Disclosure practices and financial crisis: empirical evidences in the European insurance industry

by

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Abstract
This paper empirically investigates disclosure practices in the European insurance industry, over the 2005-2010 time period. First it measures the readability level of the annual reports of the sample insurers and constructs a disclosure index based on the risk information companies provide. Then, it estimates the relationship between the extent of some insurers' characteristics and risk disclosure practices and the impact of the financial crisis on the reporting choices.
The main results show that the annual reports are difficult to read; it is not documented an effort by companies to enhance their understandability, as readability levels are quite constant over time, thus a problem of readability raises. The level of risk disclosure has increased over time, with a stronger growth between 2008 and 2010. There is no significant relationship between the quality and the quantity of disclosure. Finally, the analysis also shows that insurers' characteristics, in terms of size, profitability, reserve, as well as risk and home country, significantly affect the amount of risk information disclosed; in the years affected by the financial crisis, the level of risk disclosure increases.

Keywords: insurance companies, financial reporting, disclosure, financial crisis
JEL codes: G22, G14

1. Introduction

Over the last decades, the attention given to disclosure issues, by the financial literature as well as by companies, supervisory authorities and other companies' stakeholders, has strongly increased. Cooke (1989), Botosan (1997) and a wide subsequent literature investigate disclosure practices, its determinants and its consequences, by non-financial companies; other research papers focus on the banking system (i.e. Baumann and Nier 2004; Linsley and Shrives, 2005); Horing and Grundl (2011) start to address this issues looking at the insurance industry. In addition to this increase in the scientific production about disclosure, especially in recent years, companies themselves have started to recognize the importance of disclosure and several regulatory initiatives have sought to enhance the level and the quality of disclosure by financial intermediaries and insurance companies, too[1], and, thus, satisfy the need of transparency of investors and financial markets. Moreover, the recent turmoil in world financial markets, in particular since 2008, has outlined the importance of enhancing communication with the entire financial community.

Disclosure can be defined as the act of releasing all relevant information pertaining to a company that may influence an investment decision; it refers *to reveal to knowledge, to free from secrecy or ignorance, or make known* (Lanam, 2007). As observed by Beretta (2007), while in the past companies limited to communicate through mandatory documents (i.e. balance sheets and interim reports) and considered discretion as a value to defend, today firms compete also through the dissemination of information and it also allows to solve the asymmetric information problem between principal and agent. The annual report, in particular, is increasingly perceived by companies as a communication tool towards stakeholders, in addition to its main function of reporting their financial and economic condition; it is used to announce important positive results, to manifest core values, to reassure stakeholders in difficult financial times; for stakeholders, it is necessary to make sound decisions, and primarily regulators, shareholders and customers are interested in its content. Companies are aware of the crucial role assumed by disclosure, it could be beneficial but costly as well, it requires investment and expertise; thus, the choice is no longer disclosing or not, but strategically deciding when, how and what to communicate.

The existing literature has widely debated disclosure issues by non-financial companies (i.e. Botosan, 1997; Ho and Wong, 2001; Beretta and Bozzolan, 2004; Linsley and Shrives, 2006). A few literature pays attention to disclosure practices by banks (i.e. Baumann and Nier, 2004; Perignon and Smith, 2008) and insurance companies (i.e. Horing and Grundl, 2011). Moreover, starting from the assumption that disclosure does not require only the dissemination of a set of information but this information has to be understandable by the audience, an emerging stream of literature (i.e. Lanam, 2007; Linsley and Lawrence, 2007) investigates the readability of the documents, from the consumers' point of view.

[1] The third pillar of Solvency II requires European insurers to disclose financial information publicly through the reporting from insurance undertakings to their supervisors (*supervisory reporting*) and the disclosure of information by undertakings to the public (*public disclosure*).

This research is part of the emerging literature on disclosure practices by financial companies. It revisits themes just widely developed for non-financial firms, looking at the European insurance industry. More precisely, it aims to investigate disclosure practices by a sample of 47 European insurance companies, over the 2005-2010 time period.

This paper has three main goals. First of all, it investigates the quality of disclosure, through the analysis of the readability and the richness in vocabulary of the annual reports of the sample insurers, and the first research question to answer is: *i) Are annual reports of European insurers easy to read and understandable by stakeholders?* Secondly, it focuses on the quantity of disclosure, it investigates disclosure practices by European insurers, through the construction of a risk disclosure index, and it tries to answer a second research question: *ii) What is the level of risk disclosure by European insurance companies?* The last purpose concerns the identification of the determinants of risk disclosure practices by the sample insurers and the third research question is the following: *iii) How do insurers' characteristics affect the level of risk disclosure in the annual reports of European insurers?* Regarding the last point, the analysis also aims to identify the role of the accounting techniques during the current financial crisis and its impact on risk disclosure practices.

The main results show that the annual reports are difficult to read; it is not documented an effort by companies to enhance their understandability, as readability levels are quite constant over time, thus a problem of readability raises. The level of risk disclosure has increased over time, with a stronger growth between 2008 and 2010. There is no significant relationship between the quality and the quantity of disclosure. Finally, the analysis also shows that insurers' characteristics, in terms of size, profitability, reserve, as well as risk, home country and the financial crisis, significantly affect the amount of risk information disclosed.

This paper tries to contribute to the existing literature in four ways. First, it aims to fill a gap in the literature about disclosure practices, that is still emerging if we look at the insurance industry. Second, a new index is introduced to measure the level of risk disclosure in the annual reports, it is specifically built for the insurance industry and applied to the annual reports of insurers, following the rules for content analysis. Third, it tests the potential effects of the current financial crisis on disclosure practices. To our knowledge, there are no papers that links the financial crisis to disclosure in the European insurance industry. Finally, this paper represents the first attempt to provide a complete view of disclosure practices in the insurance industry. In fact, this paper is close to Horing and Grundl (2011) that analyze the relationship between risk disclosure levels and insurers' characteristics, but it provides two different criteria for measuring disclosure, one for qualitative disclosure (seven readability indices), one for qualitative disclosure (two risk disclosure indices). In this way, we jointly analyze quality and quantity issues, first individually and then comparing them, and, to the best of our knowledge, this approach is an innovation compared to the existing literature.

The remainder of the paper is organized as follows. Section 2 identifies the streams of the literature close to this research and develops the hypotheses to test. Section 3 describes the methodology. Section 4 focuses on sample and variables description. Section 5 provides and

discusses the empirical results. Section 6 contains the conclusions and two final appendices conclude the paper.

2. Literature Review

Most of the existing literature in the field of disclosure concerns non-financial companies, whereas few and recent studies pay attention to disclosure practices by banks and insurance companies during the financial crisis This research fits into the emerging stream of the literature that investigates disclosure practices by insurance companies; it focuses on its readability, on risk disclosure level and its determinants. Thus, the literature summarized below distinguishes between qualitative disclosure, quantitative disclosure and the determinants of disclosure levels.

2.1 Disclosure practices: the duality between quality and quantity

If consumers receive information and are able to read and understand them, they are also able to make optimal decisions in the interest of themselves and of the whole financial system (Cude, 2008). Price ignorance and a lack of effective price competition bring policyholders to pay more than necessary for their insurance protection, thus a rigorous system of price disclosure is necessary to permit buyers to make reasonably informed purchase decisions (Belth, 1968) and understand well what are doing (Belth, 1976). Starting from these observations, several papers in this field of research analyze the readability of the documents, from the consumers' point of view.

The starting point for an effective disclosure is understanding that the intended audience is the consumer; as a consequence, a good disclosure has to incorporate *"simpler and more common, non-legal language"* and *"concrete rather than abstract information"*. When presenting complex information, *"less is more"* (Lanam, 2007). In spite of that, the effectiveness of insurance products and price disclosures have not been evaluated for more than twenty years, while product designs have become more complicated (Kirsch, 2003) and risk disclosure is found difficult or very difficult to read (Linsley e Lawrence, 2007).

Linsley and Lawrence (2007) examine risk disclosures by UK companies within their annual reports, through the content analysis methodology, finding that the readability of the risk disclosures is difficult or very difficult; however, no evidence is found to suggest a potential obfuscation of the information by directors. Cude (2008) reports the results of three focus groups, where the participants were submitted 3 documents, 3 examples of insurance disclosure. This study documents that: there are no differences in understanding disclosure by gender, age, or ethnicity; some participants state they generally do not read the disclosure, but they would read it if the main information appear immediately and the document is short and readable.

In line with this stream of the literature, this research investigates the readability and the richness in vocabulary for the 2005-2010 annual reports disclosed by European insurers. It is expected that the annual report is quite difficult to read, because the description of the insurer's activity requires a complex vocabulary, and that it has become easier to read over time, consistent with the increasing importance that companies give to this document, seen as a tool to communicate with stakeholders

(i.e. regulators, practitioners, customers). Thus, the first and the second hypotheses to test are the following:

H_1: The readability level of the annual reports of European insurers is low, but it increases over the 2005-2010 time period.

H_2: The richness in the vocabulary of the annual reports of European insurers decreases over the 2005-2010 time period.

The existing literature measures the level of disclosure through a self-constructed disclosure index (Cooke, 1989; Cooke, 1992; Cooke, 1993; Botosan, 1997; Adams and Hossain, 1998; Ho and Wong, 2001; Camffermann and Cooke, 2002; Beretta and Bozzolan, 2004; Baumann and Nier, 2004; Barako et al., 2006; Hirtle, 2007; Francis et al., 2007; Beretta and Bozzolan, 2008; Beuselinck et al., 2008; Perignon and Smith, 2008; Horing and Grundl, 2011). A disclosure index is an ex ante specified list of items; in this process, the documents are analyzed in order to evaluate the presence of these items and, based on the presence and the quality of each information, a score is assigned to each of them (Horing and Grundl, 2011). Botosan (1997) constructs a disclosure index based on five categories of voluntary information that firms provided in their annual reports in 1990; Beuselinck et al. (2008) find a significant increase of financial disclosure from the private equity investment year onward and no evidence in the years preceding the private equity financing; Baumann and Nier (2004) build an index for measuring disclosure in the banking system; the index presented by Horing and Grundl (2011) measures the extent of risk disclosure by insurance companies.

A relatively large number of studies focus, in particular, on risk disclosure practices and the results reported are quite controversial. In most of the cases, risk disclosure in the annual reports is found increased over time (Lajili and Zeghal, 2005; Perignon and Smith, 2008; van Oorschot, 2010) and accounting and policy are the most disclosed matters (Linsley and Shrives, 2005). Risk disclosure practices are difficult to compare (Oliveira et al., 2011), banks do not yet provide full risk disclosure and managers could be reluctant to provide too much information not to be judged and not to give advantages to competitors (Linsley and Shrives, 2005). Operational risk disclosure varies across institutions, is descriptive and qualitative (Sundmacher, 2006); it increased in both extent and content and is inversely related to equity ratio and ROA (Helbok and Wagner, 2005).

In contrast, other studies find that firms provide little or no information about risks (Abraham et al., 2007); risk disclosure, even when in depth, is little useful and clear, thus suggesting the need for a more comprehensive disclosure (Lajili and Zeghal, 2005) and the quality is not increasing (Perignon and Smith, 2008). Deumes (2008) finds that risk disclosure quantity predicts the volatility of companies' stock prices, the sensitivity of stock prices to market fluctuations and decline in stock prices.

This research investigates risk disclosure practices by European insurance companies, through the construction of a risk disclosure index for insurers, over a multiyear period as European insurance industry represents a disclosure pattern according to the research of Chavent et al.

(2006)[2]. Consistent with part of the literature, it is expected that both external and internal factors have brought insurers to increase their risk disclosure levels over time (as found by Helbok and Wagner, 2005; Lajili and Zeghal, 2005; Perignon and Smith, 2008; van Oorschot, 2010; Horing and Grundl, 2011). Thus, the third hypothesis to test is the following:

H_3: The level of risk disclosure in the annual reports of European insurers increases over the 2005-2010 time period.

2.2 Determinants of disclosure practices

An evolution of the last field of the literature summarized above does not limit to test the level of disclosure, but it tries to identify the factors that could explain a higher or lower disclosure level. This literature observes that the amount of information disclosed by companies may be affected by, for example, companies' characteristics (Cooke, 1992, 1993; Beretta and Bozzolan, 2004; Linsley and Shrives, 2006; Horing and Grundl, 2011), governance characteristics and ownership structure (Ho and Wong, 2001; Abraham and Cox, 2007), in developed as in emerging markets (Barako et al., 2006).

The level of risk disclosure is found positively associated with company size and environmental risk (Linsley and Shrives, 2006); corporate risk reporting is related positively to the number of executive and independent directors, negatively with the amount of shares owned by long-term institutions, thus institutional investors prefer firms with a lower level of risk disclosure (Abraham and Cox, 2007). Similar results are found in a developing country like Kenya where Barako et al. (2006) observe that the extent of voluntary disclosure is influenced by corporate governance, ownership structure and company characteristics. Risk disclosure quantity is not significantly influenced either by size, industry and performance (Beretta and Bozzolan, 2004; van Oorschot, 2010). Recent papers by Horing and Grundl (2011) and Hail (2011) explore risk disclosure practices in the insurance industry. Horing and Grundl (2011) find that the importance of risk disclosure increased over time, that bigger and more risky insurers show high risk disclosure and disclosure reduces insurers' profitability. Hail (2011) investigates the voluntary disclosure of the Embedded Value (EV) and finds that, even if expensive and not required, more and more companies provide the EV disclosure and this results into a lower information asymmetry.

Within this field of the literature, after measuring risk disclosure levels by insurers, the final aim of this paper is to identify their determinants, in particular the relationship between risk disclosure levels and insurers' characteristics. We expect that bigger insurers, in terms of sales, and insurers with high performance levels disclose more information about risk (as in Beretta and Bozzolan, 2004; Linsley and Shrives, 2006; Horing and Grundl, 2011); that the amount of reserve negatively affects risk disclosure levels and that the choices about the amount of information to disclose depend on the type of insurance activity (similar to Horing and Grundl, 2011). Thus, the fourth hypothesis (and its sub-hypotheses) to test is the following:

[2] Chavent et al. (2006) propose a new methodological approach to analyze non-financial firms' disclosure practices: they identify the disclosure patterns through a divisive (descendant) clustering method. According to this method disclosure patterns are related to provision intensity, size, leverage and market expectation, but not to profit, return and industry.

H_4: The level of risk disclosure depends on insurers' characteristics.

H_4(a): High sales are associated with high risk disclosure levels.

H_4(b): High return on assets is associated with high risk disclosure levels.

H_4(c): High reserve is associated with low risk disclosure levels.

H_4(d): The level of risk disclosure depends on the type of insurance activity.

2.3 Effects of financial crisis on disclosure practices

The recent financial crisis has raised several questions with respect to the disclosure practices by financial institutions. However, the literature on the effect of this "financial tsunami" for financial firms is still very limited because some papers focus on the role of the fair value accounting in the financial crisis. For example, Barth and Landsman (2010) investigate the relation between financial crisis and financial reporting for fair values, asset securitization, derivatives and loan loss provisioning of banks. Most importantly, they find fair value accounting played little or no role in the financial crisis. To fill the gap of the existing literature about disclosure issues and the implications of the financial crisis, this paper provides the first evidence on the link between financial crisis and risk disclosure practices by insurance companies thereby recognizing the specific features of this industry. Thus, the fifth hypothesis to test is the following:

H_5: The level of risk disclosure increases/decreases during the financial crisis.

3. Methodology

3.1 Qualitative disclosure versus quantitative disclosure

The level of disclosure is measured through the content analysis methodology, a research technique for the objective, systematic and quantitative description of the manifest content of communication (Berelson, 1952). It is also defined as a research technique for making replicable and valid inferences from texts, or other meaningful matters - art, images, maps, sounds, signs, symbols - to the contexts of their use (Krippendorff, 2004). It involves specialized procedures and increases researcher's understanding of particular phenomena, that otherwise could not be studied.

Moreover, it represents the main technique adopted by the existing literature in this field (i.e. Baumann and Nier, 2004; Sundmacher, 2006; Linsley and Shrives, 2006; Horing and Grundl, 2011).

This methodology is introduced in this research in two different ways and the aim is twofold: measuring both the quality and the quantity of disclosure provided by insurance companies in their annual reports, and then comparing these two measures. To this scope, two different approaches are proposed:

1. *Qualitative disclosure*. First of all, we measure the readability and the richness of the vocabulary of the annual reports of the sample companies, through the introduction of specific indices and through the support of a proper software for text analysis.
2. *Quantitative disclosure*. Second, we measure the level of disclosure in the annual reports of the sample companies, through the construction of a risk disclosure index for insurers, that requires a careful reading of risk information disclosed in the different sections of each report.

Qualitative disclosure.

In order to measure the quality of disclosure of the annual reports of European insurers and test the first two hypotheses (H_1 and H_2) presented in section 2, a set of qualitative disclosure indices is calculated for each annual report collected. Table 1 reports a list of these indices and, for each of them, it provides a brief description.

Through mathematical formulas that take into account the number of characters, words, sentences, syllables, types and tokens composing the document, these indices express the ease of reading of the text and thus allow to obtain a quantitative measure of the readability of each document and the richness of its vocabulary[3]. This kind of analysis has to be necessarily supported by the use of at least a software, that provides statistics from a text. In this research, software *QDA Miner*[4] and *Wordstat*[5] are used.

[3] In order to ensure the validity of the results, each document should be at least 300 words long.

[4] *QDA Miner* is a qualitative data analysis software package for coding, annotating, retrieving and analyzing small and large collections of documents and images; it allows to analyze interview or focus group transcripts, legal documents, journal articles, speeches, even entire books, as well as drawings, photographs, paintings, and other types of visual documents.

[5] *Wordstat* is a text analysis software, integrated to *QDA Miner*, for analyzing text and relating its content to structured information, including numerical and categorical data.

Table 1

Qualitative Disclosure

This table reports a list of the indices chosen to measure the quality of disclosure in the annual reports of the sample companies. For each index, it provides a brief description. The first five indices measure the readability of the documents and, as a result, indicate the ease of reading or the grade level required to read and understand the text. The last two indices measure the richness of the vocabulary, based on its variety and words' frequency. See Appendix A for details about the formulas and the interpretation of these indices.

Qualitative Disclosure Indices		Description
Readability Indices		
(1)	*Gunning's Fog Index*	grade level necessary to understand a text
(2)	*Flesch Index*	ease of reading of a text
(3)	*Kincaid Index*	grade level necessary to understand a text
(4)	*Coleman-Liau Index*	grade level necessary to understand a text
(5)	*Automated Readability Index*	grade level necessary to understand a text
Richness Indices		
(6)	*Type/Token Ratio (TTR)*	variety of the text vocabulary
(7)	*Hapax Index*	number of words with frequency=1

Quantitative disclosure.

In order to test the third hypothesis (H_3) presented in section 2, the quantity of disclosure is measured through the construction of a disclosure index. This process consists in the analysis of the content of the documents in order to evaluate the presence of an ex ante specified list of items and, based on the presence and the quality of each information, a score is assigned to each of them.

In this paper, the focus is on risk disclosure practices (as in Beretta and Bozzolan, 2004; Helbok and Wagner, 2005; Lajili and Zeghal, 2005; Linsley and Shrives, 2005; Barako et al., 2006; Linsley and Shrives, 2006; Sundmacher, 2006; Abraham and Cox, 2007; Abraham et al., 2007; Perignon and Smith, 2008; Deumes, 2008; van Oorschot, 2010; Hail, 2011; Horing and Grundl, 2011; Oliveira et al., 2011) because risk management is a crucial activity and a source of value creation for financial intermediaries, that can be defined as risk-taking enterprises, thus it is expected to disclose risk-related information.

Moreover, the global financial crisis, which took hold in the third quarter of 2008, has left important challenges to face for insurance companies, that resulted in an increased need for capital and a stronger attention to risk management activities.

To this scope, a content analysis approach is implemented to measure the amount of risk information provided by the sample firms in their annual reports, over the 2005-2010 time period, and a *Risk Disclosure Index for Insurers (RDII)* is obtained. The mathematical formula is:

$$RDII_{i,t} = \sum_{j=1}^{30} Score_j \qquad (8)$$

where i represents the company, t is the year the annual report refers to, j indicates each item included in the index. Thus, the value of the index, for each company i for the year t, is obtained as the sum of the scores (*Score*) assigned to each item j.

It can be standardized as follows:

$$RDII_{i,t} = \left(\frac{\sum_{j=1}^{30} Score_j}{Max\ score} \right)_{i,t} \times 100 = \frac{Total\ score_{i,t}}{Maximum\ possible\ score} \times 100 \qquad (9)$$

The items included in the *RDII* are selected looking at the literature (Botosan, 1997; Baumann and Nier, 2004; Horing and Grundl, 2011), taking into account the peculiarities of the insurance companies and checking for IFRS requirements in order to focus on information different from those required. The 30 items are organized into seven areas:

- risk management (4 items),
- underwriting risk (4 items),
- market risk (4 items),
- credit risk (4 items),
- operational risk (4 items),
- liquidity risk (4 items),
- other risks (6 items).

Each item is assigned a score between "0" and "2": "0" when there is no disclosure, "1" when the information is provided in a basic way, "2" when the information is provided in an extensive way (Table 2). In addition, the total score is calculated also assigning each item a score between "0" and "4"; it allows to better express the judge but it implies more subjectivity by the researcher. The maximum possible score is equal to 38 (if the range is 0-2) or 54 (if the range is 0-4). The value of the standardized *RDII* ranges between 0 and 100, with 0 reflecting the worst risk disclosure practices and 100 representing the best risk disclosure practices.

See Appendix B for details about the items and the potential scores assigned.

Table 2

Quantitative Disclosure

This table contains some information about the *Risk Disclosure Index for Insurers (RDII)*, constructed in order to measure the amount of risk disclosure in the annual reports of the sample companies. See Appendix B for details about the items and the scores.

Risk Disclosure Index for Insurers (RDII)				
Label	**Description**	**Range**	**Lowest**	**Highest**
RDII_02	- is composed of 30 items; - each item is assigned a score between 0 and 2.	0-38	0	38
RDII_04	- is composed of 30 items; - each item is assigned a score between 0 and 4.	0-54	0	54

3.2 Determinants of risk disclosure practices

In order to test the fourth (H_4) and the fifth (H_5) hypotheses presented in section 2, a basic model (10) estimates the relationship between risk disclosure levels and insurers' characteristics, as follows:

$$RDII_{i,t} = \alpha + \beta_1 SALES_{i,t} + \beta_2 ROA_{i,t} + \beta_3 RESERVE_{i,t} + \beta_4 TYPE + \sum_{j=1}^{n} \beta_j CONTROL_{i,t} \qquad (10)$$

where *i (i=1,…,231)* represents the insurance company, *t (t=2005,…,2010)* identifies each year over the time period investigated, *j (j=1,…,n)* is the number of control variables.

We estimate an OLS regression and we are particularly interested in the impact of insurers' characteristics, represented by the logarithm of sales (*SALES*), the return on assets (*ROA*), the weight of reserves on total liabilities (*RESERVE*) and the type of prevalent insurance activity (*TYPE*) on risk disclosure levels by the sample companies. We also control (*CONTROL*) for the ratio between equity and market capitalization (*RISK*), the logarithm of the price (*PRICE*) and a set of dummy variables that refer to the country where the company has its legal base (*HOME*), the year the annual report refers to (*YEAR*) and the financial crisis (*CRISIS*)[6].

4. Sample and data

This research makes use of a unique dataset containing several information on a sample of European insurance companies. This dataset provides information on disclosure practices and companies' characteristics for 47 insurance companies operating across Europe and referred to the 2005-2010 time period.

The sample selection process is summarized in Table 3. We start from considering all the companies included in the *STOXX® All Europe TMI*[7], that at the time when the sample has been selected was equal to 1,517. Then, consistent with the purpose of this research, non-financial companies and financial companies not operating in the insurance industry are dropped from the sample, leading to an initial sample of 52 companies. Five of these firms are further dropped because the annual reports are not available. This process yields to a final sample of 47 insurance companies and 279 annual reports available over a six-year period.

Data are taken from companies' annual reports and balance sheets, referred to the 2005-2010 time period and available on their websites in the Investor Relations section.

[6] There may be other factors that influence the effect of risk disclosure (i.e. governance characteristics), but that we do not take into account at this stage of the research, due to the time consuming process of data collection and coding.

[7] The *STOXX® All Europe TMI* represents the Western and Eastern Europe region as a whole, covering approximately 95 percent of the free float market capitalization of European companies with a variable number of components (see www.stoxx.com website). This index includes companies operating in nineteen different sectors: Automobiles & Parts (34 companies), Banks (134), Basic resources (86), Chemicals (48), Construction & Materials (90), Financial Services (78), Food & Beverages (75), Healthcare (81), Industrial Goods & Services (244), Insurance (52), Media (52), Oil & Gas (88), Personal & Household Goods (73), Real Estate (70), Retail (69), Technology (65), Telecommunications (43), Travel & Leisure (56), Utilities (79).

Table 3

Sample selection process

This table describes the sample selection process. Starting from the companies included in the *STOXX® All Europe TMI*, non-financial companies and financial companies not operating in the insurance industry were eliminated. The initial sample is composed of 52 companies; further five of them are dropped because the reports are not available, yielding to a final sample of 47 insurers.

Sample selection process	**Number**
Companies included in the *STOXX® All Europe TMI*	1,517
Less:	
Non-financial companies	(1,253)
Financial companies not operating in the insurance industry	(212)
Insurance companies included in the *STOXX® All Europe TMI*	52
Companies dropped out because of no availability of annual reports	-5
Final sample	47

The annual report is one of the multiple channels through which companies communicate with their stakeholders[8]; in support of this choice, literature shows that it is the main disclosure vehicle (Marston and Shrives, 1991) and is an influential source of information because of its wide coverage and availability (Beretta and Bozzolan, 2004) and annual report disclosure levels are positively correlated with the amount of corporate disclosure provided via other media (Lang and Lundholm, 1993).

Table 4 describes the variables employed to investigate the phenomenon and provides some descriptive statistics. For each firm, we follow two criteria to measure disclosure practices, one for measuring the quality and one for measuring the quantity of disclosure. Further, for each company we construct several firm specific variables.

Table 4

Summary of variables

This table contains a description of the variables included in the analysis and reports some descriptive statistics: mean, standard deviation, minimum, median and maximum.

Variable	**Description**	**Descriptive statistics**					
		Mean	**St.Dev.**	**Min.**	**Median**	**Max.**	**Obs.**
Qualitative disclosure							
$READ1_{it}$	is the first measure (1) of the readability of the annual report for the year *t* by the insurer *i*	18.33	2.45	11.26	18.20	27.51	251
$READ2_{it}$	is the second measure (2) of the readability of the annual report for the year *t* by the insurer *i*	31.08	11.19	0.28	31.21	61.88	251
$READ3_{it}$	is the third measure (3) of the readability of the annual report for the year *t* by the insurer *i*	15.51	2.03	9.16	15.61	23.96	251
$READ4_{it}$	is the fourth measure (4) of the readability of the annual report for the year *t* by the insurer *i*	14.33	2.22	8.35	14.24	20.72	251

[8] Companies provide information through their annual reports, that are periodically published; can also send communication to the analysts or the market, when particular events occur. Information about the companies may come from external parties, too (i.e. financial analysts, rating agencies, supervisory authorities).

$READ5_{it}$	is the fifth measure (5) of the readability of the annual report for the year *t* by the insurer *i*	15.91	2.47	5.57	15.96	27.03	251
$READ6_{it}$	is the sixth measure (6) of the readability of the annual report for the year *t* by the insurer *i*	0.07	0.04	0.03	0.07	0.50	251
$READ7_{it}$	is the seventh measure (7) of the readability of the annual report for the year *t* by the insurer *i*	0.03	0.03	0.01	0.02	0.34	251
Quantitative disclosure							
$RDII\_02_{it}$	is the risk disclosure index for insurers assigned to the insurer *i* and referred to the annual report for the year *t* (range 0-2)	21.93	6.42	2	23	35	279
$RDII\_04_{it}$	is the risk disclosure index for insurers assigned to the insurer *i* and referred to the annual report for the year *t* (range 0-4)	26.52	8.37	2	28	45	279
Insurers' characteristics							
$SALES_{it}$	is the amount of sales, as in the balance sheet of the firm *i* for the year *t*	8.94	1.58	5.36	8.89	11.72	231
ROA_{it}	is the ratio between operating income and total assets of the firm *i* for the year *t*	0.03	0.04	<0.00	0.01	0.21	231
$RESERVE_{it}$	is the ratio between reserves and total liabilities of the firm *i* for the year *t*	0.78	0.16	0.15	0.84	0.97	231
$TYPE_i$	2 dummies capturing the type of the insurance activity	-	-	-	-	-	231
$RISK_{it}$	is the ratio between total equity and market capitalization of the firm *i* for the year *t*	0.94	0.58	0.08	0.85	4.12	231
$PRICE_{ij}$	is the logarithm of price of the firm *i* for the year *t*	3.61	1.63	-1.08	3.58	7.06	225
HOME1	13 dummies capturing the home country of each insurer	-	-	-	-	-	231
HOME2	3 dummies capturing three geographic areas in Europe	-	-	-	-	-	231
YEAR	6 dummies capturing the year data	-	-	-	-	-	231
Financial crisis							
CRISIS	is a dummy variable equal to 1 for the years 2008, 2009 and 2010, 0 otherwise	-	-	-	-	-	231

5. Results

5.1 Univariate analysis: quality and quantity of disclosure

The first two purposes of this paper concern investigating the readability of the annual reports and risk disclosure levels by the sample insurers. Table 5 reports descriptive statistics of the readability and richness indices (quality of disclosure), referred to the time period 2005-2010. Table 6 shows descriptive statistics for the risk disclosure level (quantity of disclosure) assigned to the sample insurers; statistics are provided both for the index based on the range 0-2 (*RDII_02*) and for the index based on the range 0-4 (*RDII_04*).

Are annual reports of European insurers easy to read and understandable by stakeholders?

The results show that, in order to read and understand the text of the annual report, it is required a grade level, on average and for the whole time horizon, equal to 18.33 for the index (1), 15.51 for the index (3), 14.33 for the index (4), 15.91 for the index (5). If we consider that documents, in

general, are considered understandable for readability levels in the 14^{th}-15^{th}-18^{th} grade[9], it is possible to state that the annual reports published by European insurers on their websites between 2005 and 2010 appear difficult to read (Table 5). The values reported in each single year over the 2005-2010 time period are very near to the average values. Thus, the first hypothesis (H_1) formulated in the section 2 is only partially confirmed by results: annual reports' readability is low, but, contrary to the expectations, it is quite the same over the six-year time horizon; it seems that there was not a commitment by companies to make documents easier to read over time.

It means that documents are difficult or very difficult to read, the number of school years required to read and understand the reports of the sample insurers is very high and the reader should be at least a university student to understand them; thus, there could be a lack of reading maybe due to a writing problem. More precisely, it could be stated that reports result difficult to read by consumers with no financial expertise, but it does not deny that its content is understandable by more financially educated readers (i.e. authorities, competitors, employees, shareholders). In part this high education level required could be explained if we consider that, in order to describe the activity of a financial intermediary, it is necessary to use complex words, long and complex sentences, that require a financial background to the reader. But, at the same time, if they do not read or do not understand, stakeholders are not able to monitor, punishing or rewarding companies according to what is disclosed. Moreover, if consumer disclosure can be read as consumer protection (Lanam, 2008), thus a difficult disclosure results into a reduced protection for consumers and could be also seen as a voluntary choice by companies that are forced to disclose but try to obfuscate the information they are not interested to show. Adopting a simple and understandable language should be a duty by companies towards the readers, especially for non-financial educated ones; it means to give stakeholders a tool to control and defend their interests and, at the same time, encourage responsible behavior and avoid excessive risk taking by insurers.

The results are confirmed looking at the index (2), that reports an average value of 31.08 and corresponds to a difficult readability level. The richness indices (6) and (7) show that 7% of the tokens are different and 3% of the words occur once but, contrary to the expectations, the richness does not decrease over time; thus, the hypothesis H_2 is not confirmed by results: these results do not document an attempt by companies to simplify the vocabulary used, underlying and confirming the observations above about the complexity of the text.

In order to test whether the low readability levels could be explained by a voluntary choice of directors to obfuscate the companies' results, we employ the test for obfuscation introduced by Courtis (1998, 2004) and proposed by Linsley and Lawrence (2007), too. It looks at the degree of variability of the Flesch Index scores in addition to measuring the mean, as high variability in levels of reading ease can impact on reading behavior as it irritates and distracts the reader.

In our research, the mean value of the Flesch Index is 31.08 and the coefficient of variation equal to 0.36. This analysis is also replicated distinctly for each company, showing that about 38% of the companies analyzed report a coefficient of variation higher than the mean, and, for seven

[9] It means that documents are expected to be readable by an average student in its fourteenth year of school, otherwise student of age around 19.

companies, it assumes values higher than 0.50, reaching the maximum of 0.88. Thus, for a significant portion of the sample companies, it is documented the presence of both high reading level and high variability, thus it is plausible the hypothesis of an obfuscation strategy by directors.

Table 5
Descriptive statistics of the Readability Indices

This table contains some descriptive statistics of readability and richness indices (quality of disclosure). The statistics are provided for each year over the 2005-2010 years and for the whole time period, for all the sample companies.

Variable	Year	Obs.	Mean	Stand.dev.	Minimum	Percentile			Maximum
						25%	50%	75%	
(1) *Gunning's Fog Index*									
	2005-2010	251	18.33	2.45	11.26	16.59	18.20	19.80	27.51
	2005	38	18.52	2.29	14.74	16.54	18.86	20.30	22.98
	2006	44	18.12	2.17	12.27	16.81	18.11	19.35	23.79
	2007	41	18.39	2.06	14.75	16.75	18.28	19.95	23.39
	2008	42	17.75	2.64	12.62	15.59	17.49	19.55	24.22
	2009	42	18.37	2.99	11.26	16.69	18.37	19.80	27.51
	2010	44	18.84	2.43	14.59	17.29	18.32	20.46	25.40
(2) *Flesch Index*									
	2005-2010	251	31.08	11.19	0.28	23.44	31.21	39.28	61.88
	2005	38	31.74	12.22	7.24	22.6	30.77	40.37	60.9
	2006	44	30.14	10.94	11.42	23.79	28.29	38.02	61.88
	2007	41	31.19	8.83	14.62	24.15	31.58	36.59	48.34
	2008	42	32.28	11.12	7.99	24.65	31.65	40.29	52.42
	2009	42	32	13.06	0.28	24.31	33.34	40.35	60.13
	2010	44	29.31	10.98	2.13	20.89	30.14	37.37	52.15
(3) *Kincaid Index*									
	2005-2010	251	15.51	2.03	9.16	14.11	15.61	16.93	23.96
	2005	38	15.44	2.21	11.7	13.57	15.59	17.25	19.75
	2006	44	15.59	1.89	10.34	14.31	15.77	16.64	19.69
	2007	41	15.44	1.57	12.19	14.26	15.51	16.51	18.23
	2008	42	15.3	1.96	10.71	13.95	15.37	16.93	19.21
	2009	42	15.45	2.65	9.16	14.11	15.19	16.61	23.96
	2010	44	15.8	1.82	12.62	14.24	15.82	17.17	20.02
(4) *Coleman-Liau Index*									
	2005-2010	251	14.33	2.22	8.35	13.06	14.24	16.01	20.72
	2005	38	14.52	2.17	8.94	13.06	14.83	16.01	18.95
	2006	44	14.57	2.08	8.35	13.36	14.83	16.01	18.36
	2007	41	14.31	14.31	9.53	13.06	14.24	16.01	17.77
	2008	42	14.13	2.43	8.35	13.06	14.24	15.42	19.54
	2009	42	14.18	2.25	8.94	13.06	14.24	15.42	20.72
	2010	44	14.25	2.51	8.35	12.47	14.24	16.3	18.95
(5) *Automated Readability Index*									
	2005-2010	251	15.91	2.47	5.57	14.29	15.96	17.46	27.03
	2005	38	16.11	2.51	11.17	13.95	16.15	17.83	21.63
	2006	44	16.01	2.12	10.18	15.09	16.27	17.15	20.63
	2007	41	15.79	2.05	9.97	14.54	15.98	17.15	20.47
	2008	42	15.68	2.56	10.48	13.89	15.72	17.74	21.67
	2009	42	15.94	3.25	5.57	14.29	15.76	17.18	27.03
	2010	44	15.93	2.29	11.23	14.08	15.77	17.45	20.56
(6) *Type/Token Ratio*									
	2005-2010	251	0.07	0.04	0.03	0.05	0.07	0.08	0.5
	2005	38	0.09	0.03	0.03	0.06	0.08	0.1	0.21
	2006	44	0.07	0.02	0.03	0.05	0.07	0.09	0.13
	2007	41	0.07	0.03	0.03	0.05	0.07	0.09	0.14
	2008	42	0.07	0.02	0.03	0.05	0.06	0.08	0.13
	2009	42	0.08	0.08	0.03	0.05	0.06	0.08	0.5
	2010	44	0.06	0.03	0.03	0.05	0.06	0.08	0.24
(7) *Hapax Index*									

2005-2010	251	0.03	0.03	0.01	0.02	0.02	0.03	0.34
2005	38	0.03	0.02	0.01	0.02	0.03	0.04	0.11
2006	44	0.03	0.01	0.01	0.02	0.03	0.03	0.06
2007	41	0.03	0.01	0.01	0.02	0.02	0.03	0.06
2008	42	0.02	0.01	0.01	0.02	0.02	0.03	0.06
2009	42	0.04	0.06	0.01	0.02	0.02	0.03	0.34
2010	44	0.02	0.02	0.01	0.02	0.02	0.03	0.12

What is the level of risk disclosure by European insurance companies?

The risk disclosure index for insurers (*RDII_02*), over the six-year period, assumes an average value of 21.93, with a minimum of 2 and a maximum of 35 (looking at the score 0-4, its average value is 26.52, minimum 2, maximum 45). These values show an increase over time, from 16.84 in 2005 to 24.81 in 2010. If we standardize these values based on the formula (9), we can observe (Table 6, column 5) that the average value of the index is the 0.58 per cent of the maximum value potentially assigned to this index (equal to 38), from 0.44 in 2005 to 0.65 in 2010. These severe scores are due both to the specificity of the items chosen and to a severe judge by the researcher when assigning the scores, so can be considered good disclosure scores.

The average score and its trend over time confirm the third hypothesis (H_3) presented in section 2. Thus, the level of risk disclosure in the annual reports of European insurers increased over the 2005-2010 time period. This increase is particularly strong if we switch from the years 2005-2007 to the years 2008-2010. The trend of risk disclosure levels shows that companies are enhancing the disclosure levels close to the implementation of Solvency 2; the new regulatory framework, thus, may incentive insurers to enhance disclosure, in order to be prepared for its implementation.

Table 6
Descriptive statistics of the RDII

This table contains descriptive statistics of the risk disclosure index for insurers (quantity of disclosure). The statistics are provided both for the score range 0-2 (*RDII_02*) and for the score range 0-4 (*RDII_04*), for each year and for the whole 2005-2010 time period, for all the sample companies.

Variable	Year	Obs.	Mean	%	Stand.dev.	Minimum	Percentile			Maximum
							25%	50%	75%	
(8) *RDII_02*: *Risk Disclosure Index – range 0-2*										
	2005-2010	279	21.93	0.58	6.42	2	20	23	26	35
	2005	45	16.84	0.44	7.45	2	13	20	22	28
	2006	47	19.28	0.51	6.78	2	17	21	25	27
	2007	47	21.94	0.58	6.39	2	19	24	26	30
	2008	47	24.17	0.64	4.17	13	21	25	28	33
	2009	46	24.37	0.64	5.05	4	22	25.5	28	35
	2010	47	24.81	0.65	3.84	14	22	25	27	31
(9) *RDII_04*: *Risk Disclosure Index – range 0-4*										
	2005-2010	279	26.52	0.49	8.37	2	22	28	32	45
	2005	45	20.24	0.37	9.01	2	15	23	26	35
	2006	47	22.98	0.43	8.60	2	19	25	30	35
	2007	47	26.40	0.49	8.14	2	23	29	32	38
	2008	47	29.09	0.54	6.20	14	24	31	34	44
	2009	46	29.72	0.55	7.09	4	27	30.5	34	45
	2010	47	30.47	0.56	5.77	14	27	31	35	40

Moreover, the stronger increase between 2008 and 2010 shows that the recent financial crisis, started in 2007 and exploded in 2008, could be an external factor that affects the disclosure choices

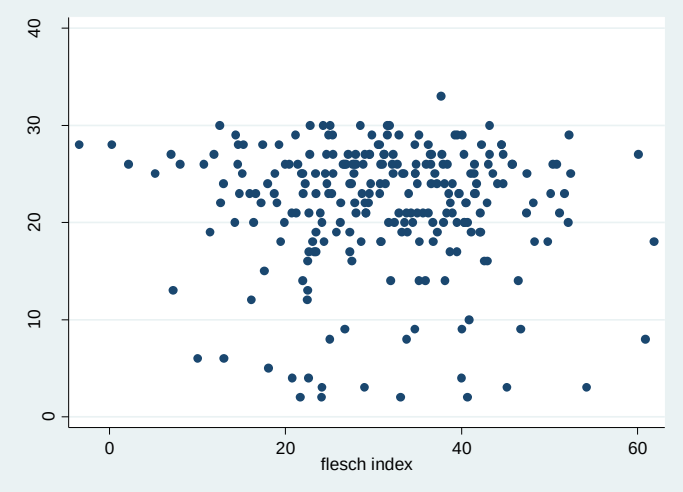
by companies[10], because disclosure is a tool to reassure stakeholders that the company is aware of the crisis, to show the measures adopted and how the performance has been affected.

Comparing qualitative and quantitative disclosure.

In order to compare qualitative and quantitative disclosure, we observe the pairwise correlation between the Flesch Index (2) and the risk disclosure index (RDII_02). The results show a correlation coefficient of -0.04 (p-value=0.56). Thus, it seems that no significant relationship exists between quality and quantity of disclosure; the decisions assumed by companies about the readability of the documents and the amount of risk information disclosed seem to follow different channels.

Two further checks are provided and confirm this observation. In fact, the twoway scatter plot between the Flesch Index (2) and the risk disclosure index (8) shows that there is a non-linear relationship between the two measures of qualitative and quantitative disclosure (Figure 1).

Figure 1
Scatter plot between Flesch Index and RDII_02



Moreover, when it is not obvious which variable causes which (and the variables analyzed do not refer to different time periods), the Granger test can be implemented (Foresti, 2006; Casu and Girardone, 2009). Considering the regression:

$$Y_t = \alpha + \phi_1 Y_{t-1} + \beta_1 X_{t-1} + \varepsilon_t \quad (11)$$

it is possible to state that x "Granger causes" y if past values of x can help to explain y (it is not a guarantee, but it might be), thus if its coefficient is statistically significant.

In this paper the Granger causality test is implemented in order to check whether the readability level might cause the risk disclosure level, and viceversa. After controlling that the two variables

[10] In support of this observation, looking at the reports published during the years 2007-2010, a lot of pages are dedicated to the financial crisis: i.e. the CEO, in its introductory letter to shareholders, often talks about the crisis; companies usually discuss about how they have faced or overcome the crisis, in other cases they declare the losses suffered. Thus, the strategy adopted by most of the companies in their disclosure is not ignoring the crisis, but talking about it, showing an awareness of the crisis and the strategies assumed by the companies to face it.

are stationary (through the Dickey-Fuller test), if β_1 is statistically significant, we conclude that x Granger causes y.

Table 7
Results from the Granger causality test
This table reports the results of the Granger causality test. The first two columns test if the Flesch Index "Granger causes" the disclosure level. The last two column test if the disclosure level "Granger causes" the Flesch Index. *, **, *** indicate the significance level of coefficient, respectively at 0.01, 0.05 and 0.10.

Granger Causality test			
Dependent variable: DII_02	Coeff.	Dependent variable: READ1	Coeff.
DII_02 (lag1)	0.74***	READ1 (lag1)	0.07
READ1 (lag1)	-0.03	DII_02 (lag1)	-0.08

The results show that the readability index does not Granger cause the risk disclosure level and viceversa, too, confirming that no causal relationship is documented between quality and quantity.

5.2 Multivariate analysis

As third purpose, this paper tries to identify the determinants of risk disclosure practices by European insurers, thus the factors that could explain a higher or lower risk disclosure level. The focus is on the impact of insurers' characteristics on risk disclosure levels, also looking at the effects of the financial crisis. First, we run two specifications of the basic "model 1" (Eq. 10) that does not take into account the impact of the financial crisis (Table 8, columns 1 and 2). Second, we replace the year dummies with the crisis dummy in order to estimate the effect of the financial crisis on disclosure practices (Table 9, columns 1 and 2).

How do insurers' characteristics affect risk disclosure levels by European insurers?

Table 8 reports the results of the basic model (10) that investigates the determinants of risk disclosure practices by insurance companies.

The results (Table 8, column 1) show that the *SALES* coefficient is positive and highly statistical significant, confirming the hypothesis $H_4(a)$: an increase of one unit in *SALES* determines an increase of 0.86 (about one point score) in the level of *RDII_02*. In line with previous literature (Cooke, 1989, 1992, 1993; Ahmed and Courtis, 1999; Linsley and Shrives, 2006) a higher size of the insurance company is associated with an increase in the amount of risk information disclosed. It means that, when become bigger, insurers disclose more information maybe because the variety and the influence of stakeholders is high; they are more in the public eye and receive pressures for adequate levels of disclosure; but also because the higher size allows to manage more money, resources and skills for disclosure aims. On the contrary, when the size is reduced, stakeholders have a limited influence, and, above all, disclosure is mainly perceived as a cost, so investment in disclosure decreases.

Table 8

Regression results

This table reports the results of the regression (10) that investigates the determinants of risk disclosure practices by the sample companies. Variables are described in Table 4. *, **, *** denote significance levels at 10%, 5%, 1%. Standard errors are reported in parenthesis.

Dep.Var.: RDII_02	Model 1	
	coeff.	coeff.
SALES	0.858**	1.390***
	(0.253)	(0.232)
ROA	-21.550**	-21.528**
	(9.314)	(10.662)
RESERVE	-3.262*	-3.328*
	(1.751)	(1.858)
TYPE	-0.831	0.491
	(0.715)	(0.635)
RISK	-0.788	-0.923*
	(0.531)	(0.541)
PRICE		-0.210
		(0.213)
HOME1	Yes	
HOME2-north		1.303**
		(0.631)
HOME2-south		-4.001***
		(0.806)
YEAR dummies	Yes	
Constant	10.940**	9.984***
	(2.999)	(3.096)
Observations	231	225
R-squared	0.6899	0.5399

A higher level of *ROA* negatively (and significantly) impact on the amount of risk information disclosed, not confirming the hypothesis $H_4(b)$: in presence of a high performance by the insurer during the year, the investment in risk disclosure is reduced. In contrast with the literature that documents no effects or positive effects (Ahmed and Courtis, 1999) of the level of profitability on the extent of disclosure, these results show that when the performance is good, companies disclose less about risk (as in Helbok and Wagner, 2005); it seems that if the operating results are good, it is enough to reassure stakeholders, it is not necessary to invest in increased disclosure; maybe it is also an opportunity to save money derived from the investment in risk disclosure practices or a way to preserve information with respect to competitors. But when the performance is low, disclosure is a way to reassure stakeholders, thus its level increases.

The *RESERVE* variable shows a negative and significant coefficient, thus the hypothesis $H_4(c)$ is confirmed by results: when the amount of reserves increases, insurers become less inclined to disclose more about risk. As just observed for the *ROA* variable, also in this case a high level of reserves reassures stakeholders about the size of risk managed by the company, justifying lower disclosure levels; at the same time, the cut of risk disclosure levels may represent a way to preserve information about risk management strategies towards competitors. Opposite observations can be done for lower amount of reserves, where disclosure helps to reassure about the risk managed by companies.

The prevalent type of insurance activity (*TYPE*) does not significantly affect the risk disclosure level, thus the hypothesis *$H_4(d)$* is not confirmed by results. There are no differences in risk disclosure levels caused by the consideration that the insurers' activity is exclusively life, non-life or full line.

We control for the ratio between equity and market capitalization (*RISK*), that reports a negative but not statistically significant coefficient; thirteen dummies are introduced to capture the home country (*HOME1*) of each insurer[11]; six further dummies are added to control for each year (*YEAR*) over the time period 2005-2010. The sign and significance of the year dummies allow to statistically confirm the hypothesis H_3 in the multivariate analysis, too, besides the univariate one.
The regression (10) is well-fitted, with R-squared equal to 0.69.

As robustness check, we introduce other specifications in the analysis above (Table 8, column 2). Two main differences are introduced: first, we add a control variable representing the share price of the company (*PRICE*) in order to test whether disclosure is conditioned by the trend of the price; second, we divide the companies in three geographic areas (Northern Europe, Central Europe, Southern Europe), thus we replace the thirteen dummies for the home country (*HOME1*) with three dummies (*HOME2*), one for each geographic area identified.

The variables *SALES*, *ROA*, *RESERVE*, *TYPE* and the year dummies confirm in sign and statistical significance what observed in the results of the first model (Table 8, column 1). The *RISK* variable reports a negative and significant coefficient. The *PRICE* variable is not significant in determining the amount of risk information disclosed, thus there is no influence of market trend of prices on disclosure choices. It is very interesting to observe the results of the two (of the three) dummies introduced to capture the geographic area; taking as base the dummy for central companies, the other two are highly statistical significant: *HOME2-north* is positive and statistical significant, *HOME-south* is negative and statistical significant, too. It means that companies located in the north of Europe disclose more than companies in the centre while companies in the south of Europe disclose less than in the ones in the centre.

The analysis reported above is replicated in order to investigate the potential impact of the financial crisis on the accounting techniques and, thus, on risk disclosure practices (Table 9). Differently from the model 1 presented in Table 8, in the model 2 we replace the year dummies with the *CRISIS*; it is a dummy variable that assumes value 1 in the years affected by the crisis (2008, 2009, 2010) and 0 otherwise (2005, 2006, 2007).

[11] The dummies for the home countries (*HOME1*) show an influence of the geographic area on disclosure levels, but, due to their high number, do not allow to capture differences in disclosure practices depending on the part of Europe where the company is located. With the aim of better investigating this point, another way of identifying the home country is provided in the regression in Table 9.

Table 9

Regression results

This table reports the results of a second specification of the regression (10) that investigates the determinants of risk disclosure practices by the sample companies. Variables are described in Table 4. *, **, *** denote significance levels at 10%, 5%, 1%. Standard errors are reported in parenthesis.

Dep.Var.: ***RDII_02***	**Model 2**	
	coeff.	**coeff.**
SALES	0.916***	1.377***
	(0.269)	(0.243)
ROA	-16.676*	-19.891*
	(9.913)	(11.219)
RESERVE	-2.707	-3.068
	(1.867)	(1.962)
TYPE	-0.808	0.491
	(0.763)	(0.670)
RISK	-0.637	-0.728
	(0.563)	(0.568)
PRICE		-0.061
		(0.222)
CRISIS	4.681***	4.664***
	(0.558)	(0.604)
HOME1	Yes	
HOME2-north		1.227*
		(0.665)
HOME2-south		-3.811***
		(0.852)
Constant	12.905***	11.701***
	(3.178)	(3.226)
Observations	231	225
R-squared	0.6388	0.4750

The coefficient of *CRISIS* is positive and highly statistical significant into the two specifications of the model 2, thus it is documented a positive effect of the crisis on risk disclosure practices: it seems that, in periods of crisis, companies invest more in disclosure; it is a way to reassure stakeholders that the company is aware of the evolving environment and to express its commitment to face it.

Regarding the other variables that show statistically significant coefficient, the observations just reported for the model 1 can be replicated for this model, too.

6. Conclusions

This research investigates risk disclosure practices by European insurers over the 2005-2010 time horizon, focusing on the readability of the documents, the amount of risk information disclosed in the annual reports and its determinants. In particular, it focuses on the description of the methodology adopted for measuring qualitative and quantitative disclosure and provides empirical results about the relationship between risk disclosure levels, insurers' characteristics, and the impact of the financial crisis.

The starting point for this kind of analysis is the recognition of the potential high value assumed by disclosure in the current financial system: if relevant information is put into the public domain then participants in the marketplace can sanction unsatisfactory results, shareholders and other stakeholders (i.e. policyholders) can better manage their risk positions and the companies themselves should benefit from a reduction in their cost of finance. It also helps supervisors to be more effective in their monitoring as they are better positioned to foresee potential problems and can therefore act earlier (Linsley and Shrives, 2005). At the same time, it is a complex process, so that only if all the actors involved – law-makers, disclosers and disclosees – play their parts properly, disclosure succeeds, otherwise it fails to reach its purposes (Ben-Shahar and Schneider, 2010).

The main results show that the annual reports are difficult to read; the lack of consumer disclosure can be seen as a loss of consumer protection, even if it does not avoid that more financially educated stakeholders can read the reports. Moreover, it is not documented an effort by companies to enhance their understandability, as readability levels are quite constant over time, thus a problem of readability raises. The level of risk disclosure has increased over time, with a stronger growth between 2008 and 2010. Several tests show that there is no relationship between the quality and the quantity of disclosure, showing that the choices about readability and risk disclosure are based on different criteria. Finally, the analysis shows that insurers' characteristics, in terms of size, profitability, reserve, as well as year, home country and the crisis, significantly affect the amount of risk information disclosed. Hence, this research highlights how European insurance industry invests more in disclosure during the financial crisis, *i.e.* to maintain market confidence it is necessary an effective disclosure of relevant risk information.

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Appendix A – Qualitative Disclosure

This appendix contains the description of the readability indices introduced for measuring qualitative disclosure in the annual reports of the sample companies. It refers to seven indices; the first five indices (*Readability Indices*) measure the readability of the documents and, as a result, indicate the ease of reading or the grade level required to read and understand the text, while the last two indices (*Richness Indices*) indicate the richness of the vocabulary used.

Label		Description
Readability Indices	1) Gunning's Fog Index	grade level necessary to understand a text
	2) Flesch Index	ease of reading of a text
	3) Kincaid Index	grade level necessary to understand a text
	4) Coleman-Liau Index	grade level necessary to understand a text
	5) Automated Readability Index	grade level necessary to understand a text
Richness Indices	6) Type/Token Ratio (TTR)	variety of the text vocabulary
	7) Hapax Index	number of words with frequency=1

The *Gunning's Fog Index* was elaborated in 1952 by Robert Gunning, an American textbook publisher. It expresses the minimum number of school years that a person needs to attend in order to read easily the text analyzed and understand it on a first reading. The mathematical formula is (1):

$$FOGIndex = 0.4(ASL + PHW) = 0.4\left[\left(\frac{words}{sentences}\right) + 100\left(\frac{complexwords}{words}\right)\right] \quad (1)$$

where *ASL* is the *Average Sentence Length*, calculated as the number of words divided by the number of sentences; *PHW* is the *Percentage of Hard Words*, the ratio between complex words and the total number of words in the passage. *Complex words* are long words, conventionally composed of three or more syllables. It awards short sentences than long sentences written in complicated language. The result is a Grade Level according to the U.S. grade levels: the ideal score is 7 or 8; anything above 12 is too hard for most people to read (otherwise, the average person reads at level 9, easy reading range is 6-10 and anything above 15 is getting difficult).

The *Flesch Index* was formulated by the American scholar Rudolph Flesch, the first who stated that the readability of a text can be measured. The mathematical formula of the *Flesch Index* is (2):

$$Flesch = 206.835 - 1.015ASL - 84.6ASW = 206.835 - 1.015\left(\frac{tot.words}{tot.sentences}\right) - 84.6\left(\frac{tot.syllables}{tot.words}\right) \quad (2)$$

where *ASL* is the *Average Sentence Length*, calculated as the number of words divided by the number of sentences; *ASW* is the *Average Number of Syllables* per word, calculated as the number of syllables divided by the number of words. The results have a range between 0 and 100, where 100 indicates the highest level of readability and the easier to read (documents easily understood by an average 11-year-old student), 0 the worst or more difficult to read (documents best understood by university graduates).

The *Flesch-Kincaid Index* is an elaboration of the Flesch Index, in the sense that it translates the 0-100 score into a grade level. The mathematical formula of the *Flesch-Kincaid Index* is (3):

$$Kincaid = 0.39ASL + 11.8ASW - 15.59 = 0.39\left(\frac{tot.words}{tot.sentences}\right) + 11.8\left(\frac{tot.syllables}{tot.words}\right) - 15.59 \quad (3)$$

The score corresponds to a grade level, the number of years of education required to understand the text.

The *Coleman-Liau Index* indicates the grade level necessary to understand a text; differently from the indices presented above, it considers the number of characters included in the text. The mathematical formula is (4):

$$CLGrade = 5.89 * ACW - 0.3 * \frac{sentences}{100 * words} - 15.8 = 5.89 * \left(\frac{characters}{words} \right) - 0.3 * \frac{sentences}{100 * words} - 15.8 \quad (4)$$

where *ACW* is the *Average Characters per Word*, calculated as the number of characters divided by the number of words.

The *Automated Readability Index (ARI)* represents the US grade level needed to comprehend the text. The mathematical formula is (5):

$$ARI = 4.71 * AVL + 0.5 * AVW - 21.43 = 4.71 * \left(\frac{characters}{words} \right) + 0.5 * \left(\frac{words}{sentences} \right) - 21.43 \quad (5)$$

where *AVL* is the average number of letters per word and *AVW* is the average number of words in sentences.

The *Type/Token Ratio (TTR)* is a measure of the richness of the vocabulary. The mathematical formula is (6):

$$TTR = \frac{V}{N} \quad (6)$$

where *V* represents the text vocabulary (number of types or lemma), *N* is the length of the text in terms of number of words (number of tokens). Generally, the number of tokens is greater than the number of types. Higher values assumed by this index indicate more richness in the vocabulary.

The *Hapax Index* is a measure of the richness of the vocabulary, its lexical variety and lexical sophistication. The mathematical formula is (7):

$$Hapax = \frac{V_{Hapax}}{N} \quad (7)$$

where *V*Hapax indicates the number of words that occurs once in the text, *N* represents the number of tokens. The results indicate the percentage of words with frequency equal to one.

Appendix B

This appendix contains the list of the 30 items that compose the risk disclosure index for insurers (RDII) and the potential scores assignable to each of them, that could have the range 0-2 (RDII_02) or 0-4 (RDII_04). The total risk disclosure index is composed of seven areas: i) Risk management (4 items); ii) Underwriting risk (4 items); iii) Market risk (4 items); iv) Credit risk (4 items); v) Operational risk (4 items); vi) Liquidity risk (4 items); vii) Other risks (6 items).

N	Items	*RDII_02*	*RDII_04*
RISK MANAGEMENT			
1	List and definition of risks	0-1	0-1
2	Description of capital adequacy approach	0-1	0-1
3	Description of capital requirements	0-2	0-4
4	Description of risk management policies	0-2	0-4
UNDERWRITING RISK			
5	Definition of the risk	0-1	0-1
6	Description of risk mitigation activities	0-1	0-1
7	Quantification of risks	0-1	0-1
8	Description of stress tests and sensitivity analysis	0-2	0-4
MARKET RISK			
9	Definition of the risk	0-1	0-1
10	Description of risk mitigation activities	0-1	0-1
11	Quantification of risks	0-1	0-1
12	Description of stress tests and sensitivity analysis	0-2	0-4
CREDIT RISK			
13	Definition of the risk	0-1	0-1
14	Description of risk mitigation activities	0-1	0-1
15	Quantification of risks	0-1	0-1
16	Description of stress tests and sensitivity analysis	0-2	0-4
OPERATIONAL RISK			
17	Definition of the risk	0-1	0-1
18	Description of risk mitigation activities	0-1	0-1
19	Quantification of risks	0-1	0-1
20	Description of stress tests and sensitivity analysis	0-2	0-4
LIQUIDITY RISK			
21	Definition of the risk	0-1	0-1
22	Description of risk mitigation activities	0-1	0-1
23	Quantification of risks	0-1	0-1
24	Description of stress tests and sensitivity analysis	0-2	0-4
OTHER RISKS			
25	Identification of other risks	0-1	0-1
26	Quantification of other risks	0-1	0-1
27	Rating	0-1	0-1
28	Competitive environment/Market share	0-1	0-1
29	Historical results	0-2	0-4
30	Forward-looking data	0-1	0-1