DOES RISK CULTURE AFFECT BANKS' VOLATILITY? THE CASE OF THE G-SIBS

Daniela Coluccia*, Stefano Fontana*, Elvira Anna Graziano**, Matteo Rossi***, Silvia Solimene*

*University "La Sapienza", Italy
**Link Campus University, Italy
***University of Sannio, Italy

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Abstract

The recent financial crisis highlights the weaknesses of the traditional measures of risk in the banking sector, as Banking Authorities have missed considering the behavioural aspect of the risk culture, which is an essential tool for the value creation process of risk management (Financial Stability Board, 2014; Carretta et al., 2015; Schwizer, 2013; Guiso, Sapienza and Zingales, 2015), usually measured using the survey method. Our paper addresses a central question: What is an alternative measure of risk that estimates the banking risk-taking behaviour, also considering their risk culture? By analysing a panel of the thirty Global Systematically Important Banks (G-SIBs) from 2006 and 2013, our paper provides empirical evidence that the presence of a Risk Committee, the size of the Risk Committee and the number of the Risk Committee's meetings have a positive impact on a bank's volatility. Using multiple regression analysis on panel data, we verify the relationship between the bank asset risk and explicative variables that measure risk governance, banks' size and traditional banks' risk indicators. Our study extends the literature by providing evidence that separates RCs as having a significant impact on reducing firms' volatility and as being an important risk governance tool in the hands of boards. Moreover, given the recent emphasis of regulatory bodies on strengthening the risk management and risk reporting systems of financial firms and the overwhelming trend of firms to form a separate RC, our study responds to the opportunity to investigate this relationship.

Keywords: Risk Culture, Risk Measure, Risk Committee, Risk Management, Multiple Regression Analysis

1. INTRODUCTION

During the recent financial crisis, the traditional measures of risk highlight their weaknesses to capture all the elements needed to ensure risk management of the banking sector (Barth, Caprio and Levine, 2013; Blanchard, 2008; US Financial Crisis Inquiry Commission, 2011). Along with the indicators, rules, law, and processes, Banking Authorities have missed considering the behavioural aspect of the risk culture, which has been defined as an essential tool for the value creation process of risk management (Financial Stability Board, 2014; Carretta et al., 2015; Guiso, Sapienza and Zingales, 2015).

According to the risk culture definition proposed by Financial Stability Board (2014) and evoked by the Basel Committee (BCBS, 2014), risk culture influences the decisions of management and employees during the day-to-day activities and impacts the risks they assume.

If we look at Global banks, the roots of their major problems are the creditors' expectation. The Government protection of creditors in case they fail produces high expectation among creditors, aligning with taking on too much risk and wasting resources by big institutions. Wasted resources are also the reason big banks operate more inefficiently than other banks without protection by the Government. This is called Too Big to Fail regime. This means that uninsured creditors expect the government to protect them from losses from the failure of a big bank, despite not having an explicit right to it.

Some analysts are convinced that the excessive taking of risks by banks and the government overprotection played a role in the recent financial crisis, threatening the long term solvency of countries. High risk-taking behaviour by banks

increases the chances of failure by banks and bailouts by the government.

In our opinion, it would be useful to investigate the risk culture and the connected risk-taking behaviour by Global banks.

In particular, our research focuses on the link between the volatility of banks and the tools they have adopted recently, in terms of risk management, to mitigate excessive risks. The major literature on this theme focused on other topics to investigate the stability of banks.

Carretta et al. (2015) analysed the supervisory culture among European banking authorities, focusing on the EU-15 zone countries and provided empirical evidence that supervisory culture influences the stability of banks. Guiso, Sapienza and Zingales (2015), instead, studied which dimensions of corporate culture are related to a firm's performance. They found that when employees see top managers as trustworthy and ethical, the firm's performance is stronger.

An alternative way of monitoring the risk-taking behaviour and banks' risk culture is shown in the analysis of the banking governance, similar to the governance of listed firms (Yatim, 2010).

According to the Basel Committee on Banking Supervision (Corporate Governance Guidelines, 2015), we analyse the presence, the importance and the tasks of Risk Committees (RCs). The presence of Risk Committee and the number of Risk Committee's meetings can be considered as proxies of risk culture in the banking sector. The risk committee of the board is responsible for advising the board on the bank's overall current and future risk appetite, overseeing senior management's implementation of the RAS (Risk Appetite Statement) reporting on the state of risk culture in the bank, and interacting with and overseeing the CRO (Chief Risk Officer). Our work aims to show if the traditional risk indicators as derivatives exposure, Z-score and Texas Ratio can still reflect the volatility of banks. Moreover, we want to test if the presence and quality of Risk Committee can significantly affect the bank's volatility, as perceived by the market.

Using multiple regression analysis on panel data, we examine this relation on a sample composed of thirty FSB Global Systematically Important Banks (G-SIBs).

At a political level, our final contribution is to inspire policymakers to believe that there is a path big banks should follow to solve instability on their own. Otherwise, there is no justification for the protection of uninsured creditors, despite the growth of risk culture within financial institutions, especially big banks. Practically, we propose a new proxy of risk culture based on Risk Committees as an important tool of corporate governance. Second, we test the relation between the proposed indicators and the most relevant risk measures. And last, our work represents the opportunity to start longitudinal and cross section studies on the banking sector.

We do not know if our analysis will be a persuasive case to convince, only in part, policymakers to lower their concern about spill overs that occur in the entire economy in case of failure. We only stated that it has been growing the attention towards risk management and governance within financial institutions, starting from the recent past. Does such a conclusion produce benefits on instability when it leads to interiorized procedures into governance system? This is also the challenge for future research.

The rest of the work is structured as follows. In Section 2 we will shape the theoretical framework, in Section 3 we will describe the sample and data used to construct the empirical analysis, in Section 4 we will present the empirical analysis and its findings, and in Section 5 we will discuss the conclusions.

2. LITERATURE REVIEW

2.1. Risk Culture: Definition and Measure

In recent time, risk culture and the weakness of Risk Management (RM) of banks are highlighted as causes of financial crisis. Paulson (2008), in a report for the US President identifying different causes of financial and banking crisis, underlines a serious weakness in Risk Management (RM) practices at several large U.S. and European financial institutions that have been conducted during the drop in mortgage subprime market with a contagious effect due to the Financial Institutions' excessive exposure to structured products as in the case of the failure of Royal Bank of Scotland in October 2008 (Fiordelisi and Marqués-Ibanez, 2013).

Different specific aspects of poor risk culture affect the risk-taking behaviour of financial institutions (Senior Supervisor Group, 2009; Lehman and Hofmann, 2010; Bonaccorsi Di Patti and Kashyap, 2014). The Senior Supervisor Group (2009), in a report for the Financial Stability Board (FSB), drafted with a survey methodology, identified the lack of internal communication, excessive performance-oriented culture and wrong compensations practices as the components and the "artefacts" of risk culture that are very poor during the crisis. Lehman and Hofmann (2010) suggest that the moral hazard behaviours identified in the financial crisis are encouraged by the system of incentives set in the banking industry. Some evidence also shows that a bank with better RM has recovered earlier from the crisis, as demonstrated by Bonaccorsi Di Patti and Kashyap (2014) for the Italian contest.

The topic of risk culture in banks is a new topic in academic studies, but different practitioners have developed several definitions for various frameworks of analysis (Ashby, Palermo and Power, 2012).

According to Schein (2010), risk culture is the set of underlying assumptions, values, and artefacts. The Institute of Risk Management (IRM, 2012) and the Chartered Institute of Internal Auditors (CIIA, 2014) define risk culture as a set of values, beliefs, knowledge and understandings. In particular, in their definition, risk culture is a term that describes the values, beliefs, knowledge and understanding of the risk shared by a group of people with a common purpose, in particular, the employees of an organization or teams or groups within an organization (Financial Stability Board, 2014, Basel Committee – BCBS, 2014).

As for the definition, even to measure the risk culture, existing models have been mostly developed by practitioners. To find an indicator that can measure the risk culture of banks, the practitioners intensively used survey methodology to test their risk appetite, their risk culture and the main

challenges in risk-taking behaviours by top management. According to De Jonghe, Edelsten and Xavier (2013), a strong risk culture needs an adequate leadership, communication, resources and incentives. These elements are previously considered by Farrel and Hoon (2009), but they instead insist more on the relevance of an open communication inside the organization. The measure proposed by IRM (2012) includes the Farrel and Hoon's framework, but then considers the Governance variable (studied as Accountability and Transparency), Decisions variable and Competency variable (seen as Risk resources and Risk skill).

An alternative method of monitoring the risk-taking behaviour and analyse banks' risk culture is by analysing the banking governance. In particular, according to the Basel Committee on Banking Supervision (Corporate Governance Guidelines, 2015), we want to propose as new proxies of risk culture in the banking sector the presence and importance of Risk Committees (RCs). The risk committee of the board is responsible for advising the board on the bank's overall current and future risk appetite, overseeing senior management's implementation of the RAS (Risk Appetite Statement) reporting on the state of risk culture in the bank, and interacting with and overseeing the CRO (Chief Risk Officer). Our work aims to show if risk culture of banks, as well as the traditional risky indicators as derivatives exposure, Z-score and Texas Ratio, can affect the volatility of the company. Moreover, we want to test if the presence and quality of Risk Committee can significantly affect the bank's volatility perceived by the market.

RC is an important tool managed by the Governance of banks to mitigate risks. Is this attitude perceived by the market? Our main target is to answer this question.

We attempted the introduction and composition of RCs of big banks as a proxy to Risk Culture within financial institutions' Risk Management practices. To claim such a conclusion, we went deeper on the effects, and their sign and significance, of RCs' characteristics on the Bank Asset Risk of banks (volatility of profits) perceived by the market. Our hypothesis (RC has a positive effect on the volatility of the returns) originated from considering that big institutions' default is controlled and managed by national authorities so that the risk the banks have to face is only their intrinsic risk as the volatility of their returns on the market.

This study contributes to the Governance literature in several important ways.

First, it extends the literature by providing evidence that separates RCs as having a significant impact on reducing firms' volatility. Our study explicitly analyses this relationship and thus sheds light on an aspect of risk management that is growing in importance.

Third, we extend the prior literature on the risk culture of the bank by introducing separate RCs as an important risk governance tool in the hands of boards.

Finally, we contribute to the existing literature by testing the influence of bank-specific corporate governance characteristics, i.e. the aforesaid "risk governance" measures, plus performance and traditional risky indicators' characteristics on the volatility of a bank.

2.2. Risk Management and Risk Committee in Banking

Corporate Governance (CG) plays a central role in the proper functioning of a company (Rossi et al., 2015).

This is more essential in financial institutions where CG ensures the fundamentals of a bank – fundraising from depositors and making investments to drive economic growth - so that banks are essential to the financial stability of a system.

A fundamental component of good governance is a demonstrated corporate culture of reinforcing appropriate norms for responsible and ethical behaviour (Nedcommunity, 2013 and 2015). The problem is understanding the contribution of CG to the banks' conduct (what is "good governance" and "bad governance"?). Also, some economists (Kirkpatrick, 2009; Simpson, 2009) suggested that the current CG system failed because it caused the recent financial crisis. The same conclusions are empirically tested by Aebi, Sabato and Schmid (2012) who showed that bank performance during this turbulent time can be explained by the banks' risk governance power structure as is evident in factors such as the Risk Committee and the CRO's line of reporting. This suggests that standard corporate governance measures cannot properly describe banks' atypical governance structure. So it is argued that a strong CG is necessary to manage risks in banks (Acharya et al., 2009).

Our work focuses on the role and the profile of risk governance in financial institutions because the risk management function in these firms is unique. The literature shows that corporate governance does not have the same impact on the performance of financial institutions as it does for non-financial institutions (see, for example, Mehran, Morrison and Shapiro, 2011). Specifically, De Haan and Vlahu (2015) point out that the empirical evidence regarding the corporate governance of non-financial firms is not found for banks.

Starting from this consideration, i.e., the existing difference between a financial institution and other companies, we would focus our attention on the impact of Risk Culture and Management on the volatility of banks, specifically on Global systematically important banks. The complexity of their operations exposes these institutions to a variety of risks because of many activities and different business lines they had developed over time (Gambetta, Zorio-Grima and Garcia-Benau, 2015).

Since 2010, the financial systems worldwide have witnessed banks strengthening their overall governance practices and supervisors enhancing their oversight processes. In the literature, Mongiardino and Plath (2010), for instance, verified that as of 2010, the risk governance in large banks seems to have improved only to a limited extent despite increased regulatory pressure induced by the financial crisis.

In general, banks show a better understanding of the important elements of corporate governance such as effective board oversight, rigorous risk management, strong internal controls, compliance and other related areas. In addition, many banks have made progress in assessing collective board skills and qualifications, instituting standalone board risk committees, establishing and elevating

the role of Chief Risk Officer (CRO), and integrating discussions between board audit and risk committees (BCBS, Corporate Governance Principles for Banks, 2015).

Studies in developed markets suggest that a traditional audit committee is insufficient for overseeing financial and non-financial risks in today's complex and high-risk environments (Choi, 2013; Brown, Steen and Foreman, 2009; Eggleston and Ware, 2009). By increasing the details about the audit committee's members, there is an impact on bank risk-taking behaviour (Garcia-Sanchez, Garcia-Meca and Cuadrado-Ballesteros, 2017). Since a RC advocates competencies on risk monitoring and risk management, it strengthens a firm's risk management system (Bailey, 2015).

As part of the overall corporate governance framework, the board is responsible for overseeing a strong risk governance framework. An effective risk governance framework includes a strong risk culture, a well-developed risk appetite framework articulated through the RAS (Risk Appetite Statement)[2], and well-defined responsibilities for risk management, in particular, and control functions, in general.

A risk governance framework should include well-defined organisational responsibilities for risk management, typically referred to as the three lines of defence (BCBS, 2011 and 2012):

- the business line;
- a risk management function and a compliance function independent of the first line of defence and;
- an internal audit function independent of the first and second lines of defence.

As for the second line of defence, the independent risk management function is a key component. This function is responsible for overseeing risk-taking activities across the enterprise. To find the best Board's own Structure and practices, we will focus on the importance of Risk Committee (RC) as a part of the organizational structure, which is responsible for advising the board on the bank's overall current and future risk appetite, overseeing senior management's implementation of the RAS, reporting on the state of risk culture in the bank, and interacting with and overseeing the Chief Risk Officer (CRO).

Stand-alone RCs are more apparent in the financial sector due to this sector's greater exposure to different types of risk (e.g., credit, market, trading, capital adequacy, regulatory, and compliance risk) (Andres and Vallelado, 2008).

The Risk Committee is an independent committee of the Board of Directors that has, as its sole and exclusive function, responsibility for the risk management policies of a Corporation's global operations and oversight of the operation of a Corporation's global risk management framework. It is required for systemically important banks. For banks of large size, risk profile or complexity is strongly advised. For other banks, it remains strongly recommended. In order to guarantee the independence of its members, it is required that the chair is an independent director and not the chair of the board or any other committee.

The literature review on RCs and its consequences is poor and under researched. The only existing study on RC is about its determinants (Subramaniam, McManus and Zhang, 2009) Obviously, RCs benefit firms by improving the board oversight of risk management and by anticipating and reacting to events and trends that might otherwise be inscrutable.

We tried to add some new in this field and to start to fill the gap existing on it.

3. DATA AND VARIABLES

3.1. Sample Selection

We collected financial and corporate governance variables for the years 2006-2013 of a sample composed by the thirty Global Systematically Important Banks (G-SIBs).

The data were taken on November 21st, 2016 from the Financial Stability Board list, which includes financial institutions subject to very high standards requirements (in terms of the capital buffer, loss absorbency capacity, resolvability and supervisory expectations). The banks are the same as those on the 2015 list.

We chose a homogeneous sample made of the most recent G-SIBs to understand their behaviour in terms of risk exposure and risk culture over the period 2006-2013. During this period, in fact, an integrated set of policy measure was issued, to be adopted in 2013 to control the systematic and moral hazard risks associated with important banks. Among these, the most important in our paper are the risk management functions, risk data aggregation, risk governance and internal controls. Table 1 shows the thirty FSB G-SIBs used to analyse if the risk culture affects banks' risk exposure.

Table 1. Sample selection

No.	*FSB G-SIBs (Global Systematically Important Banks)*
1	Citigroup
2	JP Morgan Chase
3	Bank of America
4	BNP Paribas
5	Deutsche Bank
6	HSBC
7	Barclays
8	Credit Suisse
9	Goldman Sachs
10	Industrial and Commercial Bank of China Limited
11	Mitsubishi UFJ FG
12	Wells Fargo
13	Agricultural Bank of China
14	Bank of China
15	Bank of New York Mellon
16	China Construction Bank
17	Groupe BPCE
18	Groupe Crédit Agricole
19	ING Bank
20	Mizuho FG
21	Morgan Stanley
22	Nordea
23	Royal Bank of Scotland
24	Santander
25	Société Générale
26	Standard Chartered
27	State Street
28	Sumitomo Mitsui FG
29	UBS
30	Unicredit Group

[2] RAS is a written articulation of the aggregate level and types of risk that a bank will accept, or avoid, in order to achieve its business objectives. It includes quantitative measures expressed relative to earnings, capital, risk measures, liquidity and other relevant appropriate measures. It should also include qualitative statements to address reputation and conduct risks as well as money laundering and unethical practices (FSB, *Principles for an effective risk appetite framework*, November, 2013).

3.2. Measure of "Bank Asset Risk"

As major literature on this topic suggest (Beckers, 1981; Zhao, 2013), in order to represent volatility, we construct the "Bank Asset Risk", a variable as the annualized Standard Deviation (SD) of weekly banks' stock returns (Demirgüç-Kunt and Huizinga, 2013; Moore et al., 2009; Coluccia et al., 2017). About firm volatility, previous researches have investigated its determinants using different variables, such as firm's size (Chang and Dong, 2006), debt-equity (Bushee and Noe, 2000), book to market value (Pontiff and Scholl, 1998), firm's age (Rubin and Smith, 2009), disclosure (Coluccia, Fontana and Solimene, 2017), and trading volume (Girard and Omran, 2009). Our study explicitly analyses the effects of RCs, as risk culture proxy, on volatility and thus sheds light on an aspect of risk management that is growing in importance. To our purposes, Bank asset risk determines the probability of bank distress and potential losses for bank liability holders. So that the dependent variable is represented by the historical stock volatility of selected banks (standard deviation). It has been calculated using the average of the standard deviation of individual banks. Standard deviation is calculated on firm's weekly equity returns from 2006-2013 years. The lower is the SD, the lower is the volatility of the stock return on the market.

3.3. Variables in the Model

The variables are used to investigate the relationship between risk volatility of bank and risk culture. They reflect three different dimensions we wanted to test on the volatility of a bank. Per each dimension, we selected few representative variables taken from the major literature on this topic.

They are the following:

- Risk Governance (Size of Risk Committee, Meeting of Risk Committee);
- Banks' Size (Liabilities/GDP) and Banks' Performance (Return on Asset);
- Traditional banks' Risk Indicators (Risk Appetite, Z-Score, Texas Ratio).

Due to scarce availability of governance data on banks as well as the neglect of risk management-specific governance data in traditional governance database, we hand-collected most of our corporate governance variables from annual reports and also from the banks' website. Other variables are selected from Datastream database for the period 2006-2013.

3.3.1. Risk Governance Dimension

We chose the following variables to measure the risk culture among the sample of the financial institution. The approach is the same as that of Aebi, Sabato and Schmid (2012).

According to the literature (Aebi, Sabato and Schmid, 2012), the presence and the characteristics of Risk Committee (size and number of meetings) could positively affect banks' performance and banks' risk.

We would expect that banks with RCs have stronger risk management practices.

The presence of RC is a dummy variable, which is equal to one if the bank has a dedicated committee (Risk Committee) charged with monitoring the risk management efforts within the financial institution. Banks, for which the variable is equal to zero, have no committee in charge of risk management or have the Audit Committee to assume all the responsibilities.

The hypothesis we seek to verify can, therefore, be summarized as follows:

H1a: The level of volatility of a bank tends to be lower for banks with RC.

We would expect that banks with large RCs, which gather frequently, have stronger risk management practices.

The size of RC is a measure of the members of RCs of banks for all the examined periods. This variable has assigned a value of zero for banks with no Risk Committee.

The Meetings of Risk Committee represents the number of RCs' meeting in the periods of banks at the end of every year. This variable has assigned a value of zero for banks with no Risk Committee.

The hypothesis we seek to verify can, therefore, be summarized as follows:

H1b: The level of volatility of a bank tends to be lower the higher the number of meetings of RCs and the bigger the size of RCs.

3.3.2. Banks' Size Dimension and Banks' Performance

It can be possible to distinguish between a bank's absolute size and its systemic size, i.e. its size relative to the national economy (Bertay, Demirgüç-Kunt and Huizinga, 2013)[3]. For an international sample of banks, given that the sample is made of big institutions, the main proxies for a bank's systemic size is constructed using bank balance sheet information and is measured by the bank's liabilities-to-GDP ratio, denoted liabilities over GDP. This ratio corresponds to a country's maximum expenditure in a bank bail-out relative to its GDP if all of a bank's assets go completely sour. Major literature (De Haan and Poghosyan, 2012) asserted that there is a negative relationship between the volatility of returns and size in the banking sector.

The hypothesis we seek to verify can, therefore, be summarized as follows:

H2a: The level of volatility of a bank tends to be lower for larger firms.

To verify the influence on volatility produced by banks' performance, we selected the variable ROA. In our regression, ROA is pre-tax profits divided by total Asset. This ratio provides information about the overall bank profitability. We would expect banks with a higher level of ratio to have a lower level of volatility perceived by the market.

The hypothesis we test is, therefore, the following:

H2b: The volatility tends to decrease with the profit a bank makes.

3.3.3. Traditional Risks Dimension

The following variables are selected to identify traditional risk indicator in the banking industry: Risk Appetite, Z-score and Texas Ratio.

The variable "Risk Appetite" (R.A.) represents the scale of the derivatives-hedging positions of a bank on its total asset. It is considered a measure of the risk of a bank and it plays a major role in their

[3] For companies belonging to other business industry, usually bank size is measured by the natural log of total asset. Our measure, instead, is more precise in order to describe the size of big financial institutions.

risk management strategies (Deng, Elyasiani and Mao, 2016).

Banks reduce their exposure to tradable risk (e.g., interest rate and exchange rate risks) via derivatives-hedging and simultaneously extend more loans and take greater credit risk in lending (their main area of expertise) to earn higher economic rents.

Our hypothesis is that this risk allocation strategy is associated with an increase in overall bank risk, measured by the volatility:

H3a: Hedging-derivatives are positively associated with banks' volatility.

Z-score, proxying for bank stability is traditionally a bank risk measure. It is an index of bank solvency (as the distance from insolvency, Roy, 1952) constructed for many consecutive years as the following:

$$\frac{ROA + CAR}{SROA} \quad (1)$$

Where:

- ROA = Return on Asset;
- CAR = Capital-Asset Ratio;
- SROA = and the standard deviation of Asset Return.

A higher Z-score indicates that the bank is more stable. Because the z-score is highly skewed, we use the natural logarithm of the z-score, which is normally distributed. For brevity, we intend Z-Score as the natural logarithm of the Z-score in the remainder of the paper.

The hypothesis we test is the following:

H3b: The higher the Z-Score, the lower the volatility.

The Texas Ratio is a measure of bank creditworthiness. It is considered a traditional Risk indicator for a bank. The higher the Texas ratio is, the more severe the credit troubles. It was developed by Gerard Cassidy at RBC Capital Markets, and it is calculated by a ratio between the value of the lender's non-performing assets (Non-performing loans + Real Estate Owned) and the sum of its tangible common equity capital and loan loss reserves[4].

For our purpose, we selected the Texas Ratios Modified (the numerator is the following: (NPL – Loans guaranteed by the Government that are considered safe + Real Estate Owned). The denominator is the same

The hypothesis we test is the following:

H3c: The lower the T.R., the lower the volatility.

The variables selected in the model and their acronyms are shown in Table 2.

Table 2. Variables in the model

Variables	*Symbol*
Risk Governance	
Presence of Risk Committee	RC_pres
Size of Risk Committee	RC_size
Meeting of Risk Committee	RC_meet
Control Variables	
Bank Size (Liabilities/GDP)	L_size
Bank Performance	ROA
Risk appetite	DER_ASS
Z-Score	Z
Texas Ratio	TR

[4] In analysing Texas banks during the early 1980s recession, Cassidy noted that banks tended to fail when this ratio reached 1:1, or 100%. He noted a similar pattern among New England banks during the recession of the early 1990s.

4. EMPIRICAL ANALYSIS

4.1. Statistical Model

To test the hypotheses, we performed a multivariate analysis by relating the Bank Asset Risk (as explained in the previous section) to the explanatory variables identified above.

The regression can, therefore, be summarized in the following multivariate model (we developed the model on 240 observations):

$$BAR = \alpha + \beta_1 \mathrm{RC}_{\mathrm{pres}} + \beta_2 \mathrm{RC}_{\mathrm{size}} + \beta_3 \mathrm{RC}_{\mathrm{meet}} + \\ + \beta_4 \mathrm{L}_{\mathrm{Size}} + \beta_5\, ROA + \beta_6 DER_{ASS} + \beta_7\, Z + \beta_8\, TR + \varepsilon \quad (2)$$

Where:

- BAR = Bank Asset Risk as deleveraged annualized standard deviation of weekly bank stock returns, or more precisely, as the standard deviation of bank stock returns multiplied by the ratio of the market value of common equity to the book value of total bank assets.
- RC_pres = dummy variable, equal to zero if the bank does not have any Risk Committee (Presence of Risk Committee);
- RC_size = the number of directors involved in the Risk Committees (Size of Risk Committee);
- RC_meet = the total amount of RCs meets during the year (Meeting of Risk Committee);
- L_size = the systematic size of banks (Bank Size);
- ROA = the Return on Operating Assets (Bank Performance);
- DER_ASS = Derivatives Exposure/Total Asset (Risk Appetite);
- Z = Zeta Score Ratio;
- TR = Texas Ratio.

4.2. Descriptive Statistics and Correlation Matrix

The descriptive statistics and correlation matrix are shown in Tables 3 and 4. Table 3 shows the descriptive statistics of the variables used in the model during the time period 2006-2013. Table 4 shows the correlation matrix of all (dependent and independent) variables used in the empirical analysis.

From the analysis of the descriptive statistics, we can state that the average number of RC_size has grown over the time from an average of 5.3 in 2006 up to 6.1 in 2013. This probably means that banks after the crisis had increased their risk committee size to better face risks arising from the crisis. As for the BAR variable, the mean value is 29.18% in 2006 and it rose to the maximum level in 2009 with an average value of 35.65%. It then decreased to a mean value of 27.2 in 2013. This is consistent with the behaviour and performance of banks during and after the financial crisis. The mean value of ROA is very low but aligned with previous research in the banking industry (Trayler, 2009) and varies from 0.53% in 2006 to 0.47% in 2013.

The correlation matrix of all (dependent and independent) variables is shown below.

Table 3. Descriptive statistics

	BAR	*RC_size*	*RC_meet*	*L_size*	*ROA*	*Der_Asset*	*Z*	*TR*
				2006				
Mean	29,198	5,344	16,824	8,176	0,535	0,202	75,534	0,192
Median	28,075	5,000	5,000	0,096	0,540	0,047	6,150	0,191
Maximum	70,000	13,000	100,000	401,008	1,240	1,073	1714,161	8,838
Minimum	4,515	0,000	0,000	0,000	0,008	0,001	0,101	-14,294
Std. Dev.	12,233	2,846	29,418	56,119	0,351	0,317	284,126	3,052
Skewness	0,838	0,069	2,193	7,071	0,097	1,868	5,568	-2,403
Kurtosis	2,062	0,947	3,296	49,999	-1,262	2,118	32,209	16,686
				2007				
Mean	27,480	5,118	15,333	67,183	0,627	0,862	18,383	0,173
Median	27,000	5,000	6,000	0,092	0,530	0,042	1,598	0,159
Maximum	96,507	13,000	98,000	1178,953	1,670	24,506	196,212	0,937
Minimum	2,575	0,000	0,000	0,000	0,050	0,001	0,001	-0,641
Std. Dev.	14,289	2,938	26,577	225,599	0,412	3,912	37,984	0,297
Skewness	2,825	0,338	2,414	3,703	0,446	6,045	3,014	-0,106
Kurtosis	13,675	0,701	4,562	13,837	-0,855	36,959	10,339	3,675
				2008				
Mean	31,723	5,846	14,861	83,232	0,541	0,304	12,357	0,163
Median	30,180	5,000	6,000	0,106	0,338	0,066	2,128	0,145
Maximum	99,870	15,000	102,000	1322,943	2,240	5,448	93,549	0,942
Minimum	10,863	0,000	0,000	0,000	-1,610	0,001	-1,431	-0,869
Std. Dev.	16,591	3,060	26,888	279,976	0,689	0,873	20,011	0,322
Skewness	2,373	0,710	2,864	3,569	0,011	5,461	2,164	-1,141
Kurtosis	7,603	1,826	7,063	12,043	1,385	32,035	5,106	5,403
				2009				
Mean	35,652	6,000	15,921	83,269	-0,995	8,922	1150,603	0,194
Median	34,280	5,000	6,000	0,120	0,495	0,054	6,530	0,157
Maximum	77,000	14,000	99,000	1130,221	1,240	302,274	53514,027	3,588
Minimum	12,790	0,000	0,000	0,000	-63,060	0,000	-1,673	-2,368
Std. Dev.	15,719	2,938	26,029	256,866	9,588	47,579	7720,580	0,779
Skewness	1,092	0,603	2,516	3,123	-6,533	6,099	6,856	1,193
Kurtosis	0,906	1,033	5,395	8,710	42,780	37,855	47,000	12,551
				2010				
Mean	33,418	6,447	10,684	78,232	0,533	7,263	15,011	0,146
Median	31,750	6,000	6,000	0,080	0,425	0,046	6,212	0,135
Maximum	84,000	20,000	99,000	989,609	1,340	282,161	130,251	1,419
Minimum	11,000	0,000	0,000	0,000	-0,110	0,000	0,009	-2,213
Std. Dev.	13,760	3,925	17,009	244,841	0,412	44,021	23,380	0,481
Skewness	2,001	1,290	4,136	3,107	0,332	6,324	3,029	-2,468
Kurtosis	5,459	2,984	19,440	8,469	-0,988	39,993	11,847	16,147
				2011				
Mean	34,832	6,200	12,256	63,215	0,367	0,165	15,384	0,086
Median	31,670	6,000	6,000	0,104	0,260	0,056	6,715	0,118
Maximum	85,000	14,000	99,000	1012,484	1,470	0,926	77,316	1,527
Minimum	5,744	2,000	2,000	0,000	-1,870	0,001	0,089	-4,161
Std. Dev.	17,893	2,272	20,649	220,307	0,542	0,262	18,436	0,680
Skewness	1,469	1,219	3,935	3,603	-1,006	2,059	1,549	-5,251
Kurtosis	2,154	2,746	14,991	12,320	5,407	3,274	2,013	34,358
				2012				
Mean	28,160	6,649	13,659	0,121	0,401	0,101	9,583	0,177
Median	29,760	6,000	7,000	0,031	0,198	0,032	0,618	0,120
Maximum	49,000	11,000	98,000	0,801	3,229	1,176	67,213	0,867
Minimum	0,000	2,000	0,000	0,000	-0,014	0,000	-0,028	0,000
Std. Dev.	10,561	1,863	20,556	0,170	0,566	0,207	18,371	0,208
Skewness	-0,745	0,174	3,421	1,805	2,903	3,978	1,984	1,727
Kurtosis	0,879	0,192	11,682	3,860	11,435	18,626	2,657	3,188
				2013				
Mean	27,189	6,143	13,317	0,129	0,467	9,449	20,562	0,307
Median	29,130	5,000	7,000	0,037	0,213	0,041	4,341	0,216
Maximum	39,000	10,000	97,000	0,771	4,533	133,187	191,803	1,587
Minimum	12,000	2,000	2,000	0,000	-0,670	0,000	-32,986	0,062
Std. Dev.	7,362	1,947	20,413	0,170	0,835	31,021	35,577	0,306
Skewness	-0,489	0,434	3,530	1,532	3,104	3,484	2,817	2,493
Kurtosis	-0,790	-0,724	12,533	2,574	12,178	11,313	10,722	7,662

Note: BAR = Bank Asset Risk; RC_pres = Presence of Risk Committee; RC_size = Size of Risk Committee; RC_meet = number of meetings ofRisk Committee; L_size = Banks size; ROA = the Return on Operating Assets; Der_Asset = Derivatives /Total Asset; Z = Zeta Score Ratio; TR = Texas Ratio

Table 4. Correlation matrix of variables

	BAR	*RC_SIZE*	*RC_MEET*	*L_SIZE*	*ROA*	*DER_ASSET*	*Z*	*TR*
BAR	1.000							
Prob.	-----							
RC_SIZE	-0.267218	1.000						
Prob.	0.0052	-----						
RC_MEET	-0.046320	0.026141	1.000					
Prob.	0.6341	0.7883	-----					
L_SIZE	0.677192	-0.269944	-0.050629	1.000				
Prob.	0.0000	0.0047	0.6028	-----				
ROA	0.065471	-0.043064	-0.094014	-0.082064	1.000			
Prob.	0.5008	0.6581	0.3331	0.3985	-----			
DER_ASSET	0.396550	-0.141825	-0.041981	0.472681	0.026694	1.000		
Prob.	0.0000	0.1432	0.6662	0.0000	0.7839	-----		
Z	0.169357	-0.076373	-0.022988	0.223056	0.003439	0.103679	1.000	
Prob.	0.0797	0.4321	0.8133	0.0203	0.9718	0.2856	-----	
TR	-0.031050	-0.059789	-0.060091	-0.252351	-0.187854	-0.115421	-0.072065	1.000
Prob.	0.7497	0.5388	0.5367	0.0084	0.0515	0.2342	0.4586	-----

Note: BAR = Bank Asset Risk; RC_pres = Presence of Risk Committee; RC_size = Size of Risk Committee; RC_meet = number of meetings ofRisk Committee; L_size = Banks size; ROA = the Return on Operating Assets; Der_Asset = Derivatives /Total Asset; Z = Zeta Score Ratio; TR = Texas Ratio

4.3. Multivariate Analysis

Before proceeding with regressions, the possible multicollinearity was tested among the explanatory variables using the VIF (variance inflation factor). In addition, robust standard error clustered at the firm level (HAC) was used.

Regressions were performed using the OLS model. Indeed, the Breusch-Pagan test attests to the preferability of this model compared to the random effects panel model. Similarly, the Hausman test certifies the preferability of the random effects panel model compared to the fixed-effects panel model. Table 5 shows the results of the multiple regression analysis described by the formula (2). The sample is made up of 240 observations during the time period of the analysis between 2006 and 2013.

Table 5. Multiple regression – Pooled OLS

	Coefficient	*Std.Error*	*t_stat*	*p-value*	
const	14,3188	2,94381	4,864	<0,0001	***
RC_pres	−16,4447	3,46524	4,7456	<0,0001	***
RC_size	−0,894109	0,316117	−2,8284	0,0072	***
RC_meet	−0,00968552	0,100701	−0,0962	0,09238	*
L_size	0,0338662	0,0107256	3,1575	0,003	***
ROA	4,03237	2,20853	1,8258	0,0752	*
Der_Asset	0,02925	0,0370997	0,7884	0,435	
Z	4,04E-05	0,000104916	0,3854	0,7019	
TR	9,03768	2,56549	3,5228	0,0011	***
R-squared	0,548				
Adj. R-squared	0,511				
P-value(F)	2,79E-29				
Akaike	811,8974				
Test Breush-Pagan	LM = 1,6728			0,195884	
Test Hausman	H = 43,4986			7,07	

Note: BAR = Bank Asset Risk; RC_pres = Presence of Risk Committee; RC_size = Size of Risk Committee; RC_meet = number of meetings ofRisk Committee; L_size = Banks size; ROA = the Return on Operating Assets; Der_Asset = Derivatives /Total Asset; Z = Zeta Score Ratio; TR = Texas Ratio

The regression returns a quite high R-squared value (0.548) and a small difference between the adjusted R-squared (0.511) that demonstrates the adequacy of the number of explanatory variables considered. And last, still, on a general level, it should be noted that the P-values (F) attests to the significance of the models as a whole (i.e., all variables simultaneously).

Proceeding to the specifics of the individual variables, it seems proper to first discuss those concerning risk culture that confirm previous theoretical and empirical findings (Aebi, Sabato and Schmid, 2012; De Haan and Poghosyan, 2012) and, therefore, our hypotheses.

According to previous literature and our hypotheses, the presence of Risk Committee has a positive impact on the level of the bank's risk. The relationship between this variable and the volatility of the firm is negative and statistically significant. So, the presence of a Risk Committee in financial institutions results in a decrease in their volatility.

Moreover, according to our hypothesis, the number of Risk Committee's members and the number of Risk Committee's meetings have a negative and significant relationship with the volatility.

This relationship is probably consistent with the idea according to which bigger Risk Committees are perceived more effective by the market and, for this reason, less risky. Similarly, a greater number of Risk Committee's meetings could be interpreted as the bank's willingness to control and stem its risk exposure.

With reference to the explicative variables that represent the traditional risk measures (risk appetite, Z-score ratio and Texas ratio), the only variable that has a coefficient statistically significant is Texas ratio, which shows a positive sign

consistent to our hypothesis: the higher the T.R., the higher the volatility.

Finally, it is interesting to note how, in conflict with our hypotheses, the other control variables (size and profitability) show a positive and significant coefficient. Therefore, financial markets consider the large banks with high profitability riskier than the smaller ones.

5. CONCLUSIONS, LIMITATIONS AND FURTHER DEVELOPMENTS

Our findings show that company's volatility is affected by control variables and risk culture variables.

The presence of RC that grew between 2006 and 2013 (+37%) produces a "positive" impact on the volatility (the sign of the relationship is negative), decreasing its level. The signs of the relationship between the RC size and the number of RC's meetings on the volatility are negative, so an increase in these variables produces a decrease in the volatility.

With reference to control explicative variables, our findings show that Texas ratio, bank's size (liabilities/GDP) and bank's performance (ROA) have a positive and significant coefficient, the bank's volatility increases with the increase of these variables.

As evidenced by descriptive statistics, over time, the presence of the risk committee has increased among big financial institutions. In 2013, almost all the banks in our sample have a risk committee.

However, the way to go to increase the risk culture and improve risk management is still long. More work has to be done by both national authorities and banks to establish effective risk governance frameworks and to enumerate expectations for third-party reviews of the framework. Strengthened reporting structures and aligned risk and business incentives can help promote a risk-aware environment. Setting the right tone at the top is the single-most-used cliché when referring to board risk governance. However, extending responsibility and awareness of risk throughout the organization is no easy task.

Driving a risk culture can be especially difficult for large organizations due to their inherent complexity. On the other hand, with regulators' eyes focused on large firms with a view to minimizing systemic risk, many smaller firms have yet to begin taking action to revamp their governance structures.

Banks also need to enhance the authority and independence of CROs. National authorities need to strengthen their ability to assess the effectiveness of a bank's risk governance and its risk culture and should engage more frequently with the board and its risk and audit committees.

As we stated in the Introduction Section, the contribution of this paper is manifold.

At a political level, it inspires policymakers to believe that there is a process big banks should follow to solve instability on their own. In particular, according to Mishkin (2001), we focus our attention on the supervision role of government. Our research could help policymakers ensure compliance with regulation, in terms of assessment of riskiness of banks. This assessment originates from mandatory reporting and voluntary reporting by banks and analysts operating in the market. Based on this assessment, supervisors take steps to control banks' risk-taking.

At an academic level, we propose a new proxy of risk culture based on Risk Committee. Secondly, we test the relationship between the proposed indicators and the most relevant risk measures. Finally, our work represents the opportunity to start longitudinal and cross section studies on the banking sector.

The paper also has some limitations. It is the first step of our project and we need to share its limitations and our future developments.

Firstly, we need to improve the variables that explain the risk culture of a company. In our paper, we considered the presence of the Risk Committee, the number of its members and the number of meetings in a year. To improve the quality of our paper in the future, we want to study other variables suitable to measure risk culture, such as the role of the Chief Risk Officer (CRO) and the percentage of independent (Gabbi, 2013) and expert (Garcia-Sanchez, Garcia-Meca and Cuadrado-Ballesteros, 2017) members of the Risk Committee. Several studies in the literature have showed the importance of the CRO position and the independency of the Risk Committee to the Board and the CEO (Aebi, Sabato and Schmid, 2012; Gontarek, 2016).

Secondly, our sample is composed of 30 big financial institutions, with their governance and financial data available. To improve the quality of the paper and the reliability of the statistical results, we need to increase the sample dimension, including the major banks taken from other sources. For instance, SNL Financial provides information about the first five global banks in the world (per each country).

Thirdly, we do not suggest a concrete way of mitigating the risk-taking behaviour of banks, but just a description of the compliance phenomenon of RC within banks and its effect on market perception. We do not know if our analysis will be a persuasive case to convince, only in part, policymakers to lower their concern about spill overs occurring in the entire economy in case of failure. We only stated that it has been growing the attention towards risk management and governance within the financial institution, starting from the recent past. An increasing attention is also devoted to the topic by the media, which are potentially a highly effective mechanism of external control (watchdog role) on the banking system (Houston, Lin and Ma, 2011). Does such a conclusion produce benefits on instability when it leads to interiorized procedures into governance system? This is also the challenge of future research.

Finally, in our work we studied the effects of risk culture on company's volatility during the period 2006-2013 without considering, among the explicative variables, the financial crisis that has been hitting markets since 2007. Financial crisis could have affected the level of the volatility of the companies in our sample. In the future, it would be appropriate to add another variable that measures the impact of financial crisis in order to clarify its effects better than the other explicative variables.

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