

# Bank Governance, Risk and Bank Insolvency: Evidence from Tunisian Banks

Nesrine Djebali (Corresponding author)

University of Jendouba, Faculty of Law

Economics and Management of Jendouba, Tunisia

Tel: 216-22-961-769 E-mail: djbeli.nesrine@gmail.com

Khemais Zaghdoudi

University of Jendouba, Faculty of Law

Economics and Management of Jendouba, Tunisia

Tel: 216-98-553-863 E-mail: k.zaghdoudi@yahoo.fr

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## Abstract

The aim of this paper is twofold. Firstly, it investigates the effect of bank governance on bank risk measured by the standard deviation of the return on assets (SDROA). Secondly, it tests the relationship between bank governance mechanisms and bank insolvency proxied by the Zscore (ROA). To achieve this goal, we used a sample of 11 Tunisian banks observed during the period 2006-2015. These 11 banks are considered as the most dynamic banks in the Tunisian banking system. The econometric approach used in this study is based on panel data analysis especially fixed and random effect models. Empirical results indicate that the presence of Supervisory Committee and monitoring of risks (COR), the executive compensation (REMB) and the board size (BDSIZE) increases significantly Tunisian bank risk and insolvency. However, the presence of independent directors (INDD) and the proportion of institutional investors decrease bank risk and bank insolvency. With regard to the effect on macroeconomic condition, only inflation rate exerts a significant effect. However, this effect is negative when the dependent variable is SDROA and positive for Z-score. The effect of GDPG is not significant for both bank risk and bank stability.

**Keywords:** Bank governance, Bank risk, Bank stability, SDROA, Z-score, Tunisian banks

## 1. Introduction

Banks play a major role on the real economy. They are considered as the main sources involved in financing the economy. However, banking sector has particular characteristics (high leverage, low liquidity, asymmetry of information, etc.) which make it relatively exposed to different shocks both internally and externally. These factors include macroeconomic shocks, internal and external shocks, microeconomic shocks, stabilization programs, financial liberalization programs and monitoring systems, poor banking and governance practices.

The crucial role of banks and the risk of bank fragility and bank crises pushed bankers and policymakers to improve bank regulation and bank performance and to seek for well management of bank risks. As a result, the relationship between banking governance mechanism and bank risks becomes very interesting topic. Banks with more effective boards are less likely to lend to riskier borrowers (Faley and Krishnan (2017)). Board size exerts a positive and significant effect on bank risk taking. However, non-executive directors decrease both insolvency and liquidity risk. Results show also that CEO's duality is positively and significantly associated with credit risk (Abobakr and Elgiziry (2017))

The risk of insolvency is considered as an inevitable risk. It constitutes the main source of losses and instability. Also, it is perceived as the most serious risk incurred by the financial institutions. Indeed, the negative effect of this risk pushed the banking supervision authorities to take the adequate decisions as regards its detection and its well management. This is in order to reinforce the banking system stability. In a general way, the capacity of an establishment to measure and manage risks constitutes one of the basic elements of the quality of its management.

Risk management covers all tools and techniques that are able to measure and control the level of risk. Nevertheless, several analysts agree that the current banking crisis is at the origin of weak governance driven from an insufficient internal mechanism of governance which leads to a higher bank risk taking. This risk is due to bad practices of governance. Recent studies sought the effect of good or bad governance practices on the reduction or the increase of banking risk ((Faley and Krishnan (2017), (Abobakr and Elgiziry (2017))).

The debate on the effect of bank governance mechanism on bank risk and insolvency is well documented in the banking literature. However, findings of empirical studies revealed ambiguous results. This ambiguity encouraged us to search this association in the Tunisian context. It's for this reason that we raised this research question: Are internal bank governance mechanisms associated with better protection of banks or higher exposure bank risk and insolvency?

This research attempts to fill this gap and to explore the nature of the relationship between various bank governance mechanism and bank risks. This study contributes to the existing literature by the use of two different econometric techniques. We use the model of Anginer and al. (2014) which measures the total bank risk and the risk insolvency by the technique of Z-score and we tested the effect of bank governance on bank risks using the SDROA.

The objective of this study is to investigate the impact of the internal mechanisms of governance on bank risk measured by the standard deviation of the return on assets (SDROA)

and risk of insolvency measured by Z-score. This investigation continues a new direction in the analysis of the financial distress for the banking institutions.

The remainder of this paper is as follows: A brief literature review is given in section 2. Empirical methodology and the discussion of the major findings are presented in section 3 while section 4 concludes.

## **2. Literature Review and Hypotheses**

Banks play a crucial role in economy financing. For some credit-based economies, the soundness of these economies is closely dependent to the soundness and the stability of their banking systems. Hence, there is a strong need and a necessary appeal for strong governance, good supervision and well management of bank risk. This is in order to avoid bank instability and fragility which lead to banking failure and bankruptcy.

This literature treats the impact of the banking governance on the bank risk. NoutWellink (2014), the ex-president of the Committee of Basle, reported that “the crisis highlighted the importance of a good practice of company governance for the banking institutions, the prudential monitoring and the supervision which improve bank solidity and stability of the whole financial system”.

Shleifer and Vishny (1997) defined the company governance with reference to the whole mechanisms of security which make it possible for equity providers to maximize the output of their financial investments. The internal mechanisms of governance, which are intentional and formal, cover the control exerted by the shareholders through the right to vote, the board of directors, the mutual monitoring between managers and the control exerted by the employees. However, Charreaux, (2006), stressed that the governance falls under the prospect of efficiency in most theories of the firm. The system of governance aims at improving firm’s efficiency. Hence, the mechanisms of governance discipline leaders and contribute to increase the firm’s efficiency through the creation of the added value. With reference to La Porta and al. (2000), banking governance is defined by mechanisms to which the external investors are protected from the expropriation risk of the internal investors (majority shareholders and leaders). According to Kashyap and al. (2008), the performance of companies is more sensitive to the quality of governance during the period of the crisis. Consequently, the companies’ governance system should protect the interests of stakeholders which create more added values (Belkhir 2007). The company’s governance called upon to the installation of certain constraining mechanisms which aim to control and discipline the manager in order to protect the interest of all stakeholders in the company.

In the following development, we will review studies that investigated the association between bank governance and bank risk and/or bank stability. Also, we will provide studies that measured and tested default probability of banks. Based on a sample of international banks from 22 countries during the period 2004 -2008, Anginer and al. (2014) measured the probability of default using the model of Merton and the Z-score method. They argue that a good practice of governance is associated with an increase of the volatility assets and thus is positively related with the risk of banking bankruptcy.

### *2.1 Presence of Supervisory Committee and Monitoring of Risks*

The Risk and Oversight Committee is an independent committee of the board of directors whose role is to manage, monitor and minimize the various risks facing the banking industry. Such a Committee helps the Board of Directors meet its supervisory responsibilities and minimizes bank exposure to risk.

Brancato et al. (2006) and Sabato, (2010) showed the positive effect of the presence of an audit committee in the reduction of banking risk, the creation of a specialized risk management committee makes it possible to manage all risks within banks. In the same context, Mongiardino and Plath (2010) showed the positive impact of the risk management committee in large banks. They note that the best management practices provided by the risk committee ensure better stability and banking performance from which arises the need for at least one specialized committee for supervision and audit at board level.

Based on the review of the literature, we suppose that the presence of committee risk indicates a good governance practice.

*Hypothesis 1: The presence of Supervisory Committee and monitoring of risks decreases the level of bank risk*

### *2.2 Executive Compensation*

The executive compensation is considered as one of the important governance mechanism in the banking and firm theories. This mode of compensation; wages and bonus is more inciting to the CEO (Note 1) and to the members of the board of directors. There exist three forms of remunerations (Note 2): (i) The bonus remuneration, (ii) The variable remuneration and the monetary remuneration (iii).

By using a sample of 132 listed French companies, Geraldine and Yves (2002) examined the impact of certain variables of governance on the remuneration of the chairman. This study is interested in the investigation of the impact of the characteristics of the board of directors on the remuneration of the manager. The main finding showed that the existence of a committee of remuneration affects the policy of remuneration, but this influence differs according to the type of ownership structure of the company. The proportion of independent administrators to the council does not affect the policy of remuneration of the leaders. According to John and Qian, (2003), the sensitivity of the remuneration of the leaders to the performance would be less strong in banks than in industrial firms. In their study, the direct remuneration of the managers, on average of 4.2 million dollars, was made up for 16% from the salary (Note 3), 23% of the bonus, 7% of other remunerations in cash and for 54% of attribution of options. Webb (2008) reported that the bank manager having an aversion with the risk taking into account the strong regulation in this sector, it would be necessary to increase the inciting character of remuneration. Moreover, Mishra and Nielsen (2000) noted that variable remunerations would have a positive effect on the performance of the more large American banks. The share of the stock-options would be weaker in the remuneration of the bank leaders, as in other industries with low growth (Adams and Mehran, 2003).

In our model, we will calculate the rough remuneration of the leaders compared to the total

assets. Following this development, we can put the following hypotheses:

*Hypothesis 2: Remuneration of executive directors reduces the level of banking risk.*

### 2.3 Board Size

The board size is an important mechanism of governance which can affect the firm's performance. A very small board it exposed to more difficulty to resist and control the direction and to well avoid and manage the multiplicity of risks affecting the banking environment. For Jensen (1993), the board of directors is a fundamental mechanism of the internal monitoring system which makes it possible to discipline and fix the rules with the leader. The size of the board of directors is measured by the number of members of the board. It affects positively or negatively the banking performance. From where a board of directors made up from seven to eight members is more effective since it would allow a better performance, a better coordination, faster decisions and a weak agency cost.

Based on 340 bank-years for 80 unique banks over the period 1994–2008, Faleye and Krishnan (2017), studied the effect of bank governance on risk-taking in commercial lending. Empirical findings indicate that banks with more effective boards are less likely to lend to riskier borrowers. Face riskier borrowers, banks can practice credit rationing to avoid credit risk. Hence bank governance regulations may have potential unintended consequences.

Tan and Anchor (2017) explored the impact of competition on credit risk, liquidity risk, capital risk and insolvency risk in the Chinese banking industry during the period 2003-2013. To this end, they performed the generalized method of moment system estimator (GMM). The main findings of this paper are higher level of competition leads to higher credit risk, higher liquidity risk, higher capital risk, but lower insolvency risk.

By using sample of 27 Egyptian banks covering the period from 2006 to 2011, Abobakr and Elgiziry (2017) investigated the influence of board characteristics on bank risk taking. Empirical findings indicate that the Board size exerts a positive and significant effect on bank risk taking. However, non-executive directors decrease both insolvency and liquidity risk. Results show also that CEO's duality is positively and significantly associated with credit risk.

Banking and firm literature highlighted that board size can strongly explain the level of performance (Jensen and Murphy 1990; Tosi and al. 2000; Albouy 2004). A company of bigger size implies a higher level of responsibility. A board of directors of big size can be unable to ensure the well management. It could be subject to problems of divergence of the interests due to the high members of board. This suggests that the effectiveness of the board can be dependent to the board of directors in a nonlinear way.

Ronald et al. (2004) studied a series of variables of company's governance which refer to a sample of banking institutions and manufacturing companies. They showed that a board of directors of an important size provides a greater monitoring of the process of financial accounting. As for Adams and Mehran, (2003), the board of directors of banks has on average 16 members and banks having larger board are neither less powerful nor riskier. In the same context, Vallelado (2008) studied the relation between bank governance and bank

performance. He reported that the board size of directors influences the bank performance and the credit risk with a threshold of 19 members. By using a sample made up of 107 banks. In the same line of idea, using the Z-score method, Pathan, S. (2009), measured the risk of insolvency for a sample of 212 American Large banks. The results showed that an important size of board directors affects negatively the bank risk taking.

Switzer and Wang (2013) tested the relationship between credit risk and the various mechanisms of governance. They used the technique of Z-score for a sample of American commercial banks. They showed that the structures of company's governance have a more important impact on the commercial banks rather than on the saving institutions during the year preceding the financial crisis of 2008-2009. Results showed also that commercial banks having more important boards of directors and older finance directors are associated with low levels of credit risk. Also the fall of the presence of the institutional and independent investors is associated with a lower level of credit risk. Finally, as for Jamel and Khamoussi (2013), the board size of directors is negatively associated with the financial bank performance measured by the ROE.

*Hypothesis 3: The size of board of directors increase risk and bank risk insolvency*

#### *2.4 Presence of External or Independent Administrators in the Board*

According to Belkhir (2006), the percentage of independent administrators is related to bank risk, the results indicated that the number of the independent administrators, do not affect the level of performance. Chandra, et al. (2000), studied a sample of 89 large banks during the period going from 1975 to 1989, they showed that the percentage of the independent administrators affect positively the banking performance. By using a sample of 287 banks, Simpson and Gleason (1999) analyzed the effect of the property of the board of directors and the internal mechanisms of governance on the follow-up of the firm, the main results showed that the presence of independent directors in the board is associated with a weaker probability of financial distress.

The presence of independent administrators in the board of directors has a significant effect on bank performance. Let us start with the independence of the board of directors which is an indicator of the share of the independent administrators within the board. This variable is proxied by a score. A high score indicates the important presence of the independent administrators in the board of directors. Consequently, a more independent board should better represent the interests of its shareholders rather than the leader. This measure was adopted by several researchers among them in particular Pathan and al. (2007), Andres and Vallelado (2008) and Pathan (2009).

Adams and Mehran (2009) used a sample of 35 US listed banks to test the impact of the presence of the external administrators in the board of directors. They found that the percentage of independent directors does not have any effect on the bank performance. This result is divergent with the work of Booth et al. (2002) which affirmed that the percentage of independent administrators is negatively related to the control mechanisms.

*Hypothesis 4: The presence of external or independent directors is negatively associated with the level of banking risk.*

### *2.5 Proportion of Institutional Investors That Have 5% of Capital or More*

Pathan, S. (2009), based on a sample of 212 large US bank holding companies over 1997–2004, using a z-score technique showed that a less percentage of institutional investors is positively associated with bank risk-taking as bank shareholders.

In the same context, David and al (2012), using a sample of financial firms from 30 countries that were at the center of the crisis showed that the Institutional ownership “Percentage of shares owned by institutional investors who have 5% of capital”, showed that Firms with a higher institutional ownership experienced worse stock returns during the crisis period And took more risk prior to the crisis, which resulted in larger shareholder losses during the crisis period. Vincent Aebi and al (2012), investigated whether risk management is related to corporate governance mechanisms, the results showed that the percentage of a bank’s shares owned by large shareholders with ownership stakes of  $\geq 5\%$  affect performance and bank risk.

*Hypothesis 5: The proportion of institutional investors holding 5% or more of the capital is associated with a high level of banking risk.*

### *2.6 Audit Quality "BIG4"*

High-quality auditing is particularly important for financial institutions, such as banks that are exposed to different risks. Several studies revealed the important role that high-quality audit services play in reducing these risks. Audit quality is a key variable in reducing information asymmetry, controlling banking risks and minimizing the various forms of potential losses.

The key issue is the choice of audit quality and its relationship to certain internal governance mechanisms, resulting in a high-quality audit committee that improves governance within the bank. A weak committee is associated with a low quality of control and thus a risk of increasingly high risk. Previous studies have also linked the quality of the audit to boards of directors, which according to Fama and Jensen (1983), the audit quality is considered as a governance mechanism, the auditors perform the role of control, management, and Verification of information from their companies. In the same context, Simnett and al (1993) showed that the quality of the audit is positively related to the boards of directors by examining the effect of the board structure on audit quality (BIG4).

Cohen and al. (2002) examined the relationship between governance mechanisms and overall audit quality. They found that strong governance was considered to be associated with good financial reporting and good oversight by financial Committee. In the same context, Semiu and Temitope (2010) showed the existence of a significant relationship between the various banking governance mechanisms such as "the size of the board, the duality, the percentage of directors, etc." and the quality of audit. Chiara. D and Sara. T (2016), following the 2007-2008 financial crisis, links the impact of corporate governance and audit quality on risk. A financial crisis in the audit model, this study helps to identify the importance of internal control and the auditor's experience in risk assessment by the audit committee.

Based on previous research, we assume that the auditing services provided by the (BIG4)

provide good governance practice within the banks and are associated with better audit quality.

*Hypothesis 6: Banks audited by (BIG4) are less associated with bank risk and insolvency risk*

### 3. Empirical Analysis

In this section we will firstly present data and methodology. Secondly, we will specify the econometric model used in this study and give the definitions and measurements of the variables. Finally, we will interpret possible econometric and economic association between bank governance, bank risk and bank insolvency.

#### 3.1 Data and Methodology

To explore the relationships between bank governance, risk and bank insolvency, we used a sample of 11 Tunisian banks (Note 4) over the period 2006-2015. Although that Tunisian banking system covers more than 25 banks, we consider only these 11 banks in our study for many reasons. First, these banks are the most served ones in empirical studies for Tunisian banking system. Hence, we can apply comparison findings. Second, these 11 banks are the most dynamic banks in the Tunisian economy. Third, we suppose that governance mechanisms are different from other banks with reference to bank size, ownership and bank strategies.

Financial data that represent bank specifics and variables relative to bank governance are collected from annual reports of each bank. However, variables that reflected macroeconomic conditions are taken from the World Development Indicators data base.

Taking into account the two dimensions of our sample; individual and temporal, the panel data analysis based on fixed and random effect seemed to be the most appropriate. For our sample, the temporal dimension is greater than the individual dimension. It is for this reason that we apply the static panel analysis rather than the dynamic panel data.

#### 3.2 Model Specification and Variable Definitions

Following the work of Anginer and al. (2014) which investigated the relationship between corporate governance and bank insolvency risk, the econometric models used in this study can be written into two equations. The first one tested the effect of bank governance on Tunisian bank risk. However, the second one explored the impact of bank governance on Tunisian bank insolvency.

##### *Model 1: Bank Risk*

$$\text{SDROA}_{i,t} = \beta_0 + \beta_1 \text{LOANS}_{i,t} + \beta_2 \text{SIZE}_{i,t} + \beta_3 \text{LIQR}_{i,t} + \beta_4 \text{CRO}_{i,t} + \beta_5 \text{REMB}_{i,t} + \beta_6 \text{BDSIZE}_{i,t} + \beta_7 \text{INDD}_{i,t} + \beta_8 \text{STR} + \beta_9 \text{BIG4} + \beta_{10} \text{GDPG}_{i,t} + \beta_{11} \text{INF}_{i,t} + \epsilon_{i,t} \dots \text{Model (1)}$$

##### *Model 2: Bank Insolvency*

$$\text{ZSCORE}_{i,t} = \beta_0 + \beta_1 \text{LOANS}_{i,t} + \beta_2 \text{SIZE}_{i,t} + \beta_3 \text{LIQR}_{i,t} + \beta_4 \text{CRO}_{i,t} + \beta_5 \text{REMB}_{i,t} + \beta_6 \text{BDSIZE}_{i,t} + \beta_7 \text{INDD}_{i,t} + \beta_8 \text{STR} + \beta_9 \text{BIG4} + \beta_{10} \text{GDPG}_{i,t} + \beta_{11} \text{INF}_{i,t} + \epsilon_{i,t} \dots \text{Model (2)}$$



This econometric model is tested in several steps. We introduce gradually governance variables. This is in order to have partial or individual and global effect of bank governance quality on the total risk in a general way and bank insolvency risk in a particular way. For example, in the first model, we introduced only the variable of the presence of Supervisory Committee and monitoring of risks (COR). In the second model, we added the executive compensation (REMB). In the third model we introduced the board size (BDSIZE). The fourth model integrated the presence of independent directors (INDD). The proportion of institutional investors (STR) is added in the fifth model, while the audit quality (BIG4) is introduced in the sixth model. Finally, the seven and the last model combined all bank governance variables used in this study.

Definitions and measurements of variables used in the two econometric models are presented in Table 1 below.

Table 1. Definition and measurement of variables

Variables	Definitions	Measurements	Sources
<i>Dependent variables</i>			
Zscore	Bank Insolvency	Bank solvency constructed as: $(E(ROA) + CAR)/SROA$ where ROA is return on assets, CAR represents capital assets ratio and SROA stands for standard deviation of return on assets	Anginer and al. (2014) Leaven and Levine (2008)
Sdroa	Bank risk	The standard deviation of return on assets	Anginer and al. (2014)
<i>Bank specifics</i>			
Loans	Bank Loans	Total loans divided by total assets	Anginer and al. (2014)
Liqr	Liquidity risk	Total credit divided by total deposit	Anginer and al. (2014)
Size	Bank size	Logarithm of total assets	Anginer and al. (2014)
<i>Bank Governance mechanisms</i>			
Cro	The presence of Supervisory Committee and monitoring of risks	Dummy variable takes 1 in the presence of Supervisory Committee and monitoring of risks 0 otherwise.	Aebi and al. (2012)
Remb	The executive compensation	The Naperien Logarithm of (Executive compensation / Total Assets)	Baker, and al. (1988) and Attia, M.B (2013)
Bdsize	The Board size	The Board size	Molz (1988). Parveen P. Gupta (2012).
Indd	The presence of independent directors	The presence of independent directors	Baysinger and al (1991) and, Hukan and al (2011)
Str	The proportion of institutional investors	The proportion of investors that have 5% OF capital or more.	Huang and al (2011)
Big4	The audit quality	Dummy variable takes 1 if the bank is audited by BIG4 0 otherwise.	
<i>Macroeconomic specifics</i>			
GDP	Economic growth	The growth rate of gross domestic product	Anginer and al. (2014)
Inf	Inflation rate	The Customer index Price	Anginer and al. (2014)

The bank specific variables are selected following the approaches of Anginer and al (2014), where three types of financial variables are considered: bank loans (Total loans divided by total assets), liquidity risk (Total credit divided by total deposit), and bank size (in total assets). In this paper, we improve the internal governance mechanisms of the company. Regarding banks CG variables, we follow the work of Aebi and al. (2012) by selecting the presence of supervisory committee and monitoring of risks which represents a dummy variable that takes 1 in the presence of supervisory committee and 0 otherwise. Based on the study of Baker and al (1988) and Attia, M.B (2013), we add a second bank governance mechanism which represents the executive compensation of directors (logarithm of executive compensation/total assets). Molz (1988), Parveen, P Gupta (2012) showed the importance of Bdsiz (The board size) and Indd (The presence of independent directors). Moreover, Huang and al. (2004) suggested that Str (The proportion of investors who have 5% of capital or more) and Big 4 (Dummy variable takes 1 if the banks is audited by BIG4, 0 otherwise) influences bank insolvency. Finally, following Anginer and al (2014), we added macroeconomics specifics, the first one is Economic Growth (The growth rate of gross domestic product) and the second one is the inflation rate (The customer index price).

### 3.3 Empirical Finding

Before interpreting empirical results, we will give an overview of all variables used in this study. Descriptive statistics presented in Table 2 give information about each variable such as average value, the standard deviation and the maximum and minimum values.

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Sdroa	110	0,004	0,008	0	0,078
Zscore	110	7,401	8,384	0,207	34,968
Loans	110	0,795	0,099	0,525	0,965
Size	110	14,930	0,613	13,814	15,984
Liqr	110	1,335	0,461	0,636	2,597
Cro	110	0,466	0,502	0	1
Remb	110	0,067	0,056	0,004	0,257
Bdsiz	110	10,682	1,873	5	13
Indd	110	0,069	0,094	0	0,400
Str	110	0,622	0,137	0,282	0,864
big4	110	0,591	0,494	0	1
Inf	110	0,038	0,012	0,025	0,059
Gdp	110	0,022	0,014	-0,005	0,047

Table 2 above gives information about central tendency (mean), variability (standard deviation) and maximum and minimum of each variable. This table offers for readers more information about our sample.

For bank specifics, the average value of bank risk (SDROA) is about 0.4%, with a standard deviation of 0.8% and a maximum value of 7.8%. In contrary to the evolution of bank risk which appears almost stable, bank insolvency (ZSCORE) seems more unsettled. As mean and standard deviation, this variable records respectively 7.40 and 8.384. However, there is a strong spread between maximum and minimum variable with respectively 34.968 and 0.207. This means that in our sample of Tunisian banks there are banks that are more solvent and stable and there are others that are insolvent and instable. Loans specialization (LOANS) records as an average a value of 79.5%, with a standard deviation of 9.9% and a maximum and minimum respectively of 96.5% and 52.5%. The most remarkable thing for this descriptive statistics that bank size (SIZE) for Tunisian banks is stable. There is no wide difference between the average, maximum and the minimum values. This leads to conclude that the bank size of our sample is almost uniform. For example, the average value is about 14.930; the minimum value is 13.814 and the maximum value records 15.984. Contrary to Loans activity which is considered in many studies as a proxy of credit risk, liquidity risk (LIQR) in Tunisia is considered as the main factor that enhances bank solvency and bank stability. This conclusion can be confirmed by values attributed to this risk. The mean value of the liquidity risk is 133.5% with a maximum value of 259.7% and a minimum value of 63.6%. The high spread between the maximum and the minimum values indicate that for the same sample, there are banks that are more capitalized and registered a weak level of liquidity risk as well as there are others that have insufficient liquidity.

With regard to bank governance mechanism, board size (BDSIZE) records as an average a value of 10.682. The maximum and the minimum values are respectively about 10 and 5. For the presence of independent directors (INDD), the average value is about 0.069 with a maximum of 0.4. (BIG4) as a dummy variable registered classic values 0 as a minimum value and 1 as a maximum value. Its average value is almost similar to the standard deviation with respectively 0.591 and 0.494. Macroeconomic conditions are represented by the growth rate of gross domestic product (GDPG) and the inflation rate (INF). For the first indicator, a value of 2.2% is recorded as a mean value. For this variable, the minimum value is negative -0.5%. However, the maximum value is about 4.7%. From these statistics, we can conclude that Tunisia has recorded a slow growth in this period. For the second indicator (INF), the average value is 3.8% with a maximum of 5.9% and a minimum of 2.5%.

After having an idea about variables used in the econometric model, the correlation matrix presented in Table 3 below indicates the nature and the level of correlation between variables. The sign of correlation may be positive or negative and the level can be described as high or weak correlation.

Table 3. Correlation Matrix

	Sdroa	Zscore	Loans	Size	Liqr	Cro	Remb	Bdsize	Indd	Str	big4	inf	gdp
Sdroa	1.0000												
Zscore	-0.1024	1.0000											
Loans	0.1931	-0.0523	1.0000										
Size	-0.1040	0.0881	0.2675	1.0000									
Liqr	0.0068	0.0178	-0.1343	-0.4032	1.0000								
Cro	0.2065	-0.1547	0.4383	0.0296	-0.1562	1.0000							
Remb	0.2304	-0.2138	0.0935	-0.2656	0.0469	-0.0296	1.0000						
Bdsize	0.0007	0.0604	-0.2344	0.0663	-0.0082	-0.4032	-0.1103	1.0000					
Indd	-0.1078	-0.3303	0.0780	0.3600	-0.2225	0.1523	0.0911	-0.2571	1.0000				
Str	0.0357	-0.1557	0.0941	0.2463	-0.1673	-0.1215	0.1939	0.2928	0.1441	1.0000			
big4	0.2289	-0.2461	0.1632	-0.2376	-0.1461	0.1748	0.4248	-0.1422	-0.1115	0.3145	1.0000		
Inf	-0.0913	0.0217	0.4524	0.6259	-0.4749	0.3347	-0.0560	0.1119	0.2281	0.1445	0.0621	1.0000	
Gdp	-0.0301	0.0027	0.2131	0.1900	-0.0850	0.0487	-0.0129	0.2272	-0.0283	0.0318	0.0671	0.5625	1.0000

From Table 3 above we can conclude that all correlations between variables used in this study are very weak. The highest level of correlation is recorded between GDPG and INF with a value of 56.25% but it is still less than 60%. This led us to confirm the absence of multicollinearity problem between variables. With regard to the first independent variable (SDROA), Table 3 shows that this variable is negatively associated only with bank size (SIZE), the presence of independent indicators (INDD) and the two macroeconomic variables. However, the second independent variable of our study is correlated negatively with loan specialization, COR, REMB, INDD, STR BIG and INF.

### 3.3.1 Bank Governance and Bank Risk

Table 4 below presents the results of the first model which tests the relationship between bank governance and bank risk. For all estimated equations, the random effect model is the most appropriate. The result of Hausman test indicates the preference for GLS regression since the probabilities associated to this test are higher than 5%.

Table 4. Result of Random effect regression: Bank governance and bank risk (Dependent variable is SDROA)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Sdroa	Coef,	Coef,	Coef,	Coef,	Coef,	Coef.
Loans	0,02 1,710*	0,016 1,38	0,02 1,720*	0,018 1,57	0,019 1,58	0,018 1,58
Size	-0,002 -0,76	-0,002 -0,71	-0,002 -0,82	-0,002 -0,85	-0,002 -0,87	0,004 1,690*
Liqr	0,001 0,1	0,002 0,74	0,003 1,13	0,003 1,32	0,003 1,33	-0,56 0,577
Inf	-0,291	-0,328	-0,428	-0,424	-0,426	-0,459

	-1,880*	-2,150**	-2,760***	-2,720***	-2,72	-2,910***
Gdp	0,078	0,091	0,08	0,077	0,076	0,069
	0,85	1,01	0,91	0,87	0,85	0,78
Cro	0,004	0,005	0,008	0,008	0,008	0,008
	1,810*	2,100**	2,990***	3,030***	2,940***	2,990***
Remb		0,034	0,04	0,043	0,044	0,036
		2,000**	2,350**	2,460**	2,420**	1,870*
Bdsize			0,001	0,001	0,001	0,002
			2,230**	1,990**	1,980**	2,330**
Indd				-0,009	-0,008	-0,004
				-0,78	-0,72	-0,36
Str					-0,002	-0,006
					-0,26	-0,73
big4						0,003
						1,39
_cons	-0,005	-0,026	-0,053	-0,059	-0,06	-0,077
	-0,17	-0,8	-1,57	-1,700*	-1,71*	0,037**
Hausman test	1,49	2,48	1,49	2,15	4,24	7,81
prob> chi 2	0,959	0,928	0,9929	0,9889	0,9358	0,73
Wald chi 2	10,69	15,11	20,91	24,41	21,19	23,41
prob> chi 2	0,098	0,034	0,0074	0,011	0,0198	0,015
R-squared	69,65	81,99	79,19	76,74	79,76	77,08
<b>N of Obs.</b>	<b>110</b>	<b>110</b>	<b>110</b>	<b>110</b>	<b>110</b>	<b>110</b>

\*\*\*, \*\* and \* indicate level of significance respectively at 1%, 5% and 10%

Table 4 shows that loan specialization (LOANS) is positively and significantly associated with bank risk. This means that an increase of bank loans increases bank risk. Normally, bank activities are based on bank loans. Consequently, an increase of bank loans leads to more interest revenues which increase bank profitability and reduce bank risk. Our results indicated the opposite effect. In this case, we should examine firstly the quality of these loans. We should check if they are granted to good customers and with sufficient guarantees. In case of bad loans granted to bad customers without guarantees, loans can significantly decrease bank risk. Our findings are in line with Berger and Udell (1990).

The effect of the two other variables that reflected bank specifics in our study such as bank size and liquidity risk is insignificant. These results are surprising especially for the effect of liquidity risk for the case of Tunisian banking system. According to previous studies investigated in Tunisian context, this risk is qualified as the most worrying for Tunisian banks. Our empirical findings corroborate the works of Hakimi and Zaghdoudi (2017a,b) and Hakimi and *al.* (2017).

Empirical results relative to the effect of the macroeconomic variables indicate that the effect of the inflation on bank risk is negative and significant. According to these results, an increase of the inflation rate decreases bank risk. This result is in line with Boyd et al (2000) where inflation decreases financial performance and increases bank risk. Contrary to the

effect of inflation, the level of growth proxies by the GDPG does not exert any significant effect. From these results, we can conclude that bank risk is more sensitive to the fluctuation of the inflation rate rather than the evolution of the level of growth.

Let's turn to the fundamental problem of this study which focused on the effect of bank governance on bank risk. Empirical findings indicated that the presence of Supervisory Committee and monitoring of risks (COR). Theoretically, the presence of a specialized risk management committee makes it possible to manage all risks within banks. Also, the best management practices provided by the risk committee ensure better stability and banking performance from which rises the need for at least one specialized committee for supervision and audit at board level. However, our results indicate that the presence of increases the level of bank risk. These results are divergent from the work of Sabato, (2010), Mongiardino and Plath (2010)

Results show that the executive compensation (REMB) increases significantly the bank risk. Executive compensation may affect risk taking since it can be at the detriment of the interest of all the stakeholders. Our results are convergent with Mehran, and Quian (2010), and Kolm et al (2014). Findings supported also that the board size (BDSIZE) increase significantly Tunisian bank risk. Large board size is face to several problems like communication, coordination and decision. Hence, it affects the flexibility in decision-making and my increases bank risk. Our results are in line with Chumba (2015), Minton et al (2011), Rachdi et al (2011). In contrary, these results are divergent from Dhouibi (2013), Salhi and Boujelbene (2012) where small board size aligns the interests between shareholders and managers resulting in a reduction of bank risk and bank insolvency. However, findings supported that the presence of independent directors (INDD) and the proportion of institutional investors decrease bank risk. Several empirical studies supported that the presence of independent directors and institutional investors affect positively the bank performance and decrease significantly bank risk. This positive effect is due the well monitoring and the best practice of principal of governance. Our results are in line with Belkhir (2006), Chandra, et al. (2000)

Based on these results, we can accept only the hypothesis H3 where the board size is seemed to increase significantly the Tunisian bank risk. Also, with reference to empirical findings, we reject the hypotheses H1 and H2. Results in relation with the hypotheses H4, H5 and H6 are not significative.

### 3.3.2 Bank Governance and Tunisian Bank Insolvency

In this section we will discuss empirical findings of the effect of bank governance on bank insolvency measured by Z-Score. Empirical results are displayed in table 5 above. Contrary to results of the association between bank governance and bank risk which are all estimated with random effect model, in the sixth model the fixed effect model is preferred. From the first model to the fifth, the random effect model is the most appropriate since the probabilities associated to the Hausman test are higher than 5%. However, for the last equation (model 6), the ordinary least square (OLS) of fixed effect is preferred. For this model the probability of the Hausman test (0.0047) is lower than 5%.

Table 5. Result of Random/Fixed effect regression of bank governance and bank insolvency (Dependent variable is ZSCORE)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Coef,	Coef,	Coef,	Coef,	Coef,	Coef.
Loans	-13,794	-11,314	-13,483	-12,984	-12,769	-12,235
	-2,720***	-2,170**	-2,460**	-2,320**	-2,150**	-2,030**
Size	0,719	0,634	0,715	0,704	0,697	0,765
	1,220	1,100	1,210	1,170	1,150	1,260
Liqr	0,124	-0,031	-0,082	-0,138	-0,144	-0,162
	0,170	-0,040	-0,110	-0,190	-0,200	-0,220
Inf	68,218	63,226	80,590	90,674	90,093	78,543
	1,770*	1,660*	1,980**	2,080**	2,060**	1,770*
Gdp	-11,574	-11,264	-8,558	-13,394	-13,389	-11,954
	-0,540	-0,540	-0,400	-0,590	-0,590	-0,520
Cro	1,078	1,448	1,165	1,071	1,092	1,457
	1,340	1,760*	1,370	1,230	1,250	1,620
Remb		22,814	23,544	20,796	21,203	28,392
		1,630	1,660*	1,430	1,450	1,850*
Bdsize			-0,212	-0,246	-0,244	-0,187
			-1,320	-1,440	-1,420	-1,030
Indd				-3,330	-3,302	-0,952
				-0,720	-0,700	-0,200
Str					-0,263	-0,455
					-0,100	-0,160
big4						0,908
						1,080
_cons	12,737	11,668	15,636	16,633	16,692	15,046
	1,360	1,250	1,610	1,68*	1,670*	1,550
Hausman test	0,060	0,440	2,260	1,340	4,290	26,960
prob> chi 2	1,000	0,996	0,972	0,998	0,933	0,005
Wald chi 2	13,030	16,210	16,890	16,710	16,750	—
prob> chi 2	0,043	0,023	0,031	0,053	0,080	—
Fisher test	—	—	—	—	—	1,740
Prob F	—	—	—	—	—	0,087
R-squared	16,430	20,250	22,550	22,710	22,740	24,480
N of Obs.	110	110	110	110	110	110

\*\*\*, \*\* and \* indicate level of significance respectively 5% and 1

Results presented in Table 5 indicate that LOANS exerts a negative and significant effect on bank insolvency. This finding means that an increase of bank loans decreases Tunisian bank insolvency. When banks distribute more credits in good conditions with sufficient guarantees,

they can recover the principal and the received interest. This situation leads to maintain and to improve bank liquidity and bank profitability. In this case, banks can respond to all requests of withdrawal of capital either partial or integral. This enhances the bank reputation and increases its solvency.

Like their effects on bank risk the effect of the two other variables that reflected bank specifics in our study such as bank size and liquidity risk is insignificant. This confirms once again that bank size and liquidity risk do not have any significant effect on bank risk and bank insolvency.

For the effect of the macroeconomic variables, the findings indicate that the effect of inflation on bank risk is positive and significant. According to this result, an increase of the inflation rate decreases bank insolvency. Contrary to the effect of inflation, the level of growth proxied by the GDPG does not exert any significant effect. From these results, we can conclude that bank insolvency is more dependent to the inflation rate rather than the level of growth.

Empirical results in Table 5 showed also that the presence of Supervisory Committee and monitoring of risks (COR), the executive compensation (REMB) increases significantly Z-score in other words, they decrease Tunisian bank insolvency. In contrary, Board size (BDSIZE), the presence of independent directors (INDD) and the proportion of institutional investors (STR) and the audit quality (BIG) do not exert any significant effect on bank insolvency. With reference to these results we can reject the hypotheses H1 and H2 in relation with the positive effect of the presence of Supervisory Committee and monitoring of risks (COR), the executive compensation (REMB). Results are not significant for the rest of all hypotheses; hence no judgment should be taken here.

To summarize we can conclude that the relationship between bank governance, bank risk and bank insolvency is dependent to the presence of Supervisory Committee and monitoring of risks, the executive compensation and the board size. Only these variables exert a significant effect. Hence, policy makers, bankers are invited to grant more attention to these governance mechanisms and search to improve others to reduce bank risk and bank insolvency.

#### **4. Conclusion**

Using a sample of 11 Tunisian banks over the period 2006-2015, the objective of this study is to test the linkage between bank governance, risk and bank insolvency for the Tunisian context. The econometric approach served in this work is the panel data analysis. The main empirical results showed that: (i) the presence of Risk Monitoring Committee (COR), remuneration (REMB) and the size of the board (BDSIZE) considerably increase banking risk and Tunisian banking insolvency. (ii) The presence of independent directors (INDDs) and the proportion of institutional investors reduce bank risk and insolvency and positively affect the development and monitoring of banks. This study has some policy implications. It contributes to the scientific research and practices of the Tunisian financial sector, in a general way, and of these banks, in a particular way. Indeed, this contribution is manifested by identifying the main important mechanisms of internal banking governance and studying their impact on total risk and the risk of bank insolvency.



Like all works, this research work suffers from certain limitations. We analyzed only the main mechanisms of internal banking governance linked to the structure of the board of directors, while we intend in our future ways to analyze the effect of banking governance mechanisms and their impact on total risk and risk of bank insolvency, such as the effect of the law, regulation. Taking into these factors, our work could be enriched". To avoid such risk taking, a first priority should be linked to the legal and regulatory environment of the financial system in order to address the various problems affecting banks. Overall, our future expectations on observing the theory of law and finance are to show how external governance mechanisms allow banks to be less exposed to risk even if we also anticipate some risk disruption credit over the last few years due to the influence of changing legal and regulatory environment and bank rescue plans by government.

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## Notes

Note 1. Chief Executive Officer “CEO”: appointment or removal of the Chief Executive Officer. The Chief Executive Officer is responsible for building his or her team. The appointment of the members of the Board of Management is ratified by the Board of Directors. The Board of Directors will be advised by their Nomination and Remuneration Committee.

Note 2. Remuneration: recommendation on the remuneration of the members of the Board of Directors, based on proposals submitted by the Nomination and Remuneration Committee

Note 3. Salary and bonus/incentive scheme of the Chief Executive Officer and members of the Board of Management: this is delegated to the Nomination and Remuneration Committee of the Board of Directors with their recommendations approved by the Board of Directors.

Note 4. List of Banks: Amen Bank (AB), Arab Tunisian Bank (ATB), Attijari Bank (ATTIJARI), Housing Bank (BH), Arab International Bank of Tunisia (BIAT), National Agricultural Bank (BNA), Bank of Tunisia (BT), Bank of Tunisia and Emirates (BTE), Tunisian Bank Company (STB), International Bank Union (UIB) and Banking Union for Trade and Industry (UBCI).

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