# Bank credit risk and performance: the case of Tunisian banks during the period 2005 − 2015

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## *Abstract*

The main objective of this research is to study the impact of bank credit risk on performance. The empirical tests were carried out on panel data of firms belonging to the Tunisian banking sector institutions. To answer this research problem, we have analyzed in a first chapter the link between risk and financial performance. Then, based on financial theories, we formulated a set of hypotheses related to the influence of Investment, bank size, presence of women and board independence on performance.

The results of the empirical tests indicate that risk has a positive effect on performance. Conversely, the empirical tests show that bank size and dual function had negative effects on performance. Finally, the results of the tests on bank risk are mixed depending on the characteristics of the board of directors.

*Keywords* : ROA, ROE, Performance, Tunisian Bank, Risk, Corporate Governance

# Introduction Générale

Many governments have adopted policies to improve financial sector governance over the past decade.

In recent years, the notion of governance has become a central concern for both governments and the governed, as well as for development agencies. Tunisia, like all developing country states, is expected to promote good governance of banking and financial institutions to ensure the development of the national economy.

The notion of governance according to Chareaux "the set of mechanisms that govern the behaviour of managers and delimit their discretionary latitude. It is a range of norms that aim to homogenise the utility functions of managers and shareholders". In other words, the concept of governance is the set of decision-making bodies and rules, information that must be transparent, monitoring and control that allow stakeholders (shareholders, employees, suppliers, customers, etc.) to monitor the respect of their interests and their opinions taken into account in the functioning of the institution.

Thus, Aoki (2000) explained governance as the structure of rights and responsibilities between stakeholders and the bank. Furthermore, in the shareholder approach, corporate governance is the set of control mechanisms over managers to defend shareholders against excessive power and informational asymmetry.

The banking sector is the engine of financing the development of the Tunisian economy through its two main functions: the collection of savings and the allocation of credit.

Banks were determined to be the intermediaries between creditors and lenders. Nowadays, banks have gone beyond this stage and have acquired new instruments that allow them to have other types of more advantageous functions. This disparity allows these financial agents to intervene more efficiently on the capital market and to generate high returns.

The Tunisian government system obliges banks to respect government standards in the form of ratios. The purpose of this measure is to secure the whole banking system, as well as to increase the equity capital and its solvency. The equity and similar funds must be higher than 8% of the bank's credit risk.

The concept of bank performance plays a fundamental role in the financial monitoring and evaluation process of banks.

For his part. Chandler (1991) explained the concept of performance as "a combination of functional and strategic effectiveness, where functional effectiveness is about improving the products, purchasing, production processes, marketing function and human relations within the company. While strategic efficiency is about getting ahead of competitors by positioning oneself in the growth market or withdrawing from a declining market".

In this research, we seek to demonstrate the extent to which internal and external governance mechanisms have an impact on the performance of Tunisian banks, given that banking and financial institutions play an important role in the evolution of the Tunisian economy.

Our research methodology is based on a model aimed at testing the exogenous variable, i.e. the performance of the bank (ROA. ROE, COSR) as a function of the endogenous variables (SP, GDP, inflation rate). To do so, we use a sample of nine Tunisian commercial banks.

**Review of the literature**

Bank loans are financing granted to various economic agents (legal entities or individuals) by credit institutions. Before they are granted, they involve a risk analysis and the taking of guarantees. They can be granted for short periods (overdraft) or, on the contrary, can be repaid over the long term (30 years and more). Doumbia, S. (2011).

A credit is a provision of money in the form of a loan, granted by a creditor (lender) to a debtor (borrower). For the creditor, the operation gives rise to a claim on the borrower, by virtue of which he or she may obtain repayment of the funds and payment of remuneration (interest) according to a set schedule. For the borrower, whether a company or an individual, the credit confirms the existence of a debt and makes a temporary financial resource available.

According to Rocheteau & Chen (2001), a credit is an advance of money. You have to be sure of your ability to repay and take into account the duration of your commitment. There are different types of credit: the bank will work with you to find the most suitable formula for your situation.

Credit with revisable rate: credit generally with a medium term for which the expiries of interest are carried out at renewable rate at determined intervals (in general three or six months) Lefrancq, Chambost, & Poincelot (2016, December). (English: rollover credit) Kareche, & Smail,(2018): barter involving different currencies and carried out, between banks, by a cross set of entries, with prior agreement and a clause of repurchase: one draws on one's credit and then reconstitutes, within a short period (in practice three months), one's drawing right. The word "swap" is becoming more widespread, to the point where the verb "swaper" is sometimes used (the word "swap" has even been used improperly recently to designate a foreign currency carryover or foreign currency treasury agreements between banks of the same nationality). Restructuring loan: in the specific context of the restructuring of the debt of certain countries, additional medium-term financing distributed among the banks in proportion to their outstanding amounts in the country in question and associated with a rescheduling. The restructuring credit is done through a procedure administered by the banks themselves. (English: new money) One-off credit: short-term credit where the amount and conditions are negotiated on an ad hoc basis. The rate is determined according to the market at the time. (English: spot credit)

"Credit is the provision of money in the form of a loan by a lender to a borrower. Why 'in the form of a loan', what is the difference between credit and loan? Lesur, (2015)

Credit is repayable in time, so a loan is a commitment that binds the debtor. He must repay the credit he has received with the payment of fees, insurance and interest which are conditions for obtaining the loan. Braudel (2017).

A credit is an advance granted to a client by a bank or other financial institution. With the capital he receives, the client obtains funds that will subsequently enable him to finance his project. It therefore allows an operation to be carried out without waiting for the money to be available. Here are the important terms related to this subject:

- Contract according to Brousseau (1990) it is an act that binds the two parties. Once signed, the bank must release the agreed capital and the client is bound by the repayment according to the terms dictated by the contract.

- Creditor and claim: the one who has borrowed is called the creditor. The claim is the total amount of money that he/she must receive from the person who needs the capital. It is made up of: the capital advanced, the remuneration or commission, the contribution for the insurance and the miscellaneous expenses. Martin-Serf (2012).

- Debtor and debt: the debtor is the person who benefits from the advance and who must repay it. The debt is the amount he/she has to repay. Thus, the debt is the capital received plus the cost of borrowing expressed as a percentage or rate. Martin-Serf, (2012).

- Interest rate: this is the remuneration received by the bank. Oshikoya (1992).

- Insurance: compulsory, especially in the case of home loans, it is levied as a percentage of each partial repayment. Ponte, Carvajal-Trujillo & Escobar-Rodríguez (2015).

- Maturity: this is the date by which the borrower must have repaid the loan in full. It can be from 6 months for consumer loans to 25 years for home loans. There are loans with a single maturity that can be repaid in one go and others with several maturities that can be repaid in stages.

- Monthly payment, annuity: the monthly payment is the amount paid per month to repay a loan with several instalments. It is called an annuity if it is a yearly payment.

## The hypotheses

**H1**: a large board size has a negative effect on bank performance.

**H 2**: the presence of outside directors on the board has a positive effect on bank performance.

**H 3**: the presence of institutional investors has a positive effect on bank performance.

**H4**: the presence of foreign investors has a positive impact on bank performance

**H5**: state participation has a negative impact on bank performance.

**H6**: larger banks perform better.

# Empirical part

### 1.1. The presentation of the model

To test the impact of credit risks on the banking performance of Tunisian banks, we have been inspired by the methodology used by Omri (2003).

Our model can be written in the following form:

$$CR = c + \beta_{it} X1_{it} + \beta_{it} X2_{it} + \dots + \varepsilon$$

As we have two variables to explain the return on assets ratio ROA, the return on equity ratio ROE, which is as follows:

- Model 1 :

$$ROA = C + \beta_{it} TCA + \beta_{i\,it} ADEX + \beta_{it} INV\_INST + \beta_{it} PARTET + \beta_{it} PARTEQ + \beta_{it} TB + \varepsilon$$

- Model 2 :

$$ROE = C + \beta_{it} TCA + \beta_{it} ADEX + \beta_{it} INV\_INST + \beta_{it} PARTET + \beta_{it} PARTEQ + \beta_{it} TB + \varepsilon$$

With :

**TCA** : size of the board of directors.

**ADEX** : number of external directors on the board.

**INV_INST** : the participation of institutional investors.

**PARTET** : foreign participation.

**PARTEQ** : state participation.

**TB** : the size of the bank.

**CR** : credit risk

In our study, the firm's credit risk is treated as an endogenous variable (ROA, ROE) which will be explained from the exogenous variables relating to the board of directors and the ownership structure (TCA, ADEX, INV_INST, PARTET, PARTEQ, TB). While proposing some control variables (bank size).

### 1.2 Estimation of the model

The static estimation of the linear function linking credit risk to performance requires in a first step to check the homogeneous or heterogeneous specification of the data generating process.

In econometric terms, this amounts to testing the equality of the coefficients of our theoretical model studied in the individual dimension.

From an economic point of view, the specification tests consist in determining whether we can assume that the financial performance of the 11 banks in our sample is perfectly identical, or whether, on the contrary, there are specificities specific to each bank.

### 1.3. Homogeneity test

For each of the models the homogeneous or heterogeneous specification of the data generating process must be checked.

**Table 2:** Homogeneity/heterogeneity test

| Variables | Homogeneity |
|---|---|
| ROE (model 1) | 1.526 |
| | (1.499) |
| ROA (model 2) | 3.022 |
| | (0.003) |

From this table, we can see that the coefficients of the first model that describes the financial performance of banks from the endogenous variable ROE are homogeneous since the probability associated with the coefficients is of the order of (1.499) which is greater than the threshold of 5%, in which we accept H0, and deduce that the model is a homogeneous model that will be estimated by the method of least square ordinary OLS without individual effect.

For the second model which describes the financial performance of banks from the endogenous variables ROA, the probabilities associated with the coefficients is (0.003) which is lower than the 5% threshold in this case we reject H0. In this case it is heterogeneous. For this, the model must be specified by a panel with individual effects. In this case it is necessary to pass the Hausman test to determine the nature of the efforts (fixed or random).

### 1.4. Hausman test

It is a test used to discriminate between fixed and random effects and individual effects in a panel data model. It tests for correlation or misspecification (correlation between individual effects and explanatory variables).

The test is as follows:

$$H0: E(\alpha i / xi) = 0$$

$$H1: E(\alpha i / xi) = 0$$

Under the hypothesis H0, the individual effects are random, otherwise the individual effects are fixed

The following table summarizes the Hausman test for the endogenous variables (ROA) that describe the financial performance of Tunisian banks.

**Table 1:** Hausman Test

| *Variables* | *ROA* |
|---|---|
| *Hausman statistics* | *7.065* |
| | *(0.314)* |

According to the decision rule and Hausman statistic we notice that the individual effects are random for the endogenous variable ROA, while we will opt for a random effect panel in this case the model equation will be estimated by the ordinary least square random effect method (panel EGLS Cross-sectional random effects under E lives 8.1)

Before proceeding to test our basic model, further analysis must be carried out to ensure the adequacy of the variables used. First, the explanatory variables must be independent. According to Table 3, all Pearson correlation coefficients for the independent variables are below a (0.6), at which point the collinearity phenomenon becomes increasingly pronounced.

**Table 2 :** Total correlation matrix

| | ROE | ROA | TB | TCA | PARTET | PARTEQ | ADEX | INV_INST |
|---|---|---|---|---|---|---|---|---|
| **ROE** | 1.0000 | | | | | | | |
| **ROA** | 0.917612 | 1.0000 | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TB** | 0.029285 | 0.016267 | 1.0000 | | | | | |
| **TCA** | -0.091622 | -0.280184 | 0.005256 | 1.0000 | | | | |
| **PARTET** | 0.037176 | 0.035086 | 0.026037 | 0.238272 | 1.0000 | | | |
| **PARTEQ** | 0.051749 | -0.023361 | -0.034307 | -0.104735 | -0.031189 | 1.0000 | | |
| **ADEX** | 0.039573 | -0.012260 | -0.318349 | 0..282947 | 0.128693 | 0.018503 | 1.0000 | |
| **INV_INST** | -0.174340 | -0.056648 | 0.238179 | -0.270815 | -0.042264 | -0.246807 | -0.677682 | 1.000 |

## Study results: analysis and interpretation

### 1. Descriptive statistics

The table below presents the descriptive statistics for the variables of interest

**Table 3 :**Descriptive statistics

| | ROE | ROA | TCA | PARTET | PARTEQ | TB | ADEX | INV_INST |
|---|---|---|---|---|---|---|---|---|
| Mean | 0.08614 | 0.00767 | 11.5454 | 1.69756 | 0.81081 | 14.8106 | 0.30800 | 0.40253 |
| Mediane | 0.09809 | 0.00786 | 12.0000 | 0.23835 | 0.00000 | 14.9797 | 0.33333 | 0.44865 |
| Maximum | 0.42614 | 0.03323 | 14.0000 | 64.2500 | 33.5400 | 15.8801 | 0.58333 | 0.57590 |
| Minimum | -1.11989 | -0.09679 | 6.0000 | 0.01120 | 0.00000 | 0.00000 | 0.08333 | 0.12000 |
| Std.Dev | 0.15639 | 0.01318 | 1.44397 | 8.93504 | 4.48527 | 1.51326 | 0.15353 | 0.13631 |
| Skewness | -4.78160 | -4.87146 | -1.46856 | 6.53873 | 7.15791 | -8.61342 | 0.36263 | -0.42271 |
| Kurtosis | 35.8588 | 38.6123 | 6.88134 | 45.1101 | 52.4999 | 84.9846 | 1.95013 | 1.83306 |
| Jarque-Bera | 5367.80 | 6247.82 | 108.586 | 8911.30 | 12169.5 | 32166.98 | 7.46274 | 9.51722 |
| Probabilty | 0.00000 | 0..00000 | 0.00000 | 0.00000 | 0.00000 | 0.0000 | 0.02396 | 0.00857 |
| Observations | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 |

The table above provides descriptive statistics for the Tunisian commercial banks listed for the period 2003-2013. According to these statistics, the 10 Tunisian banks recorded during the study period averages of 8.61% for ROE, 0.76% for ROA. Jbili and Enders (1997) note that Tunisian commercial banks rarely exceeded 1% for ROA during the period 1990-1997. In his study of the impact of ownership structure on the performance of banks in the Middle East and North Africa region, Kobeissi (2004) found an average of 0.9529% for ROA and 10.14% for ROE based on a total number of 34 observations of Tunisian commercial banks from 2000 to 2002.

For the size of the board of directors, according to the descriptive statistics, the average size of the board of directors is of the order of (11.54), which explains that the specificity of credit risk is characterised by the large size of the board. While for firms belonging to other sectors (agribusiness, tourism, trade...etc.), the average size in 2002 is 7 members according to the study of Zghal (2005) on 47 Tunisian non-financial firms. Moreover, several authors conclude that banks have larger boards than industrial firms. For example, Adams and Mehran (2003), T.Amara and A.Ncib (2021), observed, over the period 1986-1999, 35 bank holding companies and 35 industrial firms among the 200 largest in the United States and found that the boards of directors in industrial firms have six fewer members than those in bank holding companies.

Thus, the percentage of external directors on the board is equal to an average of 30.80%. This rather low proportion is in line with the strict definition applied to the notion of director independence. However, it is recalled that independence in banks is difficult to detect because of the credit-based relationships between directors and/or their home companies and the bank or its subsidiaries. These relationships are not easily disclosed, so the criterion of independence in the banking sector is biased.

In addition, the proportion of capital held by institutional investments holds large (or even considerable exceeding 55%) shares in most banks. While foreign ownership averages 21.72%. Indeed, it varies between 13% and 64% during the years studied in six Tunisian banks (ATB, BIAT, ATTIJARI bank, BT, UBCI and UIB). As for the state, it holds an average share of 81.7%; this means a strong state participation in the capital of Tunisian banks.

For the control variable bank size the average size of the banks is 14.67%, which leads us to consider that these banks are small.

Thus, we can see that the kurtosis coefficient is high for most of the variables under study. This excess of Kurtosis indicates a high probability of occurrence of extreme points, and consequently, the series present a thick character.

Furthermore, the Skewness coefficient is different from 0. This illustrates the presence of asymmetry, which may be an indicator of non-linearity, since linear Gaussian models are necessarily symmetric. This asymmetry is reflected in the fact that volatility is lower after an increase than after a decrease in profitability. A negative skewness coefficient indicates that the distribution is skewed to the left, i.e. the variables under study react more to a negative shock than to a positive one.

Consequently, the normality hypothesis is not verified and the Jarqe-Bera test confirms this result and significantly rejects the normal distribution of the different variables forming the sample; this represents a general characteristic of financial series for most of the variables under study.

## 1. Result of the regression model: Analysis and interpretations

### Presentation of the result

The regression results are reported in Table 3

**Table 4:** Estimating bank performance

| Variable | ROE | | ROA | |
|---|---|---|---|---|
| | Coefficient | significativity | coefficient | significativity |
| **TB** | 0.006776 | 0.5178 | 0.000550 | 0.4991 |
| **TCA** | -0.018157 | 0.1102 | -0.002955 | 0.0293 |
| **PARTET** | 0.001331 | 0.4424 | $6.79^{E}$-05 | 0.6165 |
| **PARTEQ** | -0.001350 | 0.7040 | -0.000277 | 0.3277 |
| **ADEX** | -0.122408 | 0.3842 | -0.011147 | 0.4969 |
| **INV_INST** | -0.370737 | 0.0218 | -0.024797 | 0.1921 |

| | | |
|---|---|---|
| R-*squared* | *0.069682* | *0.114622* |
| *AdjusedR-squar* | *0.015489* | *0.016773* |
| *F-statistic* | *1.2858* | *1.071811* |

<div align="right">Source : Résultat de régression des variables aves Eviers</div>

**Analysis and interpretation of results**

The main results obtained from the estimation of the endogenous variables can be interpreted as follows:

Analysis and interpretation of financial profitability results ROE :

The first model adopts the ROE performance measure as the explained variable

- The significance of the variables in the model

First, we find that the board size variable has a negative and statistically insignificant impact on performance (at the 5% and 10% thresholds), which implies that board size has no effect on financial performance, confirming the work of Simpson and Gleason (1999) who showed that the number of board members did not have a significant impact on the probability of bank failure. This result invalidates our first hypothesis H1 which links credit risk and performance in the banking sector in a positive sense.

Concerning the variable presence of external administration in the board, it is to be noticed, according to the results that this variable presents a negative and statistically Non significant coefficient (at the threshold 5% and 10%). This leads us to say that the presence of external management in the board has no effect on the financial performance of Tunisian banks. H2 is therefore rejected.

La variable participation d'investisseurs institutionnels présente un coefficient négatif et statistiquement significatif (au seuil de 5%) ; ce qui implique que cette variable a un impact négatif sur la performance financière des banques tunisiennes. Notre hypothèse H3 est donc rejetée.

Concerning the foreign participation in the capital of banks, it presents a positive and statistically insignificant coefficient. This implies the rejection of our hypothesis H4, i.e. that foreign participation has no effect on the financial performance of Tunisian banks.

As regards the variable state participation in banks, it presents a positive and insignificant coefficient. This leads to the rejection of our hypothesis H5, which stipulates that the state participation negatively affects the financial performance of Tunisian banks.

Concerning the control variable the size of the bank, it represents a positive and insignificant coefficient, which means that the size of the bank does not influence the financial performance of Tunisian banks. H6 is therefore rejected.

- The explanatory power of the model

The coefficient of determination R² is used to estimate the total variability. This coefficient varies in the interval (0-1); when this coefficient approaches the upper limit (unity), the model is said to have explanatory power.

According to the results obtained, we can see that our model does not have a good explanatory power since it explains only 7% ($R^2 = 0.0696 = 7\%$) of the variability of financial performance (measured by the ROE ratio). This makes our model insignificant and open to criticism.

- Overall significance test

F-statistic = 1.285 is lower than F0.05 (10; 11) tabulated = 20854; this implies that the model is not globally significant, i.e. the credit risk variables do not globally explain the financial performance of Tunisian banks.

Analysis and interpretation of the results of the estimation of the economic profitability ROA

The second model adopts the ROA performance measure as the explained variable.

- The significance of the variables in the model

The board size variable is statistically significant and its coefficient has a negative sign, implying that board size and economic performance are negatively correlated.

This result does not confirm our hypothesis H1, which links board size and performance in the banking sector in a negative direction. This result is practically confirmed by several authors, namely Jensen (1993) who concluded that as the size of the board of directors increases, so does the capacity for control, which leads to internal problems, including difficulty in communication and decision making. Brown and Mahoney (1992) and Bantel and Jackson (1989) assume that the existence of a negative relationship between board size and performance

is explained by the idea that large groups bring together a multiplicity of ideas and cultures which will lead to disagreement and a problem of cohesion.

Concerning the variable presence of external administrators in the board, it should be noted, according to the results of our study, that the relative coefficient is negative and not significant. This leads us to conclude that the presence of external directors in the board has no impact on the economic profitability of Tunisian banks. Therefore, our hypothesis H2 is rejected.

Concerning the foreign participation in the capital of banks, it presents a positive and statistically insignificant coefficient. In this case the foreign participation has no effect on the economic profitability. This leads to the rejection of our hypothesis H4, which states that foreign participation negatively affects the economic profitability of Tunisian banks, and consequently, the financial performance of the bank.

For the variable state participation in banks, it presents a negative and insignificant coefficient. This leads us to reject the hypothesis H5, because the state participation does not affect the economic profitability of Tunisian banks according to these results.

Finally, the control variable, the size of the bank, presents a negative and insignificant coefficient; which means an absence of correlation between the economic profitability of Tunisian banks and the size of the banks, and consequently H6 is rejected.

- The explanatory power of the model

As we can see, our model does not have a good explanatory power since it only explains 11% ($R^2 = 0.1146$) of the variability of economic profitability (measured by the ROA ratio).

- Overall significance test

F-statistic = (1.0718) is lower than F0.05 (10; 11) tabulated = (2.854); this implies that the model is not globally significant, i.e. the credit risk variables do not globally explain the economic profitability of Tunisian banks.

# General Conclusion

Banking performance is the main source of assessment of the health of the banking system. For this reason, we will define the conceptualization of banking performance. We have proposed parametric and non-parametric approaches to the measurement of banking performance. Emphasis has been put on the adaptation of the stochastic frontier approach.

In view of the importance of bank risk, we have presented a meaning of risk term in order to see the role of bank risk in the stability of the financial system. In this context, we have described the Tunisian banking system. Indeed, the Tunisian banking system has undergone several structural evolutions during the 1980s and 1990s.

To limit the fragility of the banking sector, banks have opted for strategic reforms. These are constituted by prudential rules to manage banking risk. The application of the Bale agreements allows the bank to be more competitive.

The International Monetary Fund has proposed perspectives aimed at improving the Tunisian banking system. The IMF missions are based on banking restructuring programmes to achieve banking sector consolidation and develop economic growth.

However, the presence of banking regulations has caused the Tunisian banking system to suffer. The latter has suffered from weaknesses. To address this problem, we have sought to estimate the performance and risk of Tunisian banks in the second chapter.

Although the notions of bank performance and bank risk have given rise to several recent theoretical works, the problem of data availability constitutes a difficulty to carry out empirical verification. We have noted the scarcity of empirical works analyzing the relationship between performance and risk of Tunisian banks. In order to overcome this difficulty, we started an empirical analysis of the Tunisian banking sector.

On the empirical side, predestined to the empirical part, the objective was to recognize the impact of banking risk mechanisms on performance. From a sample of nine Tunisian banks, between the period of 2003-2013, we related the measures of financial ratio ROA and ROE.

We then tried to test the conformity of our research hypotheses concerning the impact of each mechanism on bank performance.

Thus, the term performance is a one-dimensional concept as it is assessed by a single criterion (profit realisation). As a result, this concept fulfils only one role, that of creating value for shareholders. But with the development of the company, considered as a place of meeting and exchange between different actors (employees, creditors...), performance has become a multidimensional concept rather than a unidimensional one.

Indeed, banking performance is expressed both by quantitative variables (financial ratios: ROA, ROE,) and qualitative variables (managerial preferences, banking activity...).

Our work presents some contributions in particular:

The term credit risk appears more complex and has specificities compared to credit risk in ordinary firms such as the opacity of banking regulations.

The empirical findings of our work seem to diverge with the empirical literature on the impact of the credit risk system on bank performance.

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