6 | model 7 |
|---|---|---|---|---|---|---|
| Heteroscedasticity test | 0.0515 | 0.0514 | 0.0742 | 0.0743 | 0.0027 | 0.0041 |

From the table above, Prob> F> 5% for models 2, 3, 4 and 5 so there is no problem of autocorrelation. On the model 6 and 7, Prob> F <5% so there is a problem of autocorrelation.

4.3.6 Test of Normality of Residuals

The test of normality of residuals to check if the random elements are distributed according to a normal distribution. This randomness of errors is a fundamental assumption of the classical linear regression model. In our work we use the test Skewness / Kurtosis to test whether the residuals follow a normal distribution.

The assumptions of the test are the following:

- $H_0$: residuals are normally distributed;

- $H_1$: residues do not follow a normal distribution.

When the statistic is chi2 significant (Prob> chi2 <5%), residues do not follow a normal distribution.

Table 9. Test of normality of residuals

|  | Model 2 | model 3 | model 4 | model 5 | model 6 | model 7 |
|---|---|---|---|---|---|---|
| Test of normality of residuals | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.3882 | 0.0000 |

According to the above table, the probability Prob> chi2 = 0.0000 <5% for models 2, 3, 4, 5, and 7, therefore we do not accept the null hypothesis Ho of normality of residuals (residuals do not follow a normal distribution). On the model 6 Prob> chi2 = 0.3882> 5%, so the residuals follow a normal distribution.

4.3.7 Contemporaneous Correlation Test

For contemporaneous correlation, the new aspect which we must pay attention to the possibility of error correlation between individuals.

Table 10. Contemporaneous correlation test

|  | Model 2 | model 3 | model 4 | model 5 | model 6 | model 7 |
|---|---|---|---|---|---|---|
| Contemporaneous | 0.0001 | 0.0001 | 0.0000 | 0.0000 | 0.0233 | 0.0445 |

To test the presence of correlation of the inter-individual errors for the patterns 2, 3, 4, 5 and 7, we use the Friedman test since residues do not follow a normal distribution. On the model 6, the residuals follow a normal distribution, so we use the Pesaran test.

From the table above the Pr <5% for models 2, 3, 4, 5, 6 and 7, so there is a problem of contemporary correlation.

Finally, heteroscedasticity, autocorrelation and contemporaneous correlation situations are frequently encountered in the data, it is important to know how to detect.

*4.4 Factors Explaining the Performance of Tunisian Banks: Empirical Results and Interpretations*

In the presence of heteroscedasticity, autocorrelation and contemporaneous correlation, method of Ordinary Least Square (OLS) is not effective, then we use Generalized Least Squares (GLS) method.

Table 11. Results estimation model 2, 3, 4, 5, 6 and 7

| ROA | M 2 | M 3 | M 4 | M 5 | M 6 | M 7 |
|---|---|---|---|---|---|---|
| LA | - | - | -0.0086517 | -0.0039302 | - | - |
|  |  |  | (-0.251) | (-0.629) |  |  |
| KA | .0746567*** | .074965*** | .072319*** | .0734847*** | - | - |
|  | (0.0000) | (0.0000) | (0.0000) | (0.0000) |  |  |
| NET | 0.0001968 | - | 0.0001641 | - | 0.0001511 | - |
|  | (-0.530) |  | (-0.609) |  | (-0.848) |  |
| NON | - | 0.0029488 | - | 0.0027698 | - | 0.0033456 |
|  |  | (-0.180) |  | (-0.233) |  | (-0.544) |
| LIST | .0094368*** | .0095195*** | 0093781*** | .0090812*** | - | - |
|  | (0.0000) | (0.0000) | (0.0000) | (0.0000) |  |  |
| LogTA | - | - | - | - | .0048225** | .005354** |
| Inf | 0.0007145 | 0.0006689 | - | - | - | - |
|  | (-0.440) | (-0.458) |  |  |  |  |
| OWN | .0016673** | .0013821* | .001615** | - | .01036** | .0099351* |
|  | (-0.033) | (-0.084) | (-0.047) |  | (-0.040) | (-0.066) |
| REV | - | - | -0.001257 | -0.0010874 | -.0113851*** | -.0124744*** |
|  |  |  | (-0.608) | (-0.646) | (-0.004) | (-0.003) |
| _cons | -.0131851*** | -.0139489*** | -0.0027803 | -0.0063046 | -.067968* | -.0770463** |
|  | (-0.010) | 0 | (-0.688) | (-0.420) | (-0.079) | (-0.049) |
| Wald chi2 | 134.68 | 140.3 | 148.35 | 133.51 | 9.34 | 10.46 |
| Time periods | 10 | 10 | 10 | 10 | 10 | 10 |
| Number of obs | 190 | 190 | 190 | 190 | 190 | 190 |
| Number of group | 19 | 19 | 19 | 19 | 19 | 19 |

*Note.* *** A significant at 1%; ** A significant at 5%; * A significant at 10%.

From Table 11, the results show that the coefficient of the variable LA displays a negative sign in models 4 and 5. This can be explained by the fact that the more Tunisian banks engage in risky activities especially for credit, the more they are less efficient. Indeed, a high ratio of LA negatively affects their performance as reflected in a lower yield of bank assets. In other words, the preponderance of credit activity is a source of a decrease in the performance of these credit institutions. In this context, little concerned about the quality of their assets and the risk, these banks are less efficient because they suffer from under-evaluation of credit risk and a misallocation of resources. But it should be noted that this variable is not significant.

For the case of variable KA, the results show a significant coefficient with the expected positive sign in models 2, 3, 4 and 5. This contribution expected sign is justified by the fact that increasing the degree of capitalization Tunisian banks in our sample results in superior performance. Thus, a high bank capitalization positively affects the performance of banks in ensuring a sound banking system and reducing incentives to take risks in credit decisions. This result enables us to say that a well capitalized bank may face costs of future bankruptcy.

The results show that the coefficient of the variable NET displays a positive sign, but it is not significant in models 2, 4 and 6. This suggests that the advantage of the performance of Tunisian banks in our sample is not influenced by traditional activities. However, we know that Tunisia banks give more importance to traditional activities primarily related to the collection of deposit and the distribution of credit. Based on the results found, we can say that the preponderance of credit activity in relation to other outputs is not a source of improving the performance of Tunisian banks studied. Indeed, the profitability of the latter is strongly affected by the large volume of non-performing loans.

From the table above, the coefficient of the variable NON displays a positive sign in models 3, 5 and 7. This positive effect on bank performance can be explained by the fact that the institutions most active in non-traditional credit or market activities are the most effective. But the coefficient of this variable is not significant. This suggests that non-traditional activities are not a determinant of the performance of banks in our sample. In this context, Tunisian banks are encouraged to expand their range of financial products to enhance their performance and to meet the needs of their customers. In this context the trend of Tunisian banks to diversify into non-traditional activities or market is reinforced by the law n ° 2001–65 of 10 July 2001 on the application of the principle of universal banking or bank to do everything which allows credit institutions to

perform all banking activities.

In the case of LIST variable, the results show a significant coefficient with the positive sign expected in models 2, 3, 4 and 5. This suggests that securities listing positively affects the performance of Tunisian banks. Indeed, it increases the weight of banks in the business and reassure their current partners and gives them access to privileged partnerships with businesses high levels. In addition, it offers them improved visibility, increased brand awareness through advertising.

From Table 11, the results in Models 6 and 7 shows that the size of the bank approximated by the logTA variable is statistically significant and positively correlated with the performance of Tunisian banks in our sample, this suggests that the latter increases with size. Therefore, more banks are larger; more they are able to earn higher profits. This positive correlation can be explained by the fact that the big banks benefiting from the rule «too big to fail» are little risk, they may engage in risky activities, claiming to insured beings saved by supervisory authorities who are obliged to act as lender of last resort.

It should be noted that in a developing country like Tunisia, the state plays a crucial role in economic life for the proper functioning of the economy.

In contrast, the coefficient on Inf displays a positive sign, this can be explained by the fact that inflation is properly anticipated and interest rates are adjusted so as incomes rise faster than the costs of facilities credit, in this case it will have a positive effect on bank performance. But this variable is not significant in Models 2 and 3. This suggests that inflation has no effect on the performance of Tunisian banks studied.

The results show that the dummy variable for the structure OWN property displays an expected in models 2, 3, 4, 6 and 7 sign; it is significant and positively correlated with the performance of Tunisian banks in our sample. Therefore, private banks are more preferment than their public counterparts. This can be explained by the fact that the performance of the former is favored by the shareholding by private institutions, most of whom have trained and able to operate in a free market economy with significant staff management skills. Indeed, in recent years, privatization of banks has become a necessity to overcome the deterioration of their performance.

It should be noted that the three public banks STB, BNA and BH background facing major financial difficulties; in fact they suffer from the quality of their assets. Chedly Ayari Governor of the Central Bank of Tunisia discussed two scenarios for the development of these banks: the first is the merger of these institutions to create a public bank mega-pole while the second part is to privatize public banks in order to give birth to a public-private banking division.

Regarding the coefficient on REV, the results show that it is significant and shows the expected negative sign in models 6 and 7, this implies that the revolution negatively affects the performance of Tunisian banks. Indeed Tunisia saw a historic moment, the year 2011 was marked by the revolution of January 14. These effects on the Tunisian banking sector (weakness and paralysis) have become a major concern. In fact, lack of capital, Tunisian banks are unable to meet the needs of credit applicants and then they are unable to improve their performance due to a high level of bad debts, inadequate provisioning of fair competition, gloomy macroeconomic outlook .

Indeed, the situation has deteriorated further since 2011, as banks have been hit by the smell of revolution, where there are a significant proportion of claims of members of the old regime, who were inadequately covered by necessary guarantees. The latter is added to the non-performing loans (NPL) already accumulated, plus unpaid emerged following the difficult economic conditions, leading to an increase in outstanding NPLs of 11.7% in 2011. The share of non-performing loans of the whole banking system is therefore increased from 13% in 2010 to 13.3% in 2011. According to preliminary IMF (International Monetary Fund) estimates, the ratio of NPLs to be between 17 and 18% at end-2012 (Amen Invest, 2014).

It is imperative that Tunisian banks do more to increase their capital and improve their performance.

## 5. Conclusion

The objective of this study is to investigate the performance of Tunisian banks for the period 2003–2012. The results suggest that the asset quality, traditional activities, non-traditional activities and inflation have no effect on the performance of Tunisian banks. The increase in the degree of capitalization of these banks resulting in superior performance. The quotation in stock exchange and size positively affect the performance of the studied Tunisian banks. In addition, private banks are more performant than their public counterparts. And finally the performance of Tunisian banks was negatively affected by the revolution of 14 January 2011.

It should be noted that the performance of each bank is assessed against the "best" practices observed. So the efficiency scores are considered a measure of performance. Thus, it should be emphasized that there are other

research opportunities that can be explored. Indeed, it would be very interesting to study the technical efficiency of Tunisian banks.

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