Università
Ca'Foscari
Venezia

**Department
of Management**

Working Paper Series

**Elisa Cavezzali
and Gloria Gardenal**

Risk governance and performance of the Italian banks: An empirical analysis

**Working Paper n. 8/2015
October 2015**

ISSN: 2239-2734

Risk governance and performance of the Italian banks: an empirical analysis

Elisa Cavezzali, Gloria Gardenal

elisa.cavezzali@unive.it, ggardenal@unive.it

Dep. of Management

Ca' Foscari University of Venice

Abstract

The paper investigates the relation between the adoption of good practices in risk management and the level of performance and riskiness of banks. In particular, we aim at understanding if the application of the Enterprise Risk Management approach to banks helps increasing their stability. We test the hypothesis that those banks using an integrated risk management approach have, *ceteris paribus*, a lower level of risk and a higher performance. Our analysis focuses on 21 Italian listed banking groups, in the time period 2005-2013. Our preliminary results show that the risk management function influences the risk and performance of the bank; however, it is not possible from our data to define an optimal model of risk governance.

Keywords: risk management, risk governance, enterprise risk management, banking system

JEL Classification numbers: G21, G34, G39

Correspondence to:

Gloria Gardenal	Department of Management, Università Ca' Foscari Venezia
	San Giobbe, Cannaregio 873
Phone:	[+39] 041-234-6926
Fax:	[+39] 041-234-8701
E-mail:	ggardenal@unive.it

Introduction

The recent financial crisis has shed light on the weaknesses of the financial system and highlighted the importance, for the financial intermediaries, to be equipped with an adequate risk management function, able to oversee all kinds of relevant risks.

Despite the techniques for risk management have developed considerably in the last years and although financial intermediaries are required, by the law and the regulators, to manage risk in a structured way, the financial crisis has shown that many of them were over exposed to some classes of risk, thus creating the conditions for a severe systemic instability.

Several studies have emphasized that flaws in bank governance played an important role in the poor performance of banks during the crisis (e.g., Diamond and Rajan, 2009). Also a recent OECD report concludes that the financial crisis can be to an important extent attributed to failures and weaknesses in corporate governance arrangements (Kirkpatrick, 2009). Acharya et al. (2009) argue that a strong and independent risk management is necessary to effectively manage risk in modern-day banks as deposit insurance protection and implicit too-big-to-fail guarantees weaken the incentives of debtholders to provide monitoring and impose market discipline. Moreover, the increasing complexity of banking institutions and the ease with which their risk profiles can be altered by traders and security desks makes it difficult for supervisors to regulate risks.

Regulators are dedicating an increasing attention to the Enterprise Risk Management (ERM) issue, an integrated approach to risk management. According to this perspective, risk management can't be considered only a preventive system, but it must be configured as a comprehensive process that supports organisational and managerial decisions and the realization of corporate strategies. In fact, implementing an effective ERM system means acting on the governance, designing an appropriate organisational model and information systems able to support the processes of ERM.

Prior literature shows that a more structured risk management function reduces bank risk and increases performance (Ellul and Yerramilli, 2010; Aebi, Sabato and Schmid, 2012); moreover, risk management is more effective when the CRO is independent from the CEO, has a long experience in the financial sector and there is a Risk Committee that monitors and controls risks (Aebi, Sabato and Schmid, 2012).

We investigate these aspects on a sample of 21 Italian listed banks. Our contribution enlarges the literature in this respect, which is still scant. Differently from previous studies, we find that the presence of a CRO doesn't affect the performances and risk of the bank, except for a negative relationship with the *RAROE*.

As for the Risk Committee, its members' professional experience in the financial sector reduces the tendency of banks to acquire greater risk; however, the degree of activism of such committees does not provide an incentive to contain risks, indeed it tends to increase it. Moreover, the degree of independence of the board is positively correlated with the performance of the bank, supporting the initiatives promoted by different bank supervision authorities to ensure the bank management independence. Our results are not conclusive and leave space for further investigation.

The paper is structured as follows: paragraph 2 briefly reviews the main literature; paragraph 3 presents the data; paragraph 4 introduces the variables; paragraph 5 describes the model and the main results.

2. Literature review

Among the main issues about bank governance during the crisis, we can observe the weaknesses in risk governance, i.e. the activity performed by the board and the management of the company of controlling risks and designing internal control systems for the identification, measument and management of risk (Capuano, 2013).

Although theoretical studies about the interdependencies among risk management systems, corporate governance, risk exposure and performance of financial institutions are plenty (Hinrics, 2008; Mottura, 2008; Honohan, 2008; Anderson, 2009; Kirkpatrick, 2009), the empirical research is still inadequate and mainly focused on the American banking system.

Ellul and Yerramilli (2010), studying a sample of 74 listed large US banks in the period 2000-2008, investigate if the presence of an influential and independent risk management function influences the risk and performance of the financial intermediaries. In particular, they measure the quality of the risk management system through a self-developed risk management index (RMI), based on six variables of risk governance[1]. The analysis suggests a negative relation between the RMI index and the risk taken by the bank; those banks that have a more structured and integrated risk management function (meaning a higher RMI index) have a lower tendency to acquire additional risks, a better operating performance and a yearly return higher in the years of the crisis (2007-2008).

Also Aebi, Sabato and Schmid (2012) focus their attention on the characteristics of the risk governance of two samples of US banks during the financial crisis (July 2007 – December 2008); in particular, they show that those banks where the Chief Risk Officer reports directly to the board have a higher performance with respect to those where he/she refers to the CEO, thus showing the exsistence of a conflict of interest between these two organisational figures, presumably due to the tendency of the CEO to consider risk management a secondary issue with respect to, for example, the expansion of volume of sales, assets and profit, which can increase his/her personal prestige. This analysis also shows that the establishment, within the board, of a committee dedicated to the monitoring and control of the overall risk of the bank (Risk Committee) – a measure mostly present in the best practices for risk governance[2] - doesn't increase the bank performances during the crisis; these are, instead, positively influenced by the frequency of the meetings of the risk committees.

Several studies focus on the relation between some characteristics of the members of the board, such as the independence and the experience in the financial sector, and the performance and risk of the bank. For example, Minton, Taillard and Williamson (2011) discover that banks with a higher independence of the board members have a lower level of

[1]The six variables are: presence (or not) of the *Chief Risk Officer*, his/her importance within the organisation (measured through his/her position in the hierarchy and his/her salary) and the quality of risk monitoring by the bank board.

[2]See Mongiardino and Plath (2010), *Risk governance at large banks: Have any lessons been learned*?, Journal of risk management in financial institutions, Vol. 3, p. 116-123.

risk[3]; moreover, the experience of the board members is negatively correlated with the bank performance but positively correlated with its risk (in contrast with the regulators, according to which a higher experience of the board should reduce the risk profile of the bank).
Capuano (2013) starts from these contributions and develops an analysis aimed at evaluating the effects of risk governance on the performance and risk of banks during the financial crisis, focusing on the European banks[4]. The risk governance measures taken into consideration refer to the Chief Risk Officer and the board through the use of variables that express, on one side, the importance given to the role of the CRO and, on the other side, to the quality of the bank risk monitoring performed by the board through the Risk Committee[5]. As far as the influence of the risk governance variables on the risk profile of the intermediary, the analysis shows that the sole presence of the CRO is not sufficient to reduce the riskiness of the bank (instead, it seems to increase risk), whereas if the CRO is also a member of the executive board allowa to mitigate the tendency of the bank to acquire excessive risk.
Both the level of the CRO remuneration and the professional experience of the members of the Risk Committee do not seem to be useful in reducing the corporate risk but rather to increase it. The diligence of the Committee, instead, allows increasing the stability of the bank, reducing the level of riskiness. Concerning the effect of the risk management function on the bank performance, the analysis indicates that the presence of a CRO increases the Return on Equity (ROE), while there is a negative relation between the dimension of the CRO remuneration and performance.
The number of meetings of the Risk Committee influences negatively the performance of the banks, in contrast with Aebi et al. (2012). However, there is a positive relation between the board independence and the bank performance.
Our research is in line with these contributions but focuses on the Italian banking system, in order to highlight possible analogies or differences with the results presented above.

3. The dataset

The dataset consists of 21 Italian banking groups (see Table 1 below) listed at *Borsa Italiana*, for which we have collected both financial data and corporate governance data, in the time horizon 2005-2013.
Information was collected from Bankscope and Bloomberg and integrated with other data sources (financial reports, corporate governance reports, remuneration reports) published on the company websites and on *Borsa Italiana* webpage.
The dataset was selected using a progressive criterion: first, we have selected the entire universe of Italian banks in Bankscope at the end of 2014, getting a subset of 1.092 banks. After that, we selected only the listed companies, belonging to one of the following categories

[3]Same result for Pathan (2009).
[4]He considers a dataset of 40 major European banking groups from 2005 to 2010.
[5]The variables belonging to the first category express the presence of the CRO within the organisation and the importance given to this figure. The variables belonging to the second category are mainly usefull to verify some characteristics of the board of directors (e.g., % of independent members) and of the Risk Committee.

of activity: *Commercial banks*, *Cooperative banks*, and *Investment banks*. After discarding the banks belonging to groups already selected in the subsample, we endend up with the list of banks reported in Table 1.

	Bank Name	City	Country code	Total Assets th EUR Last avail. yr	Latest accounts date
1.	**UniCredit SpA**	MILANO	IT	845.838.400	12/2013
2.	**Intesa Sanpaolo**	TORINO	IT	626.283.000	12/2013
3.	**Banca Monte dei Paschi di Siena SpA-Gruppo Monte dei Paschi di Siena**	SIENA	IT	199.105.900	12/2013
4.	**Banco Popolare - Società Cooperativa-Banco Popolare**	VERONA	IT	126.042.700	12/2013
5.	**Unione di Banche Italiane Scpa-UBI Banca**	BERGAMO	IT	124.241.800	12/2013
6.	**Mediobanca SpA-MEDIOBANCA - Banca di Credito Finanziario Società per Azioni**	MILAN	IT	70.464.000	06/2014
7.	**Banca popolare dell'Emilia Romagna**	MODENA	IT	61.758.100	12/2013
8.	**Banca Popolare di Milano SCaRL**	MILAN	IT	49.353.300	12/2013
9.	**Banca Carige SpA**	GENOVA	IT	42.156.300	12/2013
10.	**Banca Popolare di Sondrio Societa Cooperativa per Azioni**	SONDRIO	IT	32.769.900	12/2013
11.	**Credito Emiliano SpA-CREDEM**	REGGIO-EMILIA	IT	31.530.800	12/2013
12.	**Credito Valtellinese Soc Coop**	SONDRIO	IT	27.198.700	12/2013
13.	**Banca popolare dell'Etruria e del Lazio Soc. coop.**	AREZZO	IT	16.445.300	12/2013
14.	**Banco di Sardegna SpA**	SASSARI	IT	12.876.500	12/2013
15.	**Banca Ifis SpA**	VENICE	IT	11.337.800	12/2013
16.	**Banco di Desio e della Brianza SpA-Banco Desio**	DESIO	IT	9.270.300	12/2013
17.	**Banca Generali SpA-Generbanca**	TRIESTE	IT	6.602.700	12/2013

18.	**Banca Intermobiliare di Investimenti e Gestioni**	TORINO	IT	3.810.600	12/2013
19.	**Banca Popolare di Spoleto SpA**	SPOLETO	IT	3.775.500	12/2012
20.	**Banca Profilo SpA**	MILAN	IT	1.889.900	12/2013
21.	**Banca Finnat Euramerica SpA**	ROME	IT	1.135.200	12/2013

Table 1: The banks selected for the analysis

The unit of analysis is the banking group; therefore, the consolidated financial statement represents our main source of information.
The time horizon considered for the analysis goes from 2005 to 2014, thus including the period before, during and after the crisis; the dataset is therefore updated and extends the contributions to the literature about this topic[6].

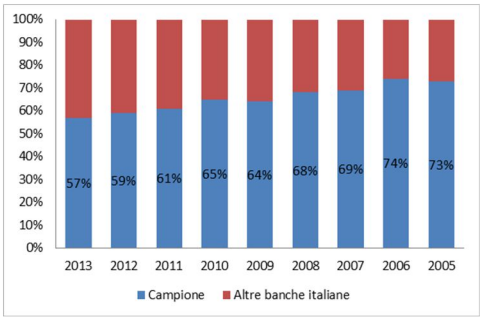

Figure 1: Total assets of the banks selected with respect to the total asset of the Italian banking system

The size of the selected groups guarantees a good degree of representativeness with respect to the universe of the Italian banks. In fact, looking at the entire time period considered for the analysis, the minimum value of total assets of the dataset never goes below 57%[7], whereas the average value of total assets with respect to the total value of the national banking system, considered over the 9 years of analysis is around 65% (see *Figure 1*).

4. The variables: definition and descriptive statistics

In order to study the effect of the risk management characteristics on the level of risk and performance of the banks we include in our models, as dependent variables, risk and performance measures, while, as independent ones, risk proxies for risk management/risk governance and other control variables.
With regard to the dependent variables, first, we include in the models different proxies for the bank performance and riskiness. Consistently with the analysis of Campbell (2013), as for

[6]Capuano (2008), our main inspiration for this analysis, covers the period up to 2010. The other research stops in 2008.
[7]Information about the dataset was collected from Bankscope, whereas the data about the Italian banking system were taken from the Statistic Database of Banca d'Italia (https://infostat.bancaditalia.it).

the performance variables, we consider four indicators: *ROE*, *ROA* and their risk-adjusted measures (*RAROE* and *RAROA*).

ROE (return on equity), measured as net income over equity, and *ROA* measured as net income to average total assets, are the most common measures of performance used in the literature. Furthermore, to have a clearer picture of the bank performance, we include in our analysis also the volatility of the performance measures: the risk-adjusted return on equity (*RAROE*), calculated as the ratio between *ROE* and its standard deviation, and the risk-adjusted return on assets (*RAROA*), equal to the ratio between *ROA* and its standard deviation.

As for the variables designed to measure the bank riskiness, according to Capuano (2013), we use the return on equity standard deviation (σROE), the return on asset standard deviation (σROA), the *Z-score*, calculated as:

$$Z - score = \frac{\left[ROA + \left(\frac{E}{A}\right)\right]}{\sigma ROA}$$

where *E/A* is the equity-to-total assets ratio while the *ROA* and σROA are, respectively, the return on assets and the *ROA* standard deviation. Table 2 reports the main descriptives of our dependent variables.

Year		**ROE**	**ROA**	**RAROE**	**RAROA**	**σ*ROE***	**σ*ROA***	***Z-score***
2005	mean	10.96	1.14	6.22	8.62	2.75	0.34	112.50
	std. Dev.	5.99	1.07	5.54	20.38	2.12	0.45	289.70
	max	23.17	4.92	25.06	94.75	8.02	2.11	1337.85
	min	0.80	0.07	0.36	0.27	0.30	0.01	13.54
2006	mean	10.62	1.01	12.54	15.93	2.24	0.25	219.86
	std. Dev.	3.55	0.60	19.53	32.11	1.84	0.30	471.33
	max	17.89	2.98	88.99	130.11	5.88	1.37	1605.13
	min	5.70	0.47	1.52	1.66	0.10	0.01	20.49
2007	mean	13.48	1.96	13.90	19.77	3.29	0.77	199.96
	std. Dev.	9.41	4.24	16.70	32.20	5.81	2.63	303.20
	max	46.17	20.25	68.17	131.52	26.31	12.21	1096.02
	min	5.71	0.39	1.75	1.55	0.18	0.01	5.53
2008	mean	-0.34	-0.12	50.49	4.70	9.83	1.48	63.78
	std. Dev.	21.16	1.88	194.96	8.05	16.52	4.16	86.65
	max	15.88	1.73	895.20	30.58	67.15	19.23	260.22
	min	-86.68	-6.94	-1.29	-1.24	0.01	0.03	-0.47
2009	mean	5.22	0.43	3.39	3.48	7.15	0.69	83.34
	std. Dev.	6.24	0.41	4.51	5.04	13.62	1.26	109.31
	max	28.68	1.63	19.06	22.16	62.90	5.54	428.04

	min	-1.48	-0.11	-0.46	-0.47	0.30	0.02	4.65
2010	mean	5.57	0.48	21.98	8.93	1.15	0.12	239.07
	std. Dev.	6.40	0.46	45.33	9.14	1.28	0.12	251.59
	max	31.44	2.22	196.58	31.11	4.48	0.42	1073.39
	min	0.74	0.05	0.46	0.44	0.01	0.01	23.01
2011	mean	-1.71	-0.09	3.53	8.79	5.86	0.43	122.40
	std. Dev.	13.71	0.96	5.03	24.32	7.53	0.52	194.07
	max	28.48	1.85	16.28	111.72	28.07	1.67	821.66
	min	-34.03	-1.94	-1.29	-1.27	0.32	0.01	1.37
2012	mean	-2.21	-0.12	0.06	0.97	7.33	0.51	38.90
	std. Dev.	17.49	0.96	3.90	3.79	6.29	0.43	60.37
	max	40.69	2.25	8.75	11.31	24.97	1.52	264.84
	min	-38.35	-1.73	-12.55	-3.57	0.76	0.05	2.08
2013	mean	-3.90	-0.16	1.95	2.84	8.19	0.52	84.78
	std. Dev.	21.93	1.13	4.47	7.35	12.61	0.66	137.90
	max	33.80	2.10	15.14	26.16	56.68	2.81	509.82
	min	-79.30	-3.92	-3.09	-2.95	0.12	0.01	-0.01
Total	**mean**	**4.16**	**0.50**	**12.77**	**8.21**	**5.33**	**0.57**	**129.24**
	std. Dev.	**14.56**	**1.83**	**68.11**	**19.63**	**9.44**	**1.75**	**247.92**
	max	**46.17**	**20.25**	**895.20**	**131.52**	**67.15**	**19.23**	**1605.13**
	min	**-86.68**	**-6.94**	**-12.55**	**-3.57**	**0.01**	**0.01**	**-0.47**

Table 2. Descriptives of the dependent variables

As expected, our evidence shows a significant increase in the overall level of risk of banks from 2006 that reaches a peak value at the end of 2008, after which the level decreases to grow again from 2010. The variable Z-score shows the opposite trend. Since it measures the degree of bank solvency and it is equal to the inverse of the probability of default, an increase in the index indicates a reduction in the probability of default and vice versa.

As for the independent variables, following Capuano (2013), the risk governance variables that we consider are related to the Chief Risk Officer (*CRO*) and the monitoring quality of the board of directors.

First, we consider the presence/absence of a *CRO* in the bank. The *CRO* presence allows the bank to oversee all operating decisions, made by the business units that imply risk taking, thus facilitating an integrated view of the company risks and a correct understanting of the possible interrelations among them (Capuano, 2013). This figure guarantees the transmission of complete, comprehensive and integrated information to the top management, providing a clear overview of the risk profile of the bank (Visco, 2012). In fact, the *CRO* should have a holistic view of the bank risks and its management and, for this reason, should be able to help the internal audit function in getting good quality information. Therefore, to capture these

aspects, we insert in our model a dummy variable (*CRO_presence*) that takes value 1 if the *CRO* is present, 0 otherwise.
The second variable considered is the *CRO* centrality (*CRO_centrality*). This is measured as the ratio between the *CRO* remuneration over the *CFO* remuneration and represents a proxy of the importance given to the *CRO* within the bank[8].
We also introduce three variables about risk governance, aimed at evaluating the ability of the board of directors (BoD) to supervise the risk management process.
In the ERM framework, the role of the board of directors is fundamental because it must supervise and guide the risk governance process of the bank. In doing so, the BoD should be aware of all major risks the bank is exposed to, so that it can verify the respect of the tolerance tresholds defined. In particular, the BoD is responsible of defining the risk appetite, monitoring the risk level of the bank and make decisions according to the fixed goals (Tarantola, 2011). According to the literature, we evaluate the board activity through variables measuring the quality of the tasks performed by the Risk Committee. Consistently with Capuano (2013), our approach is not to distinguish the hypothesis in which the Risk Committee only deals with the risk management activity from the hypothesis in which it also has other functions (e.g. internal audit). Moreover, we mainly focus on the actual activity performed by the BoD, rather than on the "name" attributed to it (the risk management activity is sometimes perfomed by the Auditing Committee).
Therefore, according to Ellul and Yerramilli (2010), Aebi et al. (2012) and Capuano (2013), first we consider the risk committee experience (*RC_experience*), calculated as the number of members with a previous professional experience in the financial sector over the total number of the members of the committee itself. The underlying hypothesis, supported also by the international regulators, is that the presence of financial experts allows a better supervision of risks and, so, a higher efficiency.
Then, in order to measure the level of efficiency of risk control we consider the Risk Committee's degree of activism. Therefore, we introduce the variable *RC_activism*, which takes value equal to 1 if the frequency of the annual committee meetings during the financial year is higher than the average frequency of the other banks with an active committee, 0 otherwise. An increased activity of the Committee should ensure a continuous monitoring of the overall risks of the intermediary, allowing to act promptly to change, if necessary, strategies and downsize the risk to acceptable levels.
The last variable related to the risk governance used in the analysis is the board independence (*BoD_indipendence*). The independence of the board should guarantee the objectivity of the opinions expressed. Part of the literature argues that the degree of independence positively affects the performance of the company and contributes to a better coverage of risks. Other studies, however, show that there is a negative relationship between the number of independent directors and the performance of banks. We measure the BoD_independence as the percentage of independent members with respect to the total of the board of directors. We

[8] In the literature, one of the main variables used to measure the importance given to the CRO is defined as CRO Executive and is a dummy variable that takes value 1 if the CRO is a member of the board of directors and 0 otherwise. Being the CRO a member of the board gives him/her a greater influence and authority in the risk management activity. However, in our dataset, there is none but one case when this was true. For this reason, we didn't consider this information in our analysis

assume as independent any member without any relation with the bank and the related subsidiaries, other than being member of the board of directors.

Table 3 shows the main descriptives of the set of our independent variables.

Year		*CRO_presence*	*CRO_centrality*	*RC_experience*	*RC_activism*	*BoD_indipendence*
2005	mean	0.05	0.01	0.70	0.15	58.21
	std. dev.	0.22	0.05	0.28	0.37	29.41
	max	1.00	0.23	1.00	1.00	100.00
	min	0.00	0.00	0.00	0.00	18.18
2006	mean	0.05	0.01	0.76	0.20	54.43
	std. dev.	0.22	0.05	0.25	0.41	26.23
	max	1.00	0.23	1.00	1.00	100.00
	min	0.00	0.00	0.17	0.00	18.18
2007	mean	0.05	0.01	0.74	0.19	49.93
	std. dev.	0.22	0.06	0.23	0.40	29.97
	max	1.00	0.26	1.00	1.00	100.00
	min	0.00	0.00	0.33	0.00	10.00
2008	mean	0.10	0.02	0.75	0.38	43.74
	std. dev.	0.30	0.07	0.26	0.50	26.73
	max	1.00	0.26	1.00	1.00	94.74
	min	0.00	0.00	0.00	0.00	10.00
2009	mean	0.14	0.03	0.79	0.43	48.71
	std. dev.	0.36	0.08	0.20	0.51	29.10
	max	1.00	0.29	1.00	1.00	100.00
	min	0.00	0.00	0.33	0.00	13.33
2010	mean	0.19	0.03	0.79	0.38	48.44
	std. dev.	0.40	0.07	0.20	0.50	28.31
	max	1.00	0.24	1.00	1.00	100.00
	min	0.00	0.00	0.33	0.00	13.33
2011	mean	0.43	0.10	0.80	0.52	52.15
	std. dev.	0.51	0.16	0.21	0.51	27.47
	max	1.00	0.68	1.00	1.00	100.00
	min	0.00	0.00	0.33	0.00	18.18
2012	mean	0.52	0.14	0.73	0.52	55.68
	std. dev.	0.51	0.23	0.23	0.51	26.12
	max	1.00	1.00	1.00	1.00	100.00

	min	0.00	0.00	0.25	0.00	18.75
2013	mean	0.55	0.17	0.79	0.60	55.36
	std. dev.	0.51	0.25	0.23	0.50	21.39
	max	1.00	1.00	1.00	1.00	91.30
	min	0.00	0.00	0.25	0.00	23.08
Total	**mean**	**0.23**	**0.06**	**0.76**	**0.38**	**51.78**
	std. dev.	**0.42**	**0.14**	**0.23**	**0.49**	**27.07**
	max	**1.00**	**1.00**	**1.00**	**1.00**	**100.00**
	min	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**

Table 3. Descriptives of the main independent variables

The evolution of the *CRO_presence* variable shows a gradual increase in the years 2007-2010 and a strong growth in the last years of interest (55% in 2013).
Focusing on the *CRO_centrality*, it is not possible to identify a unique trend; however, we can see a constant growth starting from 2010, showing that this figure is getting more importance in the risk management process after the crisis.
With respect to the Risk Committee experience (*RC_experience*), the average value of the variable, considering the entire time horizon of analysis, is equal to 76%, showing that the majority of the Risk Committee members have had previous experiences in this field[9]. On average, with reference to the overall period, banks characterized by an active risks committee are about 38%. Analysing the time trend of the *RC_activism* variable, there was a significant increase of the committee activity starting in 2007, in line with the beginning of the financial crisis.
Finally, the trend of the *BoD_independence* variable over the time period analyzed is not regular. It showed a gradual decline during the period 2005-2008, and then it increased and set at about 50%.

Finally, according to prior literature, we include in our model a set of control variables. First, we calculate the Cost to Income ratio (*CI*), measured as operating costs over operating income, that is an indicator of operating efficiency of intermediaries: its reduction indicates, in fact, a lower incidence of costs compared to the wealth produced and therefore a higher level of efficiency. Then, we include the Net Interest Margin (*NIM),* representing a measure of bank profitability and calculated as the ratio between the net interest income and the total value of assets.
We also control for the bank size (*size*), calculated as the natural logarithm of total assets, in order to check for any systematic differences in performance or in risk between banks of different size class.

[9]As in Aebi et al. (2012), we consider as relevant previous experience in banks or insurance companies.

Furtheromore, to control for the capital structure of banks, we insert as control variables the Equity to Asset Ratio (*EA*), the Total Capital Ratio (*TCR*), the Loans (*loan*), the Deposits (*deposit*) and the Derivatives variables (*derivatives*).
The Equity to Asset Ratio measures the degree of capitalization of the bank and, as defined above, it is given by the ratio between the equity capital over the total assets.
The Total Capital ratio, that is the ratio between regulatory capital and risk-weighted assets, is an indicator of the soundness of the bank. The higher the ratio is, the greater the financial strength of the intermediary should be.
The *deposit* variable expresses the ratio between volume of deposits (including the short-term funding) and total assets, thereby indicating the bank ability to direct funding. The *loan* variable measures the proportion of loans with respect to the total assets of the bank, while the last control variable used is the *derivatives* one, measured as the ratio between the value of traded derivatives and the total bank value.
Table 4 summarizes the main descriptives of the control variables included in the model.

Year		***CI***	***NI***	***size***	***EA***	***TCR***	***loan***	***deposit***	***derivatives***
2005	mean	62.09	2.37	23.41	9.88	12.81	0.55	0.59	0.04
	std. Dev.	14.20	0.69	2.01	5.40	5.29	0.21	0.14	0.06
	max	97.06	3.43	27.39	28.45	29.90	0.81	0.83	0.19
	min	33.60	0.75	20.02	5.01	8.32	0.06	0.34	0.00
2006	mean	60.05	2.48	23.61	10.13	12.64	0.56	0.59	0.04
	std. Dev.	11.56	0.56	2.00	7.30	5.88	0.20	0.15	0.05
	max	85.94	3.30	27.44	39.55	35.60	0.76	0.86	0.16
	min	24.88	1.59	19.73	5.19	9.48	0.04	0.27	0.00
2007	mean	57.01	2.53	23.71	10.54	12.27	0.58	0.57	0.06
	std. Dev.	14.25	0.72	1.98	8.90	6.48	0.21	0.15	0.10
	max	80.49	3.54	27.65	47.28	38.80	0.80	0.90	0.44
	min	22.75	1.25	19.97	4.93	8.73	0.06	0.30	0.00
2008	mean	48.57	2.69	23.79	9.33	11.57	0.62	0.57	0.08
	std. Dev.	86.14	0.53	2.00	6.77	5.51	0.21	0.13	0.14
	max	97.43	3.51	27.68	37.10	34.90	0.79	0.86	0.60
	min	-322.31	1.33	19.97	2.03	6.12	0.07	0.31	0.00
2009	mean	65.84	2.20	23.82	9.56	12.86	0.62	0.58	0.07
	std. Dev.	16.63	0.63	1.98	4.95	4.80	0.19	0.15	0.16
	max	127.97	3.27	27.56	30.22	27.22	0.82	0.89	0.75
	min	42.54	0.92	20.18	6.73	8.90	0.09	0.33	0.00
2010	mean	68.70	2.04	23.89	9.41	13.14	0.62	0.60	0.08
	std. Dev.	13.19	0.48	1.97	5.84	4.81	0.19	0.14	0.17

	max	99.48	3.19	27.56	34.17	27.90	0.82	0.91	0.78
	min	40.92	1.04	20.06	6.01	9.10	0.10	0.32	0.00
2011	mean	73.93	2.10	23.94	8.17	13.45	0.61	0.60	0.09
	std. Dev.	25.69	0.57	1.93	5.19	5.06	0.19	0.15	0.15
	max	162.20	3.61	27.55	29.67	31.80	0.81	0.93	0.64
	min	40.10	1.07	20.18	4.23	8.00	0.11	0.29	0.00
2012	mean	63.99	1.99	24.05	7.42	14.07	0.57	0.64	0.07
	std. Dev.	14.67	0.43	1.83	3.38	5.48	0.20	0.14	0.08
	max	86.26	2.98	27.56	19.72	34.10	0.79	0.94	0.23
	min	27.39	1.04	20.62	2.95	7.63	0.10	0.37	0.00
2013	mean	63.73	1.81	24.14	7.40	14.77	0.54	0.66	0.05
	std. Dev.	19.44	0.40	1.75	2.95	5.47	0.19	0.14	0.07
	max	120.73	2.73	27.46	16.35	32.50	0.75	0.96	0.21
	min	28.21	1.04	20.85	3.10	9.20	0.18	0.39	0.00
Total	mean	62.65	2.25	23.82	9.10	13.06	0.59	0.60	0.06
	std. Dev.	32.90	0.62	1.91	5.89	5.40	0.20	0.14	0.12
	max	162.20	3.61	27.68	47.28	38.80	0.82	0.96	0.78
	min	-322.31	0.75	19.73	2.03	6.12	0.04	0.27	0.00

Table 4. Descriptives of the main control variables

Overall, we notice that the banks included in our dataset demonstrated a certain capabilty to maintain a good level of efficiency during the crisis climax, although in later years they showed a clear tendency to expand costs.

Furthermore, the simultaneous reduction of the intermediation margin contributed to the deterioration of the Cost to Income ratio. The Net Interest Margin showed an evident drop from 2008. The reasons of this decline came from the weak increase in loans, the high incidence of bad loans and the increase of the cost of funding, as well as the continuous increase in the average size of the banking groups in terms of total assets.

With regard to *loan* and *deposit* variables, the graph shows that, before the crisis, the portion of deposits to total assets exceeded the loans one. The *deposit* ratio reversed in 2007-2011. Since 2007, in fact, the variable *loan* grows much faster than the *deposit* one. After 2011, the relationship between the two variables is reversed again: loans fall significantly, while the deposits significantly increase.

As for the Derivatives, the trend shows a strong increase of these financial instruments with respect to the total assets between 2006 and 2008 (form 3.65% to 8.3). Reaching a new peak in 2011, the banks of our dataset reduced considerably their derivatives in the next two years, although their weight remained higher than the pre-crisis phase.

Finally, we insert in the model the dummy variable *crisis*, equal to 1 from 2008 onwards and zero otherwise; this variable must be included in the analysis to control for bias depending on the specific period considered.

5. Empirical Analysis

5.1. The model

The econometric model used is a panel regression, as our dataset is composed of 21 cross sectional units (bank groups) over a period of 9 years (2005-2013). We run a fixed effects model. This method allows us to capture the heterogeneity of the units of analysis, i.e. to control for omitted variables, and to avoid bias in the estimates. The Hausman test results suggest not to use the random effects to avoid inconsistent estimates.

The equation model we used is therefore the following one:

$$Y_{j,t} = a + \beta_j \cdot RM_{j,t} + \gamma_j \cdot X_{j,t} + s_j + r_{j,t}$$

where j indicates the banks (j= 1,…, 21), t represents years (t = 2005,…, 2013), $\boldsymbol{RM_{j,t}}$ represents the vector of risk management variables described in the previous section; $\boldsymbol{X_{j,t}}$ is the vector of control variables consistent with prior literature; $\boldsymbol{s_j}$ captures the individual effect and it is constant over time; $\boldsymbol{r_{j,t}}$ represents the casual error for observation j at time t.

5.2 The Results

Before verifying whether an efficient and integrated risk management function affects the performance and the riskiness of banks, we analyze the correlation matrix between the selected variables (see Table 5).

	ROE	*ROA*	*RAROE*	*RAROA*	*devstroe*	*devstroa*	*Z-score*	*CRO_ presence*	*CRO_ centrality*	*RC_ experience*	*RC_ activism*	*BoD_ independence*	*CI*	*NIM*	*size*	*EA*	*TCR*	*loan*	*deposit*	*derivative*
ROE	1.00																			
ROA	0.65	1.00																		
RAROE	0.06	0.02	1.00																	
RAROA	0.18	0.10	0.16	1.00																
devstroe	-0.56	-0.21	-0.10	-0.20	1.00															
devstroa	-0.13	0.10	-0.06	-0.12	0.57	1.00														
Z-score	0.10	0.04	0.20	0.90	-0.24	-0.15	1.00													
CRO_presence	-0.12	-0.13	-0.09	-0.14	0.06	-0.04	-0.12	1.00												
CRO_centrality	-0.25	-0.15	-0.07	-0.13	0.04	-0.03	-0.10	0.74	1.00											
RC_experience	0.05	-0.04	0.07	-0.14	-0.05	-0.26	-0.14	0.06	-0.11	1.00										
RC_activism	-0.34	-0.23	0.09	-0.12	0.15	-0.06	-0.03	0.21	0.28	0.00	1.00									
BoD_independence	-0.06	-0.12	0.04	0.02	-0.09	-0.15	-0.01	0.38	0.21	0.05	0.31	1.00								
CI	0.15	-0.08	0.00	-0.07	-0.26	-0.09	0.00	0.03	0.05	-0.02	0.05	0.08	1.00							
NIM	0.27	0.15	0.15	0.01	-0.14	0.05	0.00	-0.25	-0.25	-0.05	-0.06	-0.01	-0.06	1.00						
size	-0.18	-0.23	-0.09	-0.01	-0.09	-0.24	0.02	0.39	0.34	0.12	0.32	0.59	0.07	-0.20	1.00					
EA	0.19	0.46	-0.03	0.01	0.09	0.59	0.04	-0.20	-0.18	-0.20	-0.21	-0.23	0.00	0.02	-0.43	1.00				
TCR	0.08	0.30	-0.06	-0.07	0.18	0.49	-0.04	0.05	0.06	-0.22	-0.12	-0.28	0.12	-0.19	-0.45	0.79	1.00			
loan	-0.10	-0.16	0.09	0.05	-0.30	-0.26	0.11	-0.16	-0.08	0.02	0.15	0.29	0.11	0.21	0.38	-0.23	-0.51	1.00		
deposit	0.17	-0.03	-0.02	-0.01	-0.06	-0.09	-0.07	-0.07	-0.07	0.05	-0.17	-0.41	0.01	0.02	-0.44	-0.21	-0.06	-0.20	1.00	
derivative	-0.26	-0.14	-0.05	-0.10	0.38	0.04	-0.09	0.28	0.24	0.00	0.10	-0.01	-0.13	-0.25	0.09	-0.12	0.18	-0.46	-0.22	1.00

Table 5. Correlation matrix among variables

Our first evidence is in line with Capuano (2013), except for the variable Active Risk Committee, which in our analysis is positively related to bank performance measures.
According to the correlation analysis, our expectations on the signs of the relationship between the risk management variables and the performance measures, risk and risk-adjusted performance variables are reported in Table 6.

Risk Management variables	**Performance variables**		**Risk variables**			**Risk- adjusted performance variables**	
	ROE	*ROA*	*σROE*	*σROA*	*Z-score*	*RAROE*	*RAROA*
CRO_presence		−			−	−	−
CRO_centrality	−	−			−	−	−
RC_exprience				−			−
RC_activism	−	−	+			+	
BoD_independence		−		−			

Table 6: expected impacts

With regard to the empirical model, our findings show that there is a relationship between the risk management variables and the performance variables (dependent).. Table 7 reports the effects of the independent variables on the banks ROE. In particular, consistently with Capuano (2013), our results indicate that the degree of board independence brings benefits in terms of return on equity. The variable *BoD_independence* is the only variable of interest having a positive and significant impact on ROE. The other risk management variables are not statistically significant.

VARIABLES	(1) *ROE*	(2) *ROE*	(3) *ROE*
CI		0.122***	0.113***
		(1.39e-05)	(4.52e-05)
NIM		8.133***	7.235***
		(1.52e-05)	(0.000126)
size		25.18***	25.82***
		(1.90e-06)	(8.99e-07)
EA		1.146**	1.240***
		(0.0152)	(0.00768)
TCR		0.461	0.675
		(0.256)	(0.103)
loan		30.45*	25.18
		(0.0556)	(0.109)
deposit		-49.82**	-53.49**
		(0.0203)	(0.0116)
derivative		-40.22**	-46.11***
		(0.0133)	(0.00401)
crisis	-9.752***	-14.12***	-12.55***
	(3.95e-05)	(4.66e-07)	(9.97e-06)

CRO_presence	8.387*		2.844
	(0.0671)		(0.451)
CRO_centrality	-28.67**		-13.25
	(0.0128)		(0.164)
RC_experience	0.713		2.855
	(0.887)		(0.489)
RC_activism	-5.055		-3.585
	(0.119)		(0.203)
BoD_independence	0.0392		0.123**
	(0.500)		(0.0115)
Constant	9.783*	-613.5***	-632.4***
	(0.0622)	(2.98e-06)	(1.18e-06)
Observations	186	186	186
R-squared	0.215	0.472	0.516
Number of ID	21	21	21

Table 7: The effect of risk governance variables on *ROE*

These first results do not support those theories that claim as central the role of the Chief Risk Officer in managing risks, while they confirm the relevance of the board independence for the effective risk governance of a bank.

The data also show that there is a positive and significant relation between the bank size, measured in terms of total assets, and the performance, measured by the return on equity. This result is at odds with the one obtained by Capuano (2013) who found a negative link between the two variables mentioned above.

In addition, the relationship between the Equity to Asset Ratio, Cost to Income Ratio, Net Interest Margin and ROE is positive, while the relationship between variables such as Deposit, Derivative and the Return on Equity is negative. The *crisis* variable is statistically significant and, as expected, has a negative impact on the performance.

Moving to analyse the relationship between our independent variables and ROA, our findings only partially confirm the results previously discussed. As Table 8 reports, there is no statistically significant relationship between any of the independent variables and the risk management. This is at odds with the positive relationship between the degree of board independence and ROE, previously detected.

Differently, variables such as bank *size* and Equity to Asset ratio confirm the positive relationship with the performance measurement. Therefore, larger and more capitalized banks seem to be the most profitable in terms of both ROE and ROA. According to the expectations and in line with the ROE evidence, the *deposit* variable show a negative relationship with ROA. *Crisis* is again negatively affecting the bank performance.

VARIABLES	(1) *ROA*	(2) *ROA*	(3) *ROA*
CI		-0.00187	-0.00250
		(0.639)	(0.537)
NIM		0.390	0.322
		(0.142)	(0.242)
size		0.825	1.267**
		(0.134)	(0.0390)
EA		0.319***	0.333***
		(6.37e-06)	(3.10e-06)
TCR		0.0321	0.0582
		(0.579)	(0.343)
loan		-3.916**	-3.853**
		(0.0295)	(0.0368)
deposit		-5.360*	-6.034*
		(0.0865)	(0.0561)
derivative		-4.444*	-4.785**
		(0.0555)	(0.0401)
CRO_presence	-0.188		-0.363
	(0.768)		(0.514)
CRO_centrality	-0.952		0.745
	(0.565)		(0.601)
RC_experience	-0.247		0.554
	(0.731)		(0.370)
RC_activism	-0.657		-0.457
	(0.139)		(0.271)
BoD_independence	0.00262		0.0134*
	(0.753)		(0.0628)
Constant	0.900	-17.41	-28.73*
	(0.229)	(0.196)	(0.0552)
Observations	186	186	186
R-squared	0.031	0.338	0.363
Number of id	21	21	21

Table 8: The effect of risk governance variables on *ROA*

To further investigate our research question, we run other regression models including a different category of performance measurements. Specifically, we use as dependent variables risk-adjusted performance measures, such as *RAROE* and *RAROA*. Table 9 shows results with regard to *RAROE* as dependent variable[10].

[10] Results obtained using as dependent variable the *RAROA* are in line with those obtained using the *RAROE* though weaker and therefore have not been reported.

Consistently with Capuano (2013), our results detect a negative relationship between the variable *CRO_presence* and the risk adjusted performance measure, while at odds with prior research, the analysis shows a positive relationship between the variable *RC_activism* and the *RAROE*.

VARIABLES	(1) *RAROE*	(2) *RAROE*	(3) *RAROE*
CI		0.0273	0.0625
		(0.881)	(0.734)
NIM		9.287	16.17
		(0.441)	(0.196)
size		-3.922	-12.86
		(0.875)	(0.643)
EA		-0.489	-0.944
		(0.875)	(0.763)
TCR		-0.685	-0.181
		(0.795)	(0.948)
loan		14.01	16.07
		(0.863)	(0.847)
deposit		-30.68	-23.41
		(0.829)	(0.870)
derivative		-2.268	-1.245
		(0.983)	(0.991)
CRO_present	-39.43*		-39.42
	(0.0976)		(0.120)
CRO_centrality	36.27		48.19
	(0.555)		(0.456)
RC_experience	22.50		23.39
	(0.400)		(0.405)
RC_activism	25.34		37.17**
	(0.124)		(0.0498)
BoD_independence	0.0679		0.0611
	(0.826)		(0.851)
Constant	-10.45	107.3	265.5
	(0.706)	(0.861)	(0.695)
Observations	186	186	186
R-squared	0.034	0.008	0.049
Number of id	21	21	21

Table 9: The effect of risk governance variables on *RAROE*

To conclude the analysis, we study the effects of the risk management function on variables that approximate the overall risk level of the bank, such as *σROE* and *σROA*. The results obtained are shown respectively in Tables 10 and 11.
Overall, our findings show that both the CRO presence (*CRO_presence*) and its centrality (*CRO_centrality*) are not statistically significant. The Risk Committee experience (*RC_experience*) and its activism level (*RC_activism*) have, respectively, a negative impact on the risk-adjusted performance (as measured by *σROE*) and a positive impact on *σROA*. The board independence is never significant. It can be concluded that only the level of professional background of the members of the Risk Committee (expressed by the variable *RC_experience*) can help to lower the overall level of risk of the intermediary.

	(1)	(2)	(3)
VARIABLES	*σROE*	*σROE*	*σROE*
CI		-0.0720***	-0.0680***
		(0.00143)	(0.00278)
NIM		-2.668*	-2.058
		(0.0715)	(0.177)
size		-0.0937	-3.216
		(0.976)	(0.342)
EA		0.388	0.304
		(0.310)	(0.425)
TCR		-0.198	-0.310
		(0.539)	(0.363)
loan		-19.74**	-19.43*
		(0.0485)	(0.0571)
deposit		15.08	17.72
		(0.385)	(0.310)
derivative		54.57***	54.33***
		(3.60e-05)	(3.83e-05)
CRO_present	1.751		2.797
	(0.588)		(0.364)
CRO_centrality	-8.451		-9.641
	(0.314)		(0.222)
RC_experience	-3.457		-2.925
	(0.343)		(0.393)
RC_activism	6.989***		5.151**
	(0.00210)		(0.0262)
BoD_independence	-0.00278		-0.0235
	(0.947)		(0.553)
Constant	5.567	16.14	90.76
	(0.142)	(0.829)	(0.273)
Observations	186	186	186

R-squared	0.069	0.230	0.266
Number of id	21	21	21

Table 10: The effect of risk governance variables on *σROE*

VARIABLES	(1) *σROA*	(2) *σROA*	(3) *σROA*
CI		-0.00477	-0.00457
		(0.203)	(0.219)
NIM		0.206	0.270
		(0.407)	(0.285)
size		0.374	0.233
		(0.467)	(0.677)
EA		0.343***	0.334***
		(2.82e-07)	(4.18e-07)
TCR		-0.0263	-0.0597
		(0.627)	(0.289)
loan		-3.953**	-3.223*
		(0.0192)	(0.0567)
deposit		7.027**	6.939**
		(0.0170)	(0.0171)
derivative		5.461**	5.287**
		(0.0124)	(0.0137)
CRO_present	0.545		0.540
	(0.313)		(0.291)
CRO_centrality	-1.936		-1.079
	(0.168)		(0.409)
RC_experience	-2.277***		-1.822***
	(0.000244)		(0.00156)
RC_activism	0.236		0.359
	(0.528)		(0.347)
BoD_independence	-0.00440		-0.00184
	(0.532)		(0.779)
Constant	2.433***	-13.54	-8.873
	(0.000164)	(0.283)	(0.517)
Observations	186	186	186
R-squared	0.086	0.233	0.292
Number of id	21	21	21

Table 11: The effect of risk governance variables on *σROA*

Finally, the analysis carried out using as dependent variable the *Z-score* led to insignificant results and therefore we do not report it.

Conclusions

This analysis focused on a key aspect of the Enterprise Risk Management in banks, that is, the risk governance. In particular, we investigate whether the implementation of more structured risk governance in the Italian listed banks leads to positive effects in terms of performance, limiting the overall risk level of the financial intermediaries.

Recent empirical studies have tried to identify the organizational aspects that can favour or impede effective risk governance, where performances are maximized and risks minimized. However, these studies mainly focus on the US or European Banks and do not allow drawing general guidelines to define an optimal risk governance model, but they only highlight some interesting aspects to be explored.

In our empirical analysis, we consider 21 Italian listed banks and we find that some of the variables investigated show elements of connection between bank risk governance and risk-adjusted performance. Other variables, in contrast, have no significant relationships, but do provide ideas for further investigation. More specifically, as for the presence of a Chief Risk Officer, the analysis does not allow to highlight a significant relationship neither with the overall risk of the intermediary nor with the level of performance. Our evidence shows only a negative relation between the presence of this figure and the risk-adjusted return on equity. Therefore, differently from the study of Capuano (2013), the presence of a CRO (possibly with a high remuneration) doesn't provide better control of the bank risk.

Furthermore, we obtain conflicting results with regard to the role of the Risk Committee. On one hand, the professional background of the members seems to counteract the tendency of banks to acquire greater risk; on the other hand, the degree of activism of such committees does not provide an incentive to contain risks, indeed it tends to increase it.

These latter results are in contrast with the literature that shows that the risk committee can help reduce risk only if the intermediary is particularly active, while the professional experience of its members helps to increase the level of the overall risk.

Moreover, our research shows, in line with the findings of Capuano (2013) and with prior literature on this topic, that the degree of independence of the board is positively correlated with the performance of the bank, supporting the initiatives promoted by different bank supervision authorities to ensure the bank management independence.

Our study does not suggest the optimal approach to risk management in banks. Indeed, our results indicate that the presence of the CRO within the finanial institution, that should guarantee an integrated approach to risk management, has no evident and significant positive effects in the reduction of risk and/or improvement of performance. These conclusions, however, leave open the possibility of further investigation, enlarging the sample or changing the variables used as proxies. Moreover, it is clear that the variables examined may not mirror clearly the adoption of ERM within a banking organization. Therefore, it would be more appropriate to establish a more complex system of indicators representing the risk management function.

Therefore, although interesting, our preliminary findings need to be interpreted with the necessary caution, but they can be a valuable input for further analysis and insights, highlighting some significant relationships between bank risk governance and the level of risk and profitability of intermediaries.

References

Aebi V., Sabato G., Schmid M., (2012), *Risk management, corporate governance, and bank performance in the financial crisis*, Journal of Banking & Finance, vol. 36, pp. 3213-3226.

Alexander C., Pezier J., (2003), *On the Aggregation of Market and Credit Risks*, ISMA Centre Discussion Papers in Finance, n. 13, ottobre.

Andersen A., *Managing business risk: An integrated approach*, Economist Intelligence Unit (New York), 1995.

Anderson R.C., (2009), *Risk Management & Corporate Governance. Consultants report for the OECD* (www.oecd.org / corporate / ca / corporategovernanceprinciples / 42670210.pdf).

Andreis N., Zamboni P., Bonollo M., (2011), *L'Enterprise Risk Management System nelle banche italiane dopo la crisi*, Bancaria, n. 7-8, pp. 69-82.

Bervas A., (2006), *Market liquidity and its incorporation into risk management*, Banque de France – Financial stability review, n. 8, pp. 63-79.

Capuano P., (2013), *La crisi finanziaria internazionale: Il ruolo della funzione di risk management delle banche*, Aracne.

Cerrone R., (2013) *Sistemi di controllo interno e risk appetite framework nelle banche: le novità regolamentari e le evidenze dal 3° pilastro*, CASMEF Working Paper Series, Working Paper n. 10.

Conti V., (2009), *Crisi finanziarie, controlli interni e ruolo delle autorità*, Università Bocconi, Carefin-Centre for Applied Research in Finance, Working Paper n.5.

Crouhy M., Galai D., Mark R., *The essentials of risk management*, McGraw-Hill, 2006.

Deloach J.W., *Enterprise-wide risk management: strategies for linking risk and opportunity*, Prentice-Hall, 2000.

Dimakos X.K., Aas K., (2004), *Integrated risk modeling*, Statistical Modelling, vol. 4, n. 4, pp. 265-277.

Drehmann M., Sorensen S., Stringa M., (2008), *The Integrated Impact of Credit and Interest Rate Risk on Banks: An Economic Value and Capital Adequacy Perspective*, Bank of England Working Paper n.339.

Ellul A., Yerramilli V., (2010), *Stronger Risk Controls, Lower Risk: Evidence from U.S. Bank Holding Companies*, NBER – National Bureau of Economic Research, Working Paper n. 16178, luglio (www.nber.org / papers / w16178).

Floreani A., *Introduzione al risk management. Un approccio integrato alla gestione dei rischi aziendali*, Rizzoli Etas, 2005.

Forestieri G., *Risk management. Strumenti e politiche per la gestione dei rischi puri dell'impresa*, Egea, 1996.

Gottardo P., *La gestione dei rischi nelle imprese industriali e finanziarie*, Giuffrè Editore, 2006.

Grundke P., (2008), *Top-Down versus Bottom-Up Approaches in Risk Management*, ottobre (http: / / papers.ssrn.com / sol3 / papers.cfm?abstract_id=1282098).

Hashagen J., Harman N., Conover M., Sharma J., (2009), *Risk management in banking: beyond the credit crisis*, The Journal of Structured Finance, vol. 15, n. 1, pp. 92-103.

Hinrics J., (2008), *Creating synergy by integrating enterprise risk management and governance*, Journal of risk management in Financial Institutions, vol. 2, n. 2, pp. 155-164.

Honohan P., (2008), *Risk Management and the Costs of the Banking Crisis*, Institute for International Integration Studies, Trinity College Dublin and CEPR, Discussion Paper n. 263, settembre.

Kirkpatrick G., (2009), *The Corporate Governance Lessons from the Financial Crisis*, Financial Market Trends, OECD Journal, n. 2009/1, pp. 1-30

Kuritzkes A., Schuermann T., Weiner S.M., (2003), *Risk Measurement, Risk Management and Capital Adequacy of Financial Conglomerates*, Brookings-Wharton Papers in Financial Services.

Limentani R.N., Tresoldi N., (2013), *Le nuove disposizioni di Vigilanza sul sistema dei controlli interni, sul sistema informativo e sulla continuità operativa*, Bancaria n. 12, pp. 63-70.

McKinsey&Company, (2013), *Getting to ERM: A road map for banks and other financial institutions*, McKinsey Working Paper on Risk, n. 43.

Mieli S., (2012), *Sistemi di controllo dei rischi e governo degli intermediari: una prospettiva di vigilanza*, Università di Milano – Convegno ADEIMF "Corporate governance e gestione dei rischi: gli insegnamenti della crisi" (www.bancaditalia.it / pubblicazioni / interventi-vari / int-var-2012 / Mieli_conv_ADEIMF.pdf).
Mieli S., (2011), *La gestione dei rischi bancari tra crisi finanziaria e sviluppi regolamentari*, Convention APB (www.bancaditalia.it / pubblicazioni / interventi-vari / int-var-2011 / Mieli_APB-21-10-2011.pdf).

Minton A.B., Taillard J.P.A., Williamson R., (2011), *Do Indipendence and Financial Expertise of the Board Matter for Risk Taking and Performance?*, Fisher College of Business, Working Paper n. 2010-03-014 (http: / / ssrn.com / abstract=1661855).

Mottura P., (2008), *Crisi bancarie: un problema di governance?*, Bancaria, n. 12, pp. 15-28.

Pathan S., (2009), *Strong board, CEO power and bank risk-taking*, Journal of Banking & Finance, vol. 33, n. 7, pp. 1340-1350.

Pesic V., *Il Sistema dei Controlli Interni della banca. Obiettivi manageriali ed esigenze di vigilanza per il governo dei rischi*, Bancaria Editrice, 2009.

Prandi P. (a cura di), *Il risk management: Teoria e pratica nel rispetto della normativa*, Franco Angeli, 2010.

Prandi P., (a cura di) *Il risk management negli istituti di credito – Come affrontare le sfide in scenari di incertezza*, Atti di Convegno Brescia, 2 dicembre 2011, Franco Angeli, 2012.

Protiviti, (2006), *Guide to Enterprise Risk Management: Frequently Asked Questions* (www.ucop.edu / enterprise-risk-management /_files / protiviti_faqguide.pdf).
Resti A., Sironi A., *Rischio e valore nelle banche – Misura, regolamentazione, gestione*, Egea, 2008.

Romano C., (2002), *Applying Copula Function to Risk Management*, Università di Roma, La Sapienza, Working Paper.

Rosenberg J.V., Schuermann T., (2004), *A general approach to integrated risk management with skewed, fat-tailed risk*, Federal Reserve Bank of New York, Staff Reports n. 185, maggio (www.newyorkfed.org / research / staff_reports / sr185.pdf).

Ruozi R., Ferrari P., (2009), *Il rischio di liquidità nelle banche: aspetti economici e profili regolamentari*, Università degli Studi di Brescia, Dipartimento di Economia Aziendale, Paper n.90 (www.unibs.it / sites / default / files / ricerca / allegati / Paper90.pdf).

Saita F., *Il risk management in banca: performance corrette per il rischio e allocazione del capitale*, Egea, 2000.

Segal S., *Corporate Value of Enterprise Risk Management: The Next Step in Business Management*, Wiley, 2011.

Senati M., *L'evoluzione del ruolo del Risk Management alla luce del mutamento di scenario*, in *Il risk management negli istituti di credito – Come affrontare le sfide in scenari di incertezza*, a cura di P. Prandi, Atti di Convegno Brescia, 2 dicembre 2011, Franco Angeli, 2012.

Sironi A., *Rischio e valore nelle banche – Risk Management e Capital Allocation*, Egea, 2005.

Tarallo P. (a cura di), *La gestione integrata dei rischi puri e speculativi*, Franco Angeli, 2000.

Tarantola A. M. (2011), *Il ruolo del risk management per un efficace presidio dei rischi: le lezioni della crisi*, Intervento del Vice Direttore Generale della Banca d'Italia, CommunityCib – SDA BOCCONI, novembre (www.bancaditalia.it / interventi / intaltri_mdir / Tarantola-101111.pdf).

Tutino F., Birindelli G., Ferretti P. (a cura di), *Basilea 3 – Gli impatti sulle banche*, Egea, 2011.

Ward L.S., Lee D.H., (2002), *Practical Application of the Risk-Adjusted Return on Capital Framework*, Working paper (www.casualtyactuarialsociety.org / pubs / forum / 02sforum / 02sf079.pdf).