

*Full Length Research Paper*

# The factors influencing bank credit risk: The case of Tunisia

Nabila Zribi<sup>1\*</sup> and Younes Boujelbène<sup>2</sup>

<sup>1</sup>Faculty of Economics and Management of Sfax. University of Sfax-Tunisia. Route Saltania 4 Km, 3081 Sfax-Tunisia.

<sup>2</sup>Faculty of Economics and Management of Sfax. University of Sfax-Tunisia. Higher Institute of Business Administration of Sfax. Route from the Aéroport 4 Km, Sfax. BP1013-3018 Sfax-Tunisia.

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**This paper aims to examine the determinants of bank credit risk in Tunisia, being an emergent country. Our sample includes ten commercial banks over the period of 1995 to 2008. The paper takes into account both macroeconomic factors and microeconomic variables that are likely to influence credit risk. Overall, the results show that the main determinants of bank credit risk in Tunisia are: ownership structure, prudential regulation of capital, profitability and macroeconomic indicators.**

**Key words:** Bank credit risk-taking, bank's characteristics, ownership structure, capital regulation, emerging country.

## INTRODUCTION

Over the last few years, the Tunisian banking sector has become more and more market oriented, competitive, attractive for foreign investors and not immunized against diffusion of new technologies of information and communication. In consideration of this new open and turbulent environment and in view of minimizing all kinds of risks or signs of fragility, the Central Bank of Tunisia has made it mandatory for the banks to respect restrictive reforms.

These reforms are centred around five axes: improving prudential regulation, opening the financial sector to foreign investors, promoting the equity market, implementing new indirect monetary policies and liberating the interest rates and the allocation of credits. All these changes will certainly have implications on the risk taken by the Tunisian banking industry. In this setting, our paper aims to analyse the factors that are likely to influence the level of bank credit risk.

Three main factors lie behind this research: First, the competitive and regulated environment in which Tunisian banks operate. Second, the increase of the potential of moral hazard and agency problems between different actors in the Tunisian banks due to the lack of transparency. Finally, the gap we have noticed in the

literature about the analysis of the key factors influencing credit risk of banks in emerging countries.

This research paper is organized as follows. Subsequently, a review of the literature and hypotheses was done, after which the study focused on Tunisian banking literature. This was followed by a description of the methodology and the empirical results. Finally, the study was concluded.

## RELATED LITERATURE AND HYPOTHESES

Two trends in the literature have focused on the main factors that are likely to influence bank credit risk. One trend appears to suggest internal variables as potential determinants of credit risk. The other trend highlights changes in external variables in the prudential regulation and economic conditions affecting the bank credit risk. The main results of this literature provide evidence of a close relationship among internal variables, external variables and bank credit risk.

A large part of the literature highlights that the ownership structure might play a role in influencing credit risk and a particular focus is put on the relationship between public ownership or State-owned banks and their levels of risk. Generally, it is assumed that State-owned banks take more risks than the private and foreign capital requirements and bank risks in complete markets.

\*Corresponding author. E-mail: [nabila1zribi@gmail.com](mailto:nabila1zribi@gmail.com)

Their results have shown that with a flat insurance banks. In this context, Micco and Panizza (2004) have found that public banks are exposed to more risk than other banks since they play an important role in the facilitation of the credit policies and their loans are less sensitive to macroeconomic shocks in comparison with private banks. Sapienza (2004) has also found such a relationship. He explains this result by three alternative views. From the social view, he has shown that the State interferes in banks in order to correct the market failure caused by private banks. According to the political view, he demonstrates that the State-owned banks are a mechanism for pursuing politicians' private interests, such as doing favours for political protégés.

Finally, in relation to the agency view, he has shown that State-owned banks are basically benevolent maximizers of social welfare but they are plagued by corruption and misallocation. In a recent research from industrialised countries, De Nicolo (2001) and Giuliano et al. (2007) have suggested that state-owned banks typically exhibit higher risk than other types of banks. In Russian banks over the period 1999 to 2007, Zuzana and Laura (2008) have found that the effect of state ownership on banks' insolvency risk is positive. They explain this result by the fact that state-controlled banks tend to be more stable. In order to investigate this result more closely, they add an interaction term of size and state control to their model. This interaction makes the coefficient of state controlled variable become negative, which indicates that only large state-controlled banks are more stable than other state-controlled banks. In the context of a sample of 423 banks in transition countries (Russia, Ukraine, Hungary, Czech Republic etc), Rainer and Paul (2007) have found no indication of excessive risk taking by any specific ownership or size categories of transition banks. Generally, studies in the context of transition countries have not been conclusive about the sign of state-controlled banks. So, following theoretical literature, we expect to find a positive relationship between state-owned banks and the level of bank credit risk.

### **Hypothesis 1: State owned-banks take more risks than other banks**

As for the prudential regulation of capital, it might also help to explain why banks take risks. The common belief, at least among regulators, is that higher capital requirements result in a higher stability of the banking sector and consequently in lower levels of bank risk-taking. However, the literature analysing the relationship between bank capital regulation and the level of risk is ambiguous and is not conclusive about the sign (positive or negative) of this relationship. Kahane (1977) and Sharpe (1978) have analysed the relationship between premium, banks have incentives to increase risk-taking.

Similar results have been reached by Koehn and Santomero (1980). These authors have analysed the impact of capital ratio (equity capital to total assets without taking into consideration the inherent risk of different assets) on bank risk-taking. Their results show that higher capital requirements lead banks to revise the composition of their portfolios.

This composition is characterized by the detention of riskier assets in comparison with those before the amendment of the regulation. Kim and Santomero (1988) have criticized the researches of Kahane (1977) and Koehn and Santomero (1980). They have propose the ratio of equity capital to risk-weighted assets as a regulator ratio. Their results have shown that a regulator ratio adjusted to risk leads the banks to change the compositions of their asset portfolios in favour of less risky assets and thus a less bank risk-taking. Similar results have been found by Furlong and Keely (1989, 1990) and Dothan and Williams (1980) suggesting that the prudential regulation of capital leads banks to reduce their potential of bank risk-taking. For empirical researches, Shrieves and Dahl (1992) represent the reference point of all the empirical studies. Shrieves and Dahl (1992) have studied the impact of regulation of equity capital on the bank risk-taking decisions in the context of 1800 U.S. banks over the period 1983 to 1987. Based on a simultaneous equation model, these results show a positive association between changes in equity capital and the level of risk, particularly for over-capitalized banks. In the same context, Jacques and Nigro (1997) have shown that the introduction of capital based on risk has led to higher capital ratios and a lower risk portfolio of banks.

Hussain and Hassan (2004), in the context of 11 developing countries have also shown a negative relationship between capital ratio and portfolio risk. In the European context and especially in Switzerland, Rime (2001) has examined the relationship between regulatory capital and risk-taking by banks. She has concluded that the regulatory pressure has induced Swiss banks to increase their capital levels while keeping stable levels of risk-taking. Nor and Mohamed (2007) have presented a comparative study of all factors contributing to the credit risks of commercial banks in a multi-country setting: Australia, France, Japan and the U.S. represent developed economy banking systems while emerging ones are represented by India, Korea, Malaysia, Mexico and Thailand. They have found that the regulatory capital is an important factor influencing the credit risk of any banking system that offers a range of services. This study also highlights that the credit risk in emerging economy banks is higher than that in developed economies and that risk is formed by a larger number of bank-specific factors in emerging economies compared to their counterparts in developed economies.

Marina and Svetlana (2001) have studied the main The Tunisian banking sector has received a part of the factors

influencing excessive risk in transition banks with a special emphasis on Russian banks. They have found that many banks in Russia have violated prudential ratios in a forbearance environment or when the value of license is low and the probability of success in a risky project is relatively high. In the context of emerging countries, Goldlewski (2004) have found that the regulation of capital and risk are negatively related. In summary, as the ratio of capital and its regulation aim to reduce the levels of bank risk-taking, we expect to find a negative relationship between these two variables.

**Hypothesis 2: There is an inverse relationship between capital regulation and bank credit risk**

Another part of the literature has been interested in the analysis of the theoretical arguments based on the relationship between the bank size and bank risk-taking. It suggests a negative relationship between these two variables. Such a relationship is justified by the most natural argument that is diversification by size. Indeed, larger banks are expected to have lower risks because they have the capability of holding more diversifiable portfolios. In this respect, many researches have been conducted. According to the researches of Saunders et al. (1990), Chen et al. (1998), Cebenoyan et al. (1999) and Megginson (2005), there is a negative relationship between bank risk and bank size. They explain this result by the fact that larger banks are likely to be more skilled in risk management and have also better diversification opportunities. Thus, we expect to find that the bank size is negatively related to the level of risk.

**Hypothesis 3: The bank size affects the level of risk negatively**

Moreover, macroeconomic indicators can also influence bank risks. These indicators are those at the origin of banking crises: inflation rate of growth GDP, interest rate and exchange rate. In this setting, many researches have been conducted to analyse the relationship between these indicators and the occurrence of banking crises. The findings in this respect indicate that there is a close relationship between macroeconomic indicators and banking crises and excessive risk (Angeloni and al (2009), Olga Bohachova (2008), Buch and al (2010)). We will test if these variables influence the levels of credit risk in the Tunisian context.

**Hypothesis 4: Macroeconomic factors affect bank credit risk**

The Tunisian banking sector has received a part of the littérature.

One part of this literature has been interested in the analysis of banking performance, banking efficiency, banking stability and banking governance. Another part of the literature focuses on some phenomena characterizing the Tunisian banking industry like restructuring, liberalisation and privatisation. In this context, Mohamed (2002) has studied the impact of alternative ownership structures on Tunisian firm performance and managerial behaviour with special emphasis on institutional and managerial ownerships. His results have suggested a positive relationship between institutional ownership and the value of the firm explained essentially by internal mechanisms of control. He has also found that the higher the managerial ownership is the lower institutional ownership.

Abdelwahed (2003) has studied the impact of the different variables of corporate governance on the performance of 43 quoted Tunisian firms during the period 1995 to 2000. His study has shown that there is a statistically significant relationship between corporate governance systems and performance. Samy (2003) has investigated the impact of banks' characteristics, financial structure and macroeconomic indicators on banks' net interest margins and profitability in the Tunisian banking industry over the 1980 to 2000 period. His results have shown that individual bank characteristics are main factors that determine bank interest margins and net profitability. Other important internal determinants of banks' interest margins are bank loans which have a positive and significant impact. The size has mostly negative and significant coefficients on the net interest margins. He has also found that the macroeconomic indicators such as inflation and growth rates have no impact on banks' interest margins and profitability. Then, turning to the financial structure and its impact on banks' interest margins and profitability, he has found that concentration is less beneficial to the Tunisian commercial banks than competition.

Wade et al. (2005) have been interested in the analysis of the impacts of financial liberalization on the efficiency of the banking system in Tunisia, using various DEA models and Panel data covering the period 1992 to 1997. Also, Zaghla and Boujelbene (2008) have analysed the determinants of efficiency of the banking system in Tunisia. Their empirical results have revealed pronounced differences in efficiency depending on the size and structure of bank ownership. In addition, the preponderance of credit activity relative to other outputs represents a source of efficiency. Then, there is a negative relationship between the ratio of equity to total assets and bank efficiency, suggesting that banks are engaged in risky activities. Finally, the share of non-performing loans represents a source of inefficiency since the charges for bank increase with these types of loans, especially for large banks.

Studies on bank risk-taking decisions in the Tunisian banking sector are limited. In this context, we can cite the

**Table 1.** List of the Tunisian banks.

Banks abbreviation in French	Full name of banks	Ownership structure (Period: 1995 to 2008)	Specialisation
AB	Amen Bank	Private	No specialisation
ATB	Arab Tunisian Bank	Private	No specialisation
BH	Bank of Housing	State	Estate-field
BIAT	International Arab Tunisian Bank	Private	No specialisation
BNA	National Agricultural Bank	State	Agriculture
BS	South Bank or Attijari Bank	State (95 to 05) Private (06 to 08)	No specialisation
BT	Bank of Tunisia	Private	No specialisation
STB	Tunisian Company Banking	State	No specialisation
UBCI	Industrial and Commercial Bank Union	Private	No specialisation
UIB	International Bank Union	State (95 to 02) Private (03 to 08)	No specialisation

research of Hamza (2009) and Mnasri and Abaoub (2010). Hamza (2009) has investigated the effects of ownership structure, as an internal control mechanism of agency problem, on corporate governance. He has focused especially on the impact of the size, number and type of blockholders on the performance and the risk-taking of the Tunisian listed companies over the period 2001 to 2004. The main result of his study indicates that the presence of controlling shareholders affect performance and risk-taking and play an important role in corporate governance. However, we assume that the control contest of the leading shareholder is not conclusive but it indicates a form of coalition and agreement effect to share private benefits. In the same way, Mnasri and Abaoub (2010) have empirically analysed the determinants of risk-taking in Tunisian commercial banks, with a special emphasis on the ownership structure, the acceptance of government officials on banks' boards, the capital adequacy requirements and the franchise value. Using a sample of ten commercial banks for the period from 1997 to 2006, they have found that the acceptance of government officials on banks' boards reduces bank risk.

The relationship between the managerial holdings and total risk and firm specific risk is non-linear; the risk increases initially with the ownership by managers and then decreases as the effect of managerial entrenchment dominates the effects of interest alignment on bank risk. In contrast, systematic risk is unrelated to ownership and franchise value does not affect bank risk. Following these researches, our research aims to analyse the determinants of bank credit risk in relation with microeconomic factors, macroeconomic factors, ownership structure and bank prudential regulation.

## METHODOLOGY

### Sample and data

The purpose of this paper is to analyse the internal and external factors determining the levels of bank credit risk-taking in Tunisia. Our sample consists of a panel of 10 commercial banks that are listed on the Stock Exchange of Tunis (Table 1) over the period 1995 to 2008. The data used in this paper are collected from the annual reports of the Professional association of the Tunisian banks and financial establishments; the activity reports of the Banks, the guides of the Tunis stock exchange, the Documents of the council of financial market and the Web sites news of the companies, the stock exchange and the central bank of Tunisia.

### Variables' measures

First, following Shrivies and Dahl (1992), Jacques and Nigro (1997), Rime (2001) and Hussain and Hassan (2004) among others, we employ the ratio of risk-weighted assets to total assets as a measure of bank credit risk. This measure is justified by the fact that the allocation of bank assets across different categories of risk is the major determinant of bank risk. Second, we define banks' characteristics in the following manner:

1. Ratio of profitability: Return on assets "ROA" is measured as the ratio of net income to total assets.
2. Ratio of capital: CAP- is defined as the ratio of equity capital to total assets.

Thirdly, we also measure ownership structure (GOV) by a dummy variable that equals 1 if it is the case of State-controlled banks' (Public Ownership) and 0 otherwise (Private and Foreign ownership).

Fourth, we use one proxy for regulation. Our measure of bank regulation (REG) is a dummy variable that captures the degree of respect to the regulation by banks. It takes one if the bank respects the minimum threshold of 5% before 1999 and 8% after 1999 and 0 in other cases. So, if the solvency ratio of the bank (the ratio

**Table 2.** Descriptive statistics.

	Risk	COV	REG	ROA	CAP	LN size	% GDP growth	Inflation	Exchange rate	Interest rate
Mean	0.904493	0.435714	0.885714	0.007809	0.092806	14.47209	4.99285	3.442857	1.169456	6.053482
Median	0.915310	0.000000	1.000000	0.008680	0.090960	14.41782	5.15000	3.150000	1.281053	5.875000
Maximum	0.995856	1.000000	1.000000	0.035006	0.194211	16.28021	7.10000	6.300000	1.436490	8.812500
Minimum	0.660699	0.000000	0.000000	-0.103505	-0.010985	13.37246	1.70000	1.900000	0.000000	5.000000

**Table 3.** Regression results.

Credit risk	Coefficient	Z	P>  Z
GOV	0.180684	2.27	0.023**
REG	-0.029004	-3.22	0.001***
ROA	0.893013	4.47	0.000***
CAP	-0.3494283	-3.17	0.002***
LN size	0.0001677	0.03	0.977
GDP growth	-0.005324	-4.98	0.000***
Inflation	-0.0083063	-4.72	0.0000***
Exchange rate	-0.022998	-2.58	0.0100***
Interest rate	-0.016921	-5.55	0.0000***
Constant	1.149065	12.33	0.0000***

\*\*\* Significant at the 1% level. \*\* Significant at the 5% level.

Of equity-capital to risk-weighted assets) is superior to the minimum required by the regulator variable it takes the value of 1 and 0 otherwise.

Fifth, we use four macroeconomic indicators that can influence banks' risk: inflation, growth rate of GDP, interest rate and exchange rate. Finally, we define one control variable: Bank size (LNSIZE) measured as the natural logarithm of total assets.

### Empirical model

The estimation model is written as:

$$CreditRisk_{i,t} = \alpha + \zeta_{it} Z_{i,t} + \delta_{it} COV_{i,t} + \phi_{it} REG_{i,t} + \eta_{it} V_{i,t} + \beta_{it} LTA_{i,t} + \varepsilon_{it} \quad (1)$$

Where for each individual bank (i), at time (t): RISK  $i, t$ : ratio of risk-weighted assets to total assets in bank i for period t, Z  $i, t$ : matrix of the bank's characteristics variables, COV  $i, t$ : ownership structure variable, REG  $i, t$ : regulation variable, V  $i, t$ : matrix of macroeconomic variables, LTA $i, t$ : bank size,  $\alpha, \beta, \delta, \zeta, \eta, \phi$ : Parameters to be estimated;  $\varepsilon$ : Error term.

### Estimation method

In order to analyse the determinants of Tunisian bank credit risk-taking, we adopt Panel data. This econometric method permits to control the heterogeneity of the observations in their individual measurements, either by taking into account a specific stationary effect (Fixed effect) or by considering a non-observable specific

effect (Random effect). In order to identify the specific effect, we resort to Hausman test. We resort also to Breusch-Pagan test and Wooldridge's test for testing serial correlation and heteroscedasticity. The model specified is a random effect model which takes into account the existence of heteroscedasticity and correlation (Table 3).

## EMPIRICAL RESULTS

### Descriptive statistics

The descriptive statistics for the dependent, independent and control variables are provided in Table 2. First of all, the descriptive statistic of the variable of risk demonstrates that the average bank risk is 0.9044, which means that 90.44% of total assets are risk-adjusted assets. Second, the descriptive statistic of the ownership structure variable shows that the mean of ownership held directly by the State, the public and semi-public establishments is on average equal to 43.57%. This result shows that despite the encouragement of the participation of foreign and private investors in the Tunisian banking sector, the State continues until now the control of the three major Tunisian banks (BNA, BH and STB) by the support of public and semi-public establishments. Third, the descriptive statistic of bank regulation demonstrates that 88.57% of the Tunisian banks respect the regulatory threshold, which illustrates the capacity of the regulatory authorities in Tunisia to control the banking system. Fourth, the descriptive statistic of banks' characteristics

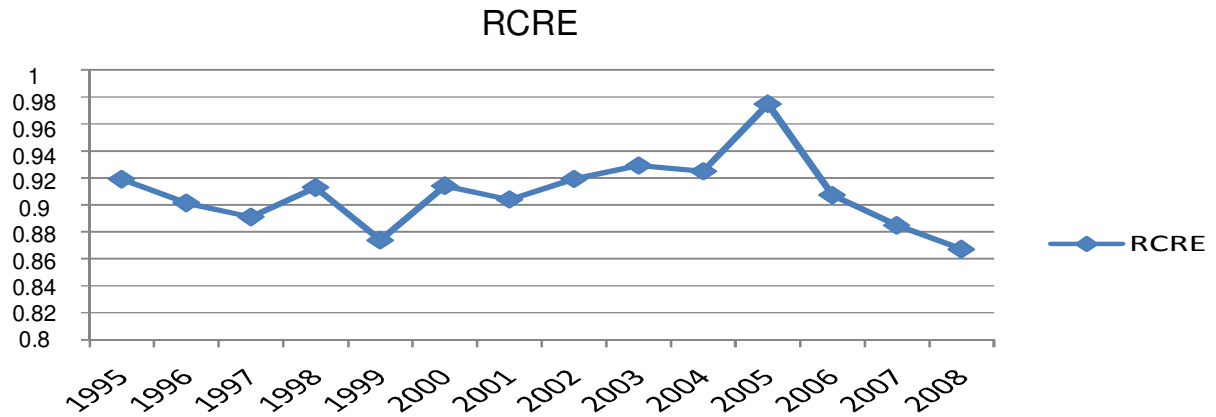


Figure 1. Evolution of mean of credit risk in Tunisia over 1995 to 2008 periods.

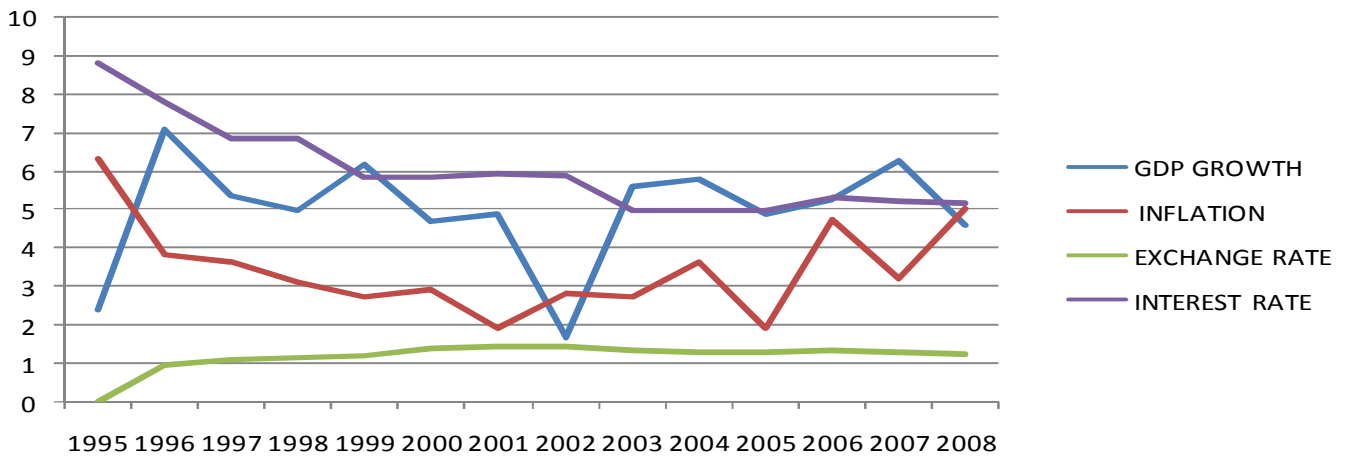


Figure 2. Evolution of mean of macroeconomics variables in Tunisia during 1995 to 2008 periods.

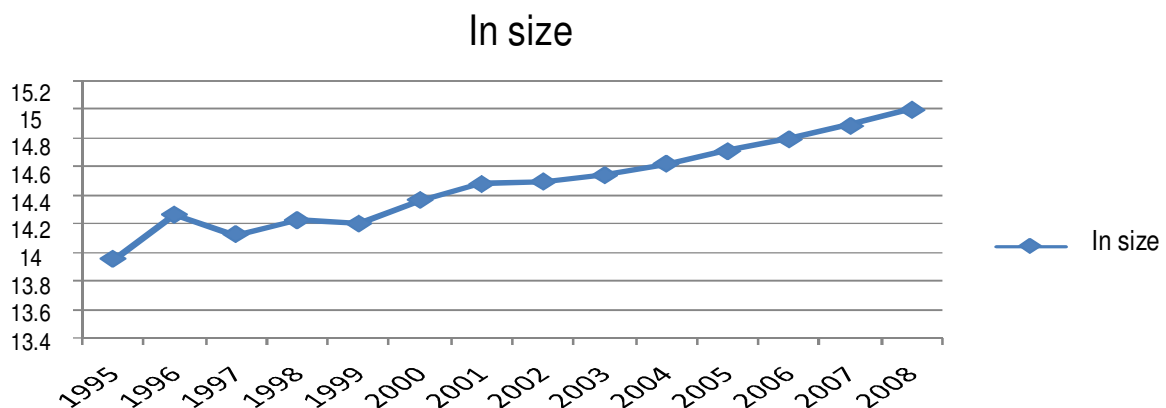


Figure 3. Evolution of mean size of Tunisian commercial banks over 1995 to 2008 period.

show that the mean of the ratio of return on assets is about 0.78%, which means that the average net income of Tunisian banks represents 0.78% of their total assets.

Also, the mean of the ratio of capital is about 9.28%, which shows that on average the Tunisian banks capital represent 9.28% of their total assets. Fifth, the descriptive

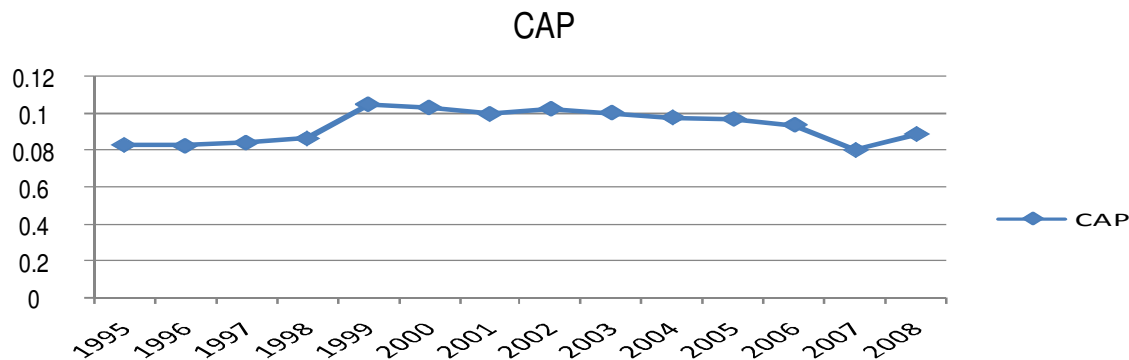


Figure 4. Evolution of the mean capital ratio in Tunisian commercial banks over 1995 to 2008 period.

statistic of the control variable indicates that the mean of banks size is about 1,447,209 Tunisian Dinars. Finally, the descriptive statistic of macroeconomic variables indicates that the mean of GDP growth is about 4.99, the mean of inflation is about 3.45 and the mean of interest rate and exchange rate are around 6 and 1.17, respectively. To have an idea about the tendencies of some of these variables during the period of the study (Figures 1, 2, 3 and 4).

### Regression results

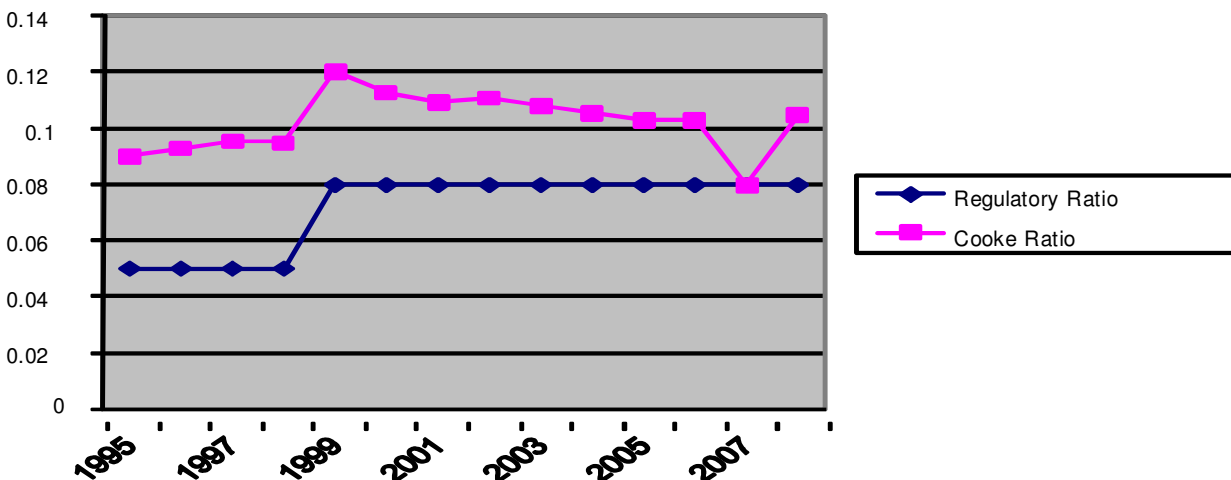
The credit risk is one of the main risks that seriously affect banks' stability. The credit risk in banking is commonly defined as the probability of a borrower defaulting his loan commitments. The main goal of a bank is to manage this type of risk because effective management of credit risk is a critical component of a comprehensive approach to risk management and essential to the long-term success of any banking organisation. In this respect, it is essential to identify the main factors causing this risk in order to manage it. In the following, we present the regression results of the main factors influencing bank credit risk in Tunisia. So, Table 3 indicates the results of GLS estimation of regression of Equation 1. Overall, the results of the model show that:

1. The ownership structure influences the risk taken by Tunisian banks. Indeed, consistent with expectation, the coefficient of GOV is positive and statistically significant with the bank credit risk. This result is coherent with the research of Sapienza (2004) and La Porta et al. (2002) who have found that the public ownership is positively related to the bank risk. They explain this result by the fact that the State acquires the control of the banks to direct their resources towards the financing of political and social projects. In the Tunisian context, this result can be explained by the fact that the public banks (BH, STB and BNA) have strengthened their efforts in financing projects in the estate, the tourist and the agricultural fields. These sectors play a leading role in the

economic development in Tunisia because of their contribution to cover the trade deficit and the resolution of unemployment problems. However, these sectors show a risky character since they are associated with numerous contingencies. For example, the tourist sector is affected by a seasonal character since the Tunisian tourism attracts more tourists in the high season and results in an under-use of the tourist facilities off-season which leads to a limited performance of this sector and this makes it vital for the State to interfere to revive it. Moreover, the agricultural sector strongly depends on the climatic conditions (drought, flood, rainfall variability etc) that can affect its performance and can justify the tendency of the state to come to the finance of this risky sector. The interference of the State to finance these risky sectors explains the positive relationship between State ownership and Tunisian bank credit risk-taking.

2. The prudential regulation of banks' capital also influences the level of banks' risks. Indeed, the coefficient of REG is negative and statistically significant with risk at a level of 1%. This result shows that the introduction of the capital adjusted to risks has led to a significant increase in capital ratios and a lower risk in the portfolios of banks which have already respected the regulations requirements. This result converges with from the literatures supporting that the over-capitalized banks force the under-capitalized banks to reduce their potential of credit bank risk taking (Kim and Santomero (1988); Furlong and Keely (1989, 1990); Jacques and Nigro (1997); etc). This result can be also explained by the efforts made by the Central Bank to make the Tunisian banks at the same level as their foreign counterparts by imposing a new prudential regulation. Indeed, the new prudential regulation in Tunisia was born with the circular of the Central Bank no. 91 to 24 of December 17<sup>th</sup>, 1991. The main important reforms of this circular are:

1. The net capital of a bank always has to represent 5% of the total of its risk-weighted assets (article 4 of this circular).
2. Since 31 December 1999, the solvency ratio has



**Graph 1.** Evolution of mean ratio of solvency and regulatory threshold. (Regulatory Threshold = 5% before 1999 and 8% from 1999 to 2008).

increased from 5 to 8%.

The negative association between the bank risk and the prudential regulation of capital make it necessary to analyse of the tendencies of the ratio of solvency of Tunisian banks during the period of the study (Graph 1).

From this graph, we can notice that the Tunisian commercial banks have respected the regulation threshold over 1995 to 2008 period. These tendencies show that the capital regulation is effective in the Tunisian banking sector and this can reduce the risks taken by these banks.

The banks' characteristics are also important factors influencing the level of the Tunisian bank credit risk-taking. Indeed, the ratio of profitability also influences bank risk taking decisions. Since the coefficient of return on assets (ROA) is positive and statistically significant with risk. This result shows that the most profitable banks are the riskiest banks. The ratio of capital CAP is negative and statistically significant with risk. This result indicates that over-capitalized banks are less risk-taker compared with under-capitalized banks. Contrary to expectation, the coefficient of bank size is insignificant with bank credit risk. This result diverges from the results obtained by Saunders and al. (1990), Chen and al. (1998), Cebenoyan et al. (1999) and Megginson (2005). This result can be explained by the fact that Tunisian banks have almost similar sizes and the majority of them conform to banking regulation and these show that the bank size have a minor influence on the level of credit risk.

Finally, the results indicate that the macroeconomic indicators are determinant factors that influence Tunisian bank credit risk-taking decisions. Indeed, the coefficients of rapid growth of GDP, inflation, exchange rate and interest rate are statistically significant at a level of 1% with bank credit risk.

## Conclusion

This paper has empirically examined the determinants of credit risk held by Tunisian banks over 1995 to 2008 periods. This study takes its importance from the numerous structural changes in the Tunisian banking sector (globalization, deregulation, internationalization, technologies of information and communication) that have exposed them to a number of risks and stated important challenges for their stability. The empirical results of this study show that the public ownership increases the bank credit risk. Moreover, the prudential regulation of capital decreases the credit risk taken by Tunisian banks. This result accounts for the willingness of these banks to respect the bank regulations. Besides, the banks' characteristics are also important factors influencing the levels of risks taken by Tunisian banks. Indeed, the ratio of return on assets is positively related with credit risk and the ratio of capital adequacy is negatively associated with credit risk. Then, the results indicate that the bank credit risk-taking decisions are also related to bank macroeconomic indicators.

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