

On the characteristics of the ERM-adopted EU insurers: A focus

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Abstract

This study seeks to address whether ERM adoption explains the differences between European insurers. From the sample of 101 European insurance companies during the period 2007-2013, results suggest that insurers tend to implement ERM when they are more leveraged, bigger and concentrate on their core-business. ERM is appreciated where firms have a higher performance and located in developed markets. Despite the fact that the difference between ERM and non-ERM firms is clear, some determinants such as firm age, core-business, internationally operation are not statistically significant. Furthermore, we can conjecture that the examined indicators are good hints to identify ERM adoption, even insurers do not disclose their practice.

JEL classification: G22, G31, G34

Keywords: enterprise risk management, ERM adoption, insurance companies.

1 Introduction

Traditionally, risk management is a fundamental activity of insurance companies and it has been performed in separate silos for each major risk (Standard&Poor's, 2005). However, there has been a revolution in the risk management discipline. Much more scrutiny of risk management is now required by rating agencies, regulators, shareholders and other external stakeholders. Not only because insurers play an important role in the financial markets but also because the complexity of the different risks increasing over time. During the recent financial crisis, the insurance sector's write-downs are comparatively small (Lehmann and Hofmann, 2010). Insurers and re-insurers remained solvent, except the special case of AIG. According to Schich (2010), the 2007-2008 crisis may primarily be a banking crisis, and the solvency of the insurance sector as a whole does not appear to be threatened. In many cases, they are profitable throughout the crisis while providing risk transfer products to both corporations and individuals (Doherty and Lamm-Tennant, 2009). However, Khosrowshahi¹ (Bell et al., 2009) emphasized that *"the crisis has revealed a vulnerable spot in the risk management program of many insurance companies such as the asset management function and its tendency to be run as a profit center independently of the core insurance business - p.39"*. This idea implies that an effective risk management program should be run in a holistic manner. Furthermore, there is a need of managing risks with a global vision that is risk management should be embedded in firm strategies and perceived at all firm levels. In fact, the current pressure from NAIC ORSA in the U.S, Solvency II in the European Union, and requirements from IAIS are forcing insurers to adopt a new risk management system, which is popularly called Enterprise risk management (ERM).

Since the mid-1990s, ERM has emerged as a concept and as a management function within corporations (Dickinson, 2001). Then, it has interested more practitioners and researchers. For instance, professionals use COSO, AS/NZ4360, FERMA or ISO 31000 as their guidelines for risk management standards in different industries. In practice, ERM also gets much attention in response to the need in the implementation of ERM. As a result, a number of frameworks have been developed, such as COSO or ISO 31000. This new paradigm of risk management even considered as a criteria of ranking in the insurance industry, as the case of S&P, A.M. Best and Moody's. Researchers also have interest in ERM, especially regarding two aspects: the determinants and the value of ERM implementation (Gatzert and Martin, 2015). In the literature, ERM is widely discussed, spreading

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from ERM framework, the degree of implementation to the determinants and the benefits of ERM (Pagach and Warr, 2011). The approaches to answer these research questions are various. For instance, several authors study the implementation of ERM based on surveys, questionnaires, or interviews (Kleffner et al., 2003; Beasley et al., 2008; Altuntas et al., 2011). Other quantitative studies examine the characteristics of firms that significantly influence the implementation of an ERM system and the benefits of ERM by using multivariate methods (Gatzert and Martin, 2015).

In October 2005, Standard & Poor's Ratings Service introduced a separate, major category of evaluating the Enterprise risk management practices of insurance companies. As insurers are influenced by ratings services (such as S&P, Moody's and A.M. Best), ERM ratings are considered as a high credible evidence of ERM adoption (McShane et al., 2011). The 2015 insurance CRO survey of Ernst & Young shows that the ERM framework has been the second concern of CROs just after capital modeling, stress testing in the near future. With a restricted number of studies on ERM, empirical evidence on the value of ERM is not clear and somehow differs. As a result, firm executives are uncomfortable making a deeper commitment to ERM (Hoyt and Liebenberg, 2011). This may cause two-way effects on ERM study when identifying ERM adoption still challenge. Empirical evidence could also be cross-sectional studies, field-based studies of organization in the same industry or even within the same organization (Mikes and Kaplan, 2013). Of course, each method has its (in) conveniences depend on the availability of data sample. Cross-sectional studies can give a general understanding of the subject, however field-studies give a deeper understanding when managing risk in reality could not be "*one size fits all*"².

In this study, we examine characteristics that are hypothesized to be the main determinants of ERM implementation for a final sample of 101 publicly traded European Union insurers from 2007 to 2013. It is important to identify firms that adopt ERM to evaluate the impact of ERM. Moreover, figuring out the common characteristics of ERM adopting firms helps stakeholders understand more about risk management activities of firms. For a comprehensive identification of ERM, we follow previous studies with keywords search in the annual reports of these insurers: chief risk officer, enterprise risk management, risk committee, integrated risk management (Hoyt and Liebenberg, 2011; Pagach and Warr, 2011). More importantly, we link with ERM ratings of Standard & Poor's in 2008, 2010, 2011 and 2013 to complement with their annual reports.

²the frequency of risk identification and assessment processes must match the velocity of risk evolution

This study is motivated by the fact that ERM is the subject that interests more and more insurance sector under the pressures of stakeholders such as regulators (Solvency II is applied in January 2016), shareholders, and rating agencies. Second, to our knowledge this is the first study focusing on the European Union market which accounts for 35,53% world market share (SwissRe, 2015b). European and single industry perspective allowing new insights into the current literature on ERM. Therefore, this study contributes to our understanding about empirical evidence of ERM implementation in the European Union, especially on identification of ERM adoption. Finally, the study provides additional evidence on ERM, giving more information for both firm executives, researchers and even policymakers.

Using a sample of 101 European insurers from 2007 to 2013, we find that adopting-ERM insurers are more leveraged, bigger and more specialized in their core-business. Regarding characteristics from the view of performance, these firms also have higher performance in terms of ROA, PrE, EPS, and Tobin's Q. In addition, adopting-ERM firms are located more in developed markets. We conjecture that besides the compliance, insurance firms adopt ERM because of their own interests. The examined variables in this study represent important determinants. Explications for this argumentation are based on the conveyed information on these variables: risk management strategy and operations are evaluated within the context performance and firm characteristics.

The rest of this paper is structured as follows. First, we discuss related studies and develop the main hypotheses. Second, we present the research design and discuss econometric issues. Next, we describe the data selection process and summary statistics. Third, we report the empirical results and discussions.

2 Literature review and research incentives

2.1 Risk management and the evolution of ERM

The history of risk analysis and risk management can be traced as far back as the practices of the Asipu of ancient Babylonia in the Tigris-Euphrates valley about 3200 B.C. and the emergence of probability theory in the 17th century (Covello and Mumpower, 1985). Then, with the rise of capitalism, scientific management (Taylorism and Fayolism) and mathematical theory of probability and statistic, there is a common agreement that risk management, like other fields of business management, is both an art and a science (Gahin,

1967).

The mid-70s and the early 1980s saw a blossoming of risk management in the Europe. In 1982, [Crockford \(1982\)](#) suggested that risk management is a linking function, coordinating diverse disciplines and skills to address both constant and variable risks. Later on, there was recognition arose from more general management thinking: a more holistic approach to risk management is feasible ([Kloman, 1992](#)). Similarly, [Miller \(1992\)](#) proposed an integrated risk management framework with its major strength of recognition of trade-offs between exposures to various uncertainties. However, integrated/enterprise-wide risk management is not a new idea when [J.Long \(1960\)](#) advocated an enterprise-wide approach to risk management. His advanced idea, as sometimes, had to wait to be recognized ([Corbett, 2004](#)). Since then, risk management has expanded rapidly on a global basis and well beyond its traditional insurance boundaries. Risk analysis and risk assessment have become far more sophisticated, using new tools of mathematics and decision theory, especially in financial theory.

Scholars started to discuss more about the concept of integrated risk management (also called holistic, enterprise-wide risk management) in 2000s. This concept defined by [DeLoach and Temple \(2000\)](#) as a structured and disciplined approach that aligns strategy, processes, people, technology and knowledge with the purpose of evaluating and managing threats and opportunities that the enterprise faces as it creates value. Furthermore, current widely discussed and advocated ISO 31000 standards has a similarity with their new set of definitions. According to [Simkins and Ramirez \(2008\)](#), ERM is *“a natural evolution of the process of risk management, and represents a more advanced and sophisticated approach to managing risk”*. Furthermore, under ERM *“all risk areas function as parts of an integrated, strategic, and enterprise-wide system. While risk management is coordinated with senior-level oversight, employees at all levels of the organization using ERM are encouraged to view risk management as an integral and ongoing part of their jobs”*.

[Bromiley et al. \(2014\)](#) provided a comprehensive review on ERM. The authors synthesized the definitions of ERM and other synonyms such as corporate risk management, multidisciplinary risk management, total risk management, holistic risk management, coordinated risk management, integrated risk management. According to the authors, there is an emerging consensus about the core elements of ERM. First, managing risk as a portfolio is more efficient than in silos. Second, ERM address both quantifiable risks and non-quantifiable risks or traditional and strategic risks. Third, ERM should not just look

at downside risk but also upside risks, which means that firms could seek competitive advantage from it. Interestingly, they distinguished between the enterprise risk management study from the point view of management scholars and accounting-finance scholars. For example, they argue that accounting-finance scholars often define optimal conditions, and then offer tools consistent with those conditions. Meanwhile, management scholars emphasized understanding how firm behave, and sometimes the association of such behaviors with performance. Beside this, they raise two thought-provoking issues. First, Enterprise risk management could be understated its value when Enterprise risk management pays off primarily in exceptional times when using continuing accounting performance. Second, how do we treat when organizations which have objectives beyond accounting performance. In fact, there is a trend of corporate social responsibility in big groups and investment responsibility is one the key pillars.

Apart from the trend that advocating Enterprise Risk Management as an evolving discipline, [Mikes and Kaplan \(2015\)](#) further suspect the frameworks as well as the maturity of risk management models. Their proposed contingency theory in managing risk indeed very thoughtful, critical and convinced. The fact is that each organization has its own facets that influence the impact of an initiative, as the case of Enterprise risk management adoption. Moreover, human decision always considered as an important factor in the organization's activities, which differs from one to the others. Apparently, it must have a framework with core principles while keeps studying various risk management practices, toward a universal form of Enterprise Risk Management.

2.2 Previous studies on ERM adoption

Studies on determinants of ERM adoption ([Kleffner et al., 2003](#); [Beasley et al., 2005](#); [Paape and Speklè, 2012](#)) use mainly qualitative focus with surveys and/or interviews and empirical studies with public data. In the first stream, studies try to find out the level of ERM implementation, the drivers of ERM adoption and several aspects of risk management practices. [Kleffner et al. \(2003\)](#) survey risk managers in Canada who are members of RIMS. With 118 responses from 336 sent surveys, their results suggest that risk management compliance has effects on ERM adoption and top managers play an important role in implementing ERM. Furthermore, ERM is a trend as the awareness of risk management is increased, with the perception of the company-wide risk management. [Beasley et al. \(2005\)](#) used survey with the members of IIA's Global Audit Information Network (GAIN)

with the final sample of 123 organizations. Their findings suggested that the board and senior management leadership on ERM is critical to extensive ERM implementation. Firm characteristics such as size, industry, auditor type and country of domicile help to explain the extent of ERM deployment. They also argue that the presence of a CRO is positively associated with ERM system, which is statistically significant. [Altuntas et al. \(2011\)](#) not only used surveys with 86 questions on 21 aspects of ERM but also telephone interviews and empirical data from insurance companies operate in Germany. With data of 113 insurers have at least 40 million euros in gross written premiums during 1999-2008, they find that the adoption of ERM dues to career concerns, especially CEOs. In addition, negative changes in the past firm performance increase a firm's probability to adopt ERM. [Paape and Speklè \(2012\)](#) used questionnaires for 825 organizations located in the Netherlands which have more than 30 employees and annual revenues over 10 million euros. They proposed 5 stages of ERM implementation and examined several aspects related to ERM such as regulation influence, internal influence, ownership, auditor, and firm/industry characteristics. Their results argue that having CRO and publicly traded firms have more mature ERM systems. In addition, larger organizations and firms in the financial sectors tend to have more sophisticated ERM systems. Similarly with some previous studies, they found no evidence of an effect of institutional ownership as well as auditor-related influences.

These above studies which combine both surveys and empirical data have advantages of further understanding the status of ERM in each organization. However, there is a risk in designing questionnaires if all respondents do not have the same perception of ERM, especially the concept of ERM. Data from cross-sectional or single industry each has its own advantages and disadvantages. Cross-sectional studies give more generality of evaluation, but single industry studies give more pertinence.

In the second stream, researchers aim to find statistical significant evidence regarding the determinants of ERM by using multivariate methods. Most of the studies ([McShane et al., 2011](#); [Pagach and Warr, 2011](#); [Hoyt and Liebenberg, 2011](#)) have underlying data from U.S. firms for different time periods. The existence of the position CRO or similar and ERM related keywords is used as the proxy for ERM implementing evidence ([Gatzert and Martin, 2015](#)). Another technique to identify ERM is based on ERM ratings and surveys of rating agencies and consulting firms. [McShane et al. \(2011\)](#) and [Baxter et al. \(2013\)](#) using ERM ratings of S&P in 2006-2008 to examine several aspects of banks and insurers and ERM adoption. According to [Baxter et al.](#), firms with superior ERM system are more complex,

have greater financial resources and better corporate governance. Although [McShane et al. \(2011\)](#) focus on the relation between firm value and the maturity of ERM, they found that there is a positive relationship between ERM rating and firm size, but no straightforward pattern for the relationship of ERM rating and other variables such as leverage, complexity, cash-flow volatility as well as growth opportunity.

Among determinants of ERM adoption, the majority of researchers interest in firm size, financial leverage, volatility, opacity, growth opportunity, diversification, and ownership. According to empirical studies, the impact of firm size on ERM is identified as a positive determinant ([Hoyt and Liebenberg, 2008, 2011](#); [Pagach and Warr, 2011](#)). Therefore, larger firms tend to require a more efficient and holistic risk management system as a result of the increasing scope and complexity of risks. Diversification has the same argumentation, however findings cannot confirm this assumption in general. In fact, diversification in different contexts has different results. For instance, industry diversification has positive significant but international diversification has mixed results ([Beasley et al., 2005](#); [Hoyt and Liebenberg, 2011](#)). This also happens when looking at the financial leverage, the results are equivocal. While [Liebenberg and Hoyt \(2003\)](#) find this aspect to be significantly positively related to ERM, [Hoyt and Liebenberg \(2008, 2011\)](#) show a negative relationship. The positive coefficients support the assumption that more leveraged firms need more efficient risk management system to mitigate potential losses due to greater risk of financial distress. Adversely, lower leveraged firms may have more favor in ERM as they expect to take more financial risk in the future, or leverage is not the most important factor of an ERM engagement. Regarding volatility and institutional ownership, there is always a positive relationship with ERM adoption. One can argue that as firms with more volatility, an ERM system can help to smooth these variances. With the presence of institutional shareholders, firms supposed under the pressure to engage in an efficient and holistic corporate risk management. In contrast, in general, no significant evidence is found concerning the impact of opacity and growth opportunity.

2.3 Research incentives

As mentioned earlier, this study examines whether ERM adoption in the insurance industry exhibits some common characteristics of insurers. The main research question of our study is *“which firm characteristics are associated with the implementation of ERM?”*. Among firm characteristics, some characteristic interest much more scholars than others, such as

leverage, size, opacity, earnings/cash flow volatility, growth opportunity, diversification and institutional ownership. Most of previous studies on ERM determinants take firm leverage into account. However, findings are dissimilar. For instance, Hoyt and Liebenberg (2003, 2011) showed contradictory results. Study on the CRO appointment of 26 US firms in which 15 are financial firms, Liebenberg and Hoyt (2003) found that firms with CRO appointment are more leveraged. Nevertheless, studying on ERM adopting firms in the US insurance industry, Hoyt and Liebenberg (2011) argue that insurance firm with the presence of ERM are less leveraged. Beasley et al. (2008) advocate that firms appear to implement ERM when they are more leveraged.

From both practical and academic point of views, we assume that insurers engaging in ERM may have higher financial leverage as they are more advanced in capital management and they tend to look forward upside risks. Furthermore, insurers with ERM tend to secure their long-term liabilities with long-term investments. Regarding firm size, most results show that firm size positively related to ERM. Beasley et al. (2005, 2008), Gordon et al. (2009), Hoyt and Liebenberg (2008, 2011), and Pagach and Warr (2011) argue that the impact of firm size on ERM is a positive determinant. Thus, the argumentation is that larger firms appear to deploy a more efficient risk management system as the result of increasing scope and complexity of risk. However, in case of insurance industry, insurers are experts in their core business of risk management, so firm size does not matter with the implementation of ERM. There are numerous studies on firm age and its impact (Coad et al., 2013), but in the case of the insurance industry, insurance core business depends a little on the number of years operation.

Volatility is one of the variables that researchers choose when they study on ERM adoption. However, findings on this variable are not in common. For example, studies in the insurance industry (Hoyt and Liebenberg, 2011; Acharyya and Mutenga, 2013) show that firms are less volatile. However, Pagach and Warr (2010, 2011) with their study on cross-industry advocate that firms engaging in ERM have more volatility. In this study, as focus only on insurance industry which is rather stable, some characteristics such as volatility, opacity and institutional ownership are not priority in research question. With a different approach to discover other facets, we take geographic diversification, firm type, productivity, and efficiency into consideration. These reasonable characteristics could give more insights into current literature on ERM in the insurance industry and in generality. In fact, studies on the above variables are sparse. For instance, some studies assert that

there is a significant relation between firm age and firm growth/business cycle (Coad et al., 2013; Huang et al., 1994). Diversification appears in many studies on risk management. Productivity, efficiency could be considered as other proxies for firm performance, which is a major concern of scholars in the field of management research. The long-term investment variable is interested in case of insurance firms because investment is one of the core business of insurers, and long-term investment integrated in their strategies, together with managing risks.

3 Research design

3.1 Identification ERM adoption

Currently, the empirical literature on ERM is confronted with the challenge of whether or not an ERM system has been implemented and to what level. There is a general acceptance that the CRO is the best signal until now for ERM adoption. Other sources of ERM adoption are ERM ratings from rating agencies, surveys of consulting firms and researcher's own ERM index. As ERM ratings from agencies are not publicly accessible and somehow unclear, it is necessary to have an ERM index which is more accessible and quantifiable like CSR index.

Following previous studies of Liebenberg and Hoyt (2003); Hoyt and Liebenberg (2011), Pagach and Warr (2011), McShane et al. (2011), Johnston and Soileau (2013), we scanned the keywords related to ERM or equivalent from the annual reports of selected insurers for the period 2007-2013. Additionally, we referred to the ERM ratings of S&P in 2008, 2010, 2011 and 2013 and the survey of Tower and Watson in 2010 to identify which firm has been implemented ERM system. In the final sample, we have 412/707 firm-year observations with the presence of the ERM, which accounts for 58,27% of the total sample.

3.2 Model specification and variables discussion

To discover the characteristics of insurers that associated with ERM adoption, the random Probit/Logit model is employed with the assumption that differences across firms have an influence on ERM adoption.

$$ERM_{it}|X_{it} = \alpha + \beta_j f(X_{it}) + v_{it} + \epsilon_{it} \quad (1)$$

The equation 1 can be rewritten in a detailed form as follows:

$$\begin{aligned}
ERM_{it} = & \alpha + \beta_1 LVRG_{it} + \beta_2 LTIg_{it} + \beta_3 FA_{it} + \beta_4 FS_{it} + \beta_5 INTL_{it} \\
& + \beta_6 BTY_{it} + \beta_7 PrE_{it} + \beta_8 CR_{it} + \beta_9 SR_{it} + \beta_{10} EPS_{it} \\
& + \beta_{11} ROA_{it} + \beta_{12} TobinQ_{it} + \beta_{13} IPP_{it} + v_{it} + \epsilon_{it}
\end{aligned} \tag{2}$$

Where ERM=1 if there is evidence of the presence of ERM in the annual reports or ratings, and ERM=0 otherwise. Table 1 summarizes the discussion of variables.

Table 1: Variables discussion

Variable	Definition	Expected sign
LVRG	is firm leverage, measured as the ratio of liabilities to book value of equity.	+
LTIg	is long-term investment, measured as the ratio of long-term investment to asset.	+
FS	is firm size, measured as natural logarithm of number of employees.	+
FA	is firm age, measured as years of operation.	+
INTL	is geographic diversification, if firm operates domestically, it takes on a value of 0, and 1 otherwise.	+
BTY	is business-type, if firm is a broker or insurance related services supplier, it takes on a value of 0, and 1 otherwise.	+
BLI	is business-line, if firm is mono-line, it takes a value of 0, and 1 otherwise.	+
PrE	is productivity of employee, measured as natural logarithm of the ratio of revenue to total employees.	+
CR	is combined-ratio, measured as the ratio of losses and expenses to earned premiums.	-
SR	is solvency ratio, measured as the ratio of book value of equity to the maximum value between 18 percent earned premiums and 26 percent losses-benefitsadjusted.	+
EPS	is earning per share, after diluted	+
ROA	is return on asset	+
TobinQ	is proxy for firm value, measured as the ratio of market value of equity and book value of liabilities to book value of asset	+
IPP	is insurance purchasing power, measured as the natural logarithm of premiums per capita.	+

3.3 Data and sample selection

This study focuses on the European Union insurance industry to complement the current empirical studies on ERM. In fact, most of previous empirical studies based on US market or cross-sectional industry. Moreover, European is the cradle of the insurance industry and

presents currently 36 percent of the market share worldwide.

We choose publicly traded insurers for the availability of data and disclosure information. First, we search a list of quoted insurers in the Europe from Bloomberg, Stockopedia and Morningstar. The maximum and minimum number of these lists are 154 and 107. Then, we link this result to the Factiva and ratings of S&P as well as the survey of Tower Watson. we got a list of 101 insurers due to the availability of data. Indispensable data are from Eastern Europe firms. Finally, based on the final list, we search and download the annual reports of these insurers from their websites. The period 2007-2013 is suitable for the study because the Europe starts later than the US in ERM and ratings agencies apply ERM to insurers started in 2005. Usually, it takes 2 or 3 years to put an initiative on the way. Moreover, the financial crisis 2007-2008, new regulations in 2009 and discussions on Solvency II during the start of this period could be good signals of implementing ERM.

The data are consolidated at group level. For non-euro currency countries, and data in US dollar, all are converted to euros with exchange rates at equivalent time period. The stock prices are extracted from Bloomberg, Yahoo finance and Google finance. The ERM variable is compiled from scanned keywords in annual reports, ratings of S&P and the survey of Tower and Watson. Although there is a different level of ERM maturity, this research simplifies ERM as a binary variable due to limited available data and the complexity of multi-level probit/logit model. The macro variable used to control is insurance purchasing power (IPP), which is extracted from World insurance annual report Sigma of SwissRe.

The majority of variables such as LVRG, the number of shareholders, EPS, ROA, Losses/Revenues etc. are extracted from Morningstar, Stockopedia and Factiva. When there are unusual figures, we use a double check within these sources and choose the ones which are more reliable. In general, the research sample consists of 101 firms from 23 countries in the Europe for the period 2007-2013. Examined variables are extracted and computed from public sources.

4 Empirical analysis

4.1 Data and properties

This section presents descriptive statistics for the variables examined in the empirical analysis of this paper.

Table 2 shows summary statistics of determinants of ERM adoption in the insurance

industry in the Europe. The statistics show that nearly 60 percent of the sample associated with ERM system. In fact, among 707 firm-year observations, we have 421 firm-year observations with the presence of ERM. According to this table, on average, insurers in the Europe possess a positive evaluation when the market value is higher book value around 28 percent. ROA of insurance firms in the Europe is about 1.8 percent during the research period. This ratio is consistent with the average ratio worldwide in 2014, though European market has been a matured market.

Table 2: Full sample firms

Variable	Obs	Mean	Std. Dev.	Min	Max
ERM	707	0.583	0.493	0.000	1.000
PrE	654	13.244	1.250	6.766	16.496
TobinQ	665	1.287	2.396	0.250	51.966
ROA	675	0.017	0.073	-1.002	0.409
CR	669	1.530	4.422	0.022	85.000
EPS	670	2.244	39.041	-954.917	99.870
SR	667	4.254	18.751	-186.264	276.667
LVRG	673	10.974	15.210	-71.600	186.562
FS	668	7.406	2.158	0.693	12.102
FA	707	65.683	65.957	0.000	246.000
LTIg	636	0.563	0.255	0.000	1.074
BLI	676	0.577	0.494	0.000	1.000
INTL	676	0.652	0.477	0.000	1.000
BTY	676	0.879	0.327	0.000	1.000
IPP	707	7.585	0.989	4.256	8.729

Notes: this table reports descriptive statistics for selected variables in the study, with full sample

Regarding operational ratios, especially combined ratio, European insurers show an under-performance when losses and expenses on average higher than earned premiums about 53 percent. According to this statistic, it is evident that nowadays insurers have other important businesses besides their traditional insurance businesses. When looking at the solvency ratio based on Solvency I requirements, European insurance firms on average have better solvability. The mean value of the solvency ratio of the sample is about 4 times of required level. From the view of the characteristics of the firm, results present the ratio of liabilities to asset on average is about 10 times. This ratio is rather high. However, it should be known that insurance firms are regulated with strong capital and a major part of their liabilities is their policy liabilities. Insurance firms in the Europe have

a mean value of age is about 65.6 years. This statistic confirms that the Europe is the cradle of the insurance market. Insurers in the Europe also have a high ratio of long-term investment. Their portfolio of long-term investment represents 57.6 percent of their total assets on average.

Statistics results exhibit that 57.6 percent of insurance firms in the study are mixed-line; 87.8 percent are core-insurance business. This confirms that the sample is suitable for the study when some firms are classed in the insurance industry, but in fact they are insurance brokers or insurance related business. Regard to geographic diversification, 65.2 percent of the sample operate outside their home country. In fact, the European Union has a similar strongly converging regulatory and competitive setting. Hence, it encourages insurers to operate internationally.

One of the most important part of this study is to examine the determinants of ERM adoption. It aims to find out the differences, if any, between ERM-adopting firm and non-ERM firms. Table 3 shows the major differences between firms adopting ERM and non-ERM firms. The differences in mean value of most examined variables are statistically significant. ERM-adopting firms have higher employee-productivity with the mean difference is 1.61 and significant at 1 percent level. With regard to ROA and EPS, non-ERM firms have lower mean value but the differences are insignificant. The ROA between two groups slightly differ with the mean difference is 0.008.

Particularly, Tobin's Q in the non-ERM group has a mean value higher than the ERM group. This gap is significant at 5 percent level. One explanation for this is that non-ERM firms located in emerging markets. These markets with potential growth on both insurance and stock markets may increase the optimism of investors. Similarly, combined-ratio and solvency ratio of non-ERM firms are higher than ERM firms. While the difference in the combined-ratio is not significant, the difference in solvency ratio is significant at 10 percent level. A possible explanation lies on the fact that non-ERM could be less efficient in policy management and capital management. With respect to variables related to firm characteristics, there is a clear difference between two groups. ERM firms are found to have a longer history than non-ERM about 45 years on average. Results also indicate that ERM firms are more leveraged with significance at 1 percent level. In addition, they are bigger in terms of assets. Furthermore, ERM-firms invest more in long-term asset than non-ERM firms. It is apparent that ERM-firms are more diversified. For instance, they are more complex when operating internationally, in core-insurance and mixed-line insurance. All

Table 3: ERM firms vs. non-ERM firms

Variables	G1(0)	Mean1	G2(1)	Mean2	MeanDiff
PrE	260	12.274	394	13.884	-1.611***
TobinQ	262	1.564	403	1.107	0.457**
ROA	272	0.013	403	0.020	-0.008
CR	267	1.731	402	1.397	0.334
EPS	267	0.173	403	3.616	-3.443
SR	266	5.914	401	3.153	2.760*
LVRG	269	4.483	404	15.296	-10.814***
FS	265	6.166	403	8.222	-2.056***
FA	295	38.969	412	84.811	-45.841***
LTIg	232	0.461	404	0.621	-0.160***
BLI	273	0.476	403	0.645	-0.169***
INTL	273	0.418	403	0.811	-0.394***
BTY	273	0.703	403	0.998	-0.294***

Notes: this table reports t-test results between firms with and without ERM. G1(0) means non-ERM presence and G2(1) means ERM presence

of the preceding examined variables have mean differences that are significant at 1 percent level.

4.2 Multiple linear regression (multivariate analysis)

Despite the fact that the univariate analysis shows preliminary supporting evidence to justify the above hypotheses, it fails to control for the interrelation between observed variables and other forecast and firm characteristics. Therefore, we use a multivariate analysis to conduct more appropriate tests of hypotheses. Before estimating the model 1, we verify the multi-collinearity issue by calculating the variance inflation factor (VIF). A commonly given rule of thumb is that VIFs of 10 or higher (or equivalently, tolerances of .10 or less) may be reason for concern³. Table 4 reports the results for VIF values. According to reported results, VIF values are small and acceptable for all observed variables. The mean VIF is 1.63 shows that multi-collinearity is not an issue of the proposed model.

To examine the determinants associated with ERM adoption, we apply both the Logit and the Probit model to model 1 for estimating the likelihood that insurance firm adopt the ERM system. As ERM adoption is a binary variable, one cannot use the linear probability

³Paul Allison states that he gets concerned when the VIF is over 2.5 and the tolerance is under .40

Table 4: Multi-collinearity test

Variable	VIF	SQRT-VIF	Tolerance	R-Squared
ERM	2.36	1.54	0.4243	0.5757
PrE	2.43	1.56	0.4112	0.5888
TobinQ	1.34	1.16	0.7459	0.2541
ROA	1.35	1.16	0.7418	0.2582
CR	1.15	1.07	0.8703	0.1297
EPS	1.16	1.08	0.8621	0.1379
SR	1.33	1.15	0.7500	0.2500
LVRG	1.38	1.17	0.7248	0.2752
FS	2.00	1.41	0.5011	0.4989
FA	1.53	1.24	0.6539	0.3461
LTIg	1.29	1.14	0.7747	0.2253
BLI	1.70	1.30	0.5877	0.4123
INTL	1.68	1.30	0.5953	0.4047
BTY	1.73	1.32	0.5767	0.4233
IPP	2.02	1.42	0.4958	0.5042
Mean VIF	1.63			

model because the predicted probabilities will not be limited between 0 and 1 and the dependent variable is not normally distributed. Therefore, we employ the Logit and the Probit model. Both of the two models are estimated by the Maximum Likelihood method. While the Probit model assumes ϵ_i a normal distribution, the Logit model assumes that ϵ_i has a logistic distribution. The interpretation of coefficients is not straight as in the linear model: an increase in x makes the outcome of 1 more or less likely and the interpretation is rather based on the sign of the coefficient but not the magnitude. Usually, the marginal effects are computed to reflect the change in the probability of $y = 1$ given a 1 unit change in an independent variable x . Results illustrated in Table 5 report the Probit estimation results for model 2.

The results show that the coefficients on PrE, TobinQ, LVRG, FS, LTIg, BTY, and IPP are significant and positive, suggesting that productivity of employee, firm value, leverage, firm size, firm-type and insurance purchasing power are significant determinants of ERM adoption. The signs of these coefficients imply that insurance firms with higher productivity of employees, higher firm value, more leveraged, bigger, more focused on core-insurance business and in developed markets are more likely to engage in ERM. The coefficients on ROA, FA, BLI, INTL are positive but not significant, implying that adopting ERM firm and non-ERM firm are not significantly different. Nevertheless, these results suggest

that an increasing of these determinants could have a positive impact on increasing the probability to implement ERM.

Table 5: Probit model

ERM	Coef.	Std.Err.	z	P> z 	[95% Conf. Interval]	
PrE	.6176119	.3308875	1.87	0.062	-.0309157	1.266139
TobinQ	1.196316	.4943625	2.42	0.016	.227383	2.165248
ROA	6.836162	5.346617	1.28	0.201	-3.643015	17.31534
CR	-.0992025	.0841241	-1.18	0.238	-.2640826	.0656777
EPS	-.0072075	.0275498	-0.26	0.794	-.0612041	.0467891
SR	-.0018408	.0412024	-0.04	0.964	-.082596	.0789144
LVRG	.1080436	.062176	1.74	0.082	-.013819	.2299063
FS	.6365982	.3316448	1.92	0.055	-.0134136	1.28661
FA	.0142762	.0090217	1.58	0.114	-.003406	.0319585
LTIg	3.688984	1.43452	2.57	0.010	.8773762	6.500592
BLI	1.192921	1.303966	0.91	0.360	-1.362805	3.748647
INTL	2.751075	1.840675	1.49	0.135	-.8565812	6.358731
BTY	9.2173	3.087584	2.99	0.003	3.165746	15.26885
IPP	2.481552	.8016602	3.10	0.002	.9103267	4.052777
_cons	-46.15448	7.262287	-6.36	0.000	-60.3883	-31.92066
/lnsig2u	3.148303	.3661016			2.430757	3.865849
sigma_u	4.826645	.8835212			3.37157	6.909688
rho	.9588418	.0144479			.9191428	.9794846

Likelihood-ratio test of rho=0: $\chi^2(01) = 154.70$ Prob $\geq \chi^2 = 0.000$

As with the Probit model, the effects of a given predictor are dependent both on the values of the other predictors and the starting value of the given predictors. Hence, results can only indicate that the probability of firm to adopt ERM increase when there is an increasing in determinants with positive coefficients. The empirical findings which are insignificant suggest that the null hypothesis is not rejected, as the case of firm age. In contrast, the coefficients on CR, SR, EPS are negative but insignificant. These results express indirectly that the higher these indicators are, the less likely firms engage in ERM. However, take into consideration that these coefficients are insignificant, there is no evidence supporting the argument that firms are more likely to adopt ERM when they have higher CR, SR and EPS.

An alternative approach is using the Logit model. The logistic regression coefficients indicate the amount of change expected in the log odds when there is a one unit change in the predictor variable with all of the other variables in the model held constant. In general,

results from both probit and logit model suggest that PrE, TobinQ, LVG, FS, LTIg, BTY, IPP are favorable determinants of ERM adoption.

4.3 Discussion of empirical results

With the sample of 101 publicly traded insurance firms in the European Union for the period 2007-2013, preliminary results illustrate empirical evidence of adopting ERM in the insurance industry and plot major characteristics of the European Union insurance market. First, the presence of ERM found in nearly 60 percent of the sample. This finding is not far from the current ERM status reported recently by [Ernst&Young \(2015\)](#). Moreover, this ratio is higher in comparison with the study of [Eckles et al. \(2014\)](#) and [Eastman and Xu \(2015\)](#), as well the study of [Hoyt and Liebenberg \(2011\)](#) where the ratio of ERM presence is 69/354, 43/371, and 117/275 respectively. This evidence indicates that ERM is more and more adopted in the insurance industry, whether this phenomenon is affected by compliance, requirements of shareholders or just incentives of top managers. Second, insurance firms in European Union have an average Tobin's Q of 1.28 which means that in general, their market value is higher their book value about 30 percent. It is important to note that the insurance industry is rather stable, even during the recent financial crisis. The examined period, mostly in the rebound stage after the crisis so reactions of investors over the stocks of the insurance market is understandable. In fact, this finding is consistent with the arguments of [Doherty and Lamm-Tennant \(2009\)](#), [Lehmann and Hofmann \(2010\)](#), [Schich \(2010\)](#), and [Liedtke and Schanz \(2010\)](#). Third, regarding key-insurance indicators, the average combined ratio indicates an inefficient performance when losses and expenses higher than earned premiums about 53 percent. Meanwhile, solvency ratio presents a good solvability, which is 4 times higher than required level. For further details, natural disasters is one of the most concern of the insurance industry. According [SwissRe \(2015a\)](#), 10-year average insured losses (exclude liability and life) is about US 60 billion. The European Union and the US (where European Union firms conduct their businesses as usual) account for 50-70 percent of this amount. For example, catastrophes in 2013 (Germany, Czech Republic et al.), in 2011-2012 (US), and in 2007 (France, the United Kingdom et al.) are among the 40 most costly insurance losses (1970-2014). Additionally, the Solvency II directive (2009/138/EC) forces European Union insurance firms to hold an amount of capital to reduce the risk of insolvency. Fourth, the European Union insurance firms have a long history, high leverage, and rather diversified. Actually, the average age of the European

Union insurance firm is 65,68 where the oldest firm is 246 years old. It is well known that the European Union is the cradle of the insurance industry. High leverage (debt-to-equity ratio) is normal in the financial sector. However, besides big firms with strong capital, the nature of insurance business with advanced premiums and sum insured lead to a high average leverage ratio of the selected sample. Another explanation of this pattern could be affected by non-core insurance business. In regard to diversification, European Union insurance firms are mostly internationally, core-insurance business and balanced business lines. These findings reflect the reality of this market where geographic barriers do not exist and insurance related services play a supporting role. This finding complements the argument of [Allen and Song \(2005\)](#) that financial institutions in EMU countries became more active in initiating integration between EMU and non-EMU partners. Furthermore, there is a balance between mono-line and mixed-line firms. In fact, it is still debatable whether omnibus is better than specialization.

Results from multivariate analysis shed further lights on the topic of ERM adoption determinants. Results from Logit/Probit models indicate that insurance firms in the European Union with more productivity, more leveraged, bigger, older and more diversified as well as higher valued in the market more likely to implement ERM. From the risk management perspective, there are both downside and upside view ([Bromiley et al., 2014](#); [Hillson, 2002](#)). In the one hand, if top risk managers believe that their firms are threatened by different risk sources, then they have reason to implement ERM. On the other hand, top risk managers also prefer ERM when they want to protect their performance from a threshold and even want to seek added value from risks. In fact, performance of insurance firms not only affects investors but also their clients. As a consequence, firms with higher performance would seek higher business target or at least current growth. ERM, then is a suitable management tool to assure these objectives. Moreover, firms with higher performance have more resources to support ERM initiatives. [Ching and Colombo \(2014\)](#) state that investments in most areas of risk management is increasing. Resources are needed for *"improving data quality and reporting, strengthening risk assessment processes, management training in risk management, analytic and quantification, risk framework or model development, setting risk committee roles and responsibilities"*. As the complexity of firms increases with business scope and accumulated operations, insurance firms have to deal with these challenges. Risk management is obviously a vital management tool but with the new business context, ERM is not only "fashionable" but also considered as a cost-revenue

efficiency investment (Grace et al., 2015).

5 Conclusion

This paper examines the determinants of ERM adoption in the insurance industry during the period from 2007 to 2013 for a sample of 101 insurance firms in European Union. We find that insurance firms more likely to adopt ERM when they are more leveraged, bigger, and focus more in their core-business. We also find that adopting ERM firms have higher productivity, firm value and invest more in long-term. Adopting firms are mostly located in developed markets.

These findings suggest that ERM-adopting firms in general have a more competitive profile than others. The coefficients on these characteristics are significant confirming that they are the important and favorable determinants of ERM adoption. In comparison with previous studies, I find that these results are consistent with the findings of Liebenberg and Hoyt (2003) and Hoyt and Liebenberg (2011) in the context of US market. Meanwhile, this study does not take the volatility variables as previous studies into account. This is not only because the interest of research but also because previous results are almost homogeneous (positively correlated with ERM). Similarly, the institutional ownership variable is found to have a positive correlation with ERM in all previous empirical studies. Furthermore, nearly 100 percent of insurance firm has institutional ownership. That is why there is no interest to take into account this variable between adopting ERM and non-adopting ERM insurance firms.

Although the empirical results generally support our hypotheses, some results remain unexplained. The hypothesis that adopting firms have higher operational performance is justified with some variables but not with others. For instance, ROA is found to have a positive coefficient with ERM but not statistically significant. Meanwhile, combined ratio, solvency ratio and EPS are found to be in a negative relation with ERM, but similarly are not significant. These results may be due to heterogeneous policies applied to the accounting standards. With accounting tactics and internal models, book value of certain indicators could be justified to balance firm's strategies. Nevertheless, such a pattern may also have implications beyond the explanatory ability of the argument we provide to explain the difference between adopting and non-adopting ERM firms.

There are several limitations in this study that have implications for future research. First, although there are firms that implement ERM before 2007, the sample does not

include this period due to the unavailability of data. Moreover, generalization of our results is limited and the findings may be different for insurers in countries other than the European Union. Therefore, future studies should enlarge the sample to capture more statistical proprieties. Second, I suggest that more complex firms would adopt ERM but the indications for risk management strategies e.g., reinsurance activities or hedging portfolio are not included in the model specification. Including these indicators can contribute to our knowledge about ERM and risk management strategy in the insurance industry. Third, as ERM maturity is classified with different levels, the model specification should use multi-level logistic regression. However, as the limits of sample and data availability, further research should take issue in consideration. Finally, a combination with qualitative method, i.e. surveys will give more robust results. One of the explanations may be that with questionnaires, researchers can access other aspects of ERM, especially perception assessments.

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