AN EMPIRICAL INVESTIGATION OF DRIVERS AND VALUE OF ENTERPRISE RISK MANAGEMENT IN EUROPEAN INSURANCE COMPANIES

Keywords: Enterprise risk management, firm characteristics, shareholder value, Solvency II

In the course of the recent regulatory development in the aftermath of the financial crisis, e.g. the introduction of Solvency II in 2016, holistic enterprise-wide risk management (ERM) frameworks have become increasingly relevant for insurance companies (see, e.g., Beasley et al., 2005; McShane et al., 2011). Solvency II requires an integrated, enterprise-wide perspective on a firm's entire risk portfolio in contrast to traditional silo-based risk management approaches, and the risk management system has to be consistent with the company's overall business strategy (see, e.g., Gatzert and Wesker, 2012). Moreover, rating agencies such as Standard & Poor's or A.M. Best emphasize the importance of a holistic risk management and have started to consider specific ERM rating categories to evaluate the financial strength as well as the creditworthiness of insurance companies (see, e.g., Standard & Poor's, 2013; Berry-Stoelzle and Xu, 2014). While ERM activities are highly relevant for insurers to comply with Solvency II requirements (especially Pillar 2), the implementation of an ERM system should also contribute to enhancing shareholder value according to the theoretical and empirical literature, e.g. by supporting the board and senior management with necessary risk management information, by increasing capital efficiency, and by better exploiting natural hedges within the company (see, e.g., Meulbroek, 2002; Beasley et al., 2008; Gatzert and Martin, 2015).

In the literature, several empirical papers study the determinants and value of ERM. Besides describing the stage of the ERM implementation (see, e.g., Thiessen et al., 2001; Kleffner et al., 2003; Beasley et al., 2009, 2010; Daud et al., 2010, Altuntas et al., 2011a, 2011b; Daud et al., 2011; Yazid et al. 2011), several empirical papers focus on determinants of ERM implementation (see, e.g., Liebenberg and Hoyt, 2003; Beasley et al., 2005; Hoyt and Liebenberg, 2008, 2011; Pagach and Warr, 2011; Razali et al., 2011; Golshan and Rasid, 2012; Farrell and Gallagher, 2014; Lechner and Gatzert, 2016). Another strand of the literature concerns the impact of ERM implementations on a firm's shareholder value (see, e.g., Hoyt and Liebenberg, 2008, 2011; Beasley et al., 2008; McShane et al., 2011; Baxter et al., 2013; Farrell and Gallagher, 2014; Tahir and Razali, 2011; Li et al., 2014; Lechner and Gatzert, 2016). Most of these empirical studies show that ERM can indeed contribute to increasing shareholder value. However, since the conclusions are typically based on data sets that focus on specific markets or industries, a generalization of results for European insurance companies is difficult due to differences in regulation such as Solvency II. In addition, most of the empirical studies use a keyword search in annual reports regarding the existence of a Chief Risk Officer (CRO) or a risk management committee as a proxy to determine whether an ERM system is implemented or not (see, e.g., Liebenberg and Hoyt, 2003; Hoyt and Liebenberg, 2011; Pagach and Warr, 2011; Lechner and Gatzert, 2016). One exception is the study of McShane et al.

(2011), who use the Standard & Poor's ERM rating to identify ERM activities of firms for U.S. data.

The aim of this paper is to contribute to the literature by analyzing the impact of ERM on the shareholder value of European insurance companies using the Standard & Poor's ERM rating to identify the insurers' ERM activities. This has not been done so far and is also of high relevance against the background of the introduction of Solvency II, which requires a holistic approach to risk management. Our analysis is thus intended to provide insight regarding the value of ERM with specific focus on European insurance companies, where we also study the determinants for implementing an ERM system (firm characteristics). By making use of the Standard & Poor's ERM rating, we are also able to overcome potential limitations regarding the determination of ERM.

Our data set consists of a sample of European insurance companies for the time period from 2009 to 2014 and is based on the Thomson Reuter's database. We focus on publicly traded insurers in order to be able to calculate Tobin's Q as a market-based measure of firm value, which is consistent with the literature. We first use logistic regression analysis to study the determinants of an ERM implementation, focusing on company size, financial leverage, capital opacity, financial slack and variation of the monthly returns of firms. To measure the impact of ERM on an insurance company's firm value, we follow Hoyt and Liebenberg (2011) and apply a full maximum-likelihood treatment effects model in a two-equation system to control for the endogeneity bias of ERM activities. The problem of endogeneity may thereby arise due to the fact that there are factors that have an impact on the decision to implement ERM and on the firm value at the same time. For instance, firm size influences a company's decision to implement ERM as well as its firm value. In a first equation (ERM Equation), the indicator variable ERM is regressed on various factors, while in a second equation (Q Equation), firm value is modeled as a function of ERM and covariates. The treatment effects approach thus allows us to model these two equations simultaneously in order to avoid the problem of endogeneity.

First results show a significant positive impact of ERM on firm value for the case of European insurers (see Table 1). In particular, Tobin's Q (denoted as *Q*) serves as a proxy for firm value and is calculated by (market value of equity + book value of liabilities) / book value of assets. *ERM* is an indicator variable determined based on the Standard & Poor's ERM rating, which is equal to 1 in case of an ERM rating belonging to the categories "very strong" (formerly denoted as "excellent") or "strong", and 0 otherwise, i.e. for the rating categories "adequate with strong risk controls", "adequate", and "weak" (and formerly also "adequate with positive trend"). *Size* represents the company size and is given as the natural logarithm of the book value of an insurance company's total assets. *Leverage* stands for financial leverage and is calculated as the quotient of book value of liabilities to the market value of equity, i.e. market capitalization. *ROA* measures profitability and is given as the ratio of net income to the book value of total assets. *SalesGrowth* measures the growth in net sales with regard to the sales level of the preceding year, i.e. it is given by $(sales_t - sales_{t-1}) / sales_t$.

Dividends is an indicator variable equal to 1 in case an insurer paid dividends in the respective year, 0 otherwise. *Opacity* is the ratio of total intangible assets to the book value of total assets. *Slack* is calculated as the quotient of cash and equivalents divided by the book value of total assets. *LnLagSdReturns* denotes the natural logarithm of the standard deviation of the monthly stock returns (cum dividend) for the prior year.

The likelihood-ratio test of independent equations indicates that we can reject the null hypothesis (at a 1% level of significance) of uncorrelated error terms of the two equations (ERM Equation and Q Equation), which supports the application of the treatment effects model. In order to assess the model's goodness of fit, a Wald test is used with the hypothesis that all the parameters in the regression model are zero (except the constant). According to this overall model test statistic, we can conclude that the covariates are appropriate and at least one covariate has an impact that is nonzero, respectively (see, e.g., Guo and Fraser, 2009).

As can be seen from the first results in Table 1, we find that insurers with an ERM system exhibit a Tobin's Q that is, on average, about 16% higher than for insurers without an ERM after controlling for covariates and endogeneity bias. We further identify firm characteristics of European insurers that increase the probability of implementing an ERM system, which comprise drivers such as firm size, financial leverage, and variation of the monthly returns of firms. In summary, our study of European insurers emphasizes that a holistic enterprise-wide risk management can indeed create value that may be beyond pure regulatory compliance.

Table 1: Full Maximum-Likelihood Treatment Effects Estimates

	ERM Equation	Q Equation
ERM		0.160690 (0.017487)***
Size	0.397428 (0.068155)***	-0.035695 (0.008250)***
Leverage	-0.027213 (0.008665)***	0.002553 (0.001062)**
ROA		2.011449 (0.380523)***
SalesGrowth		-0.000226 (0.022917)
Dividends		0.160941 (0.042032)
Opacity	-2.781568 (4.120126)	
Slack	0.938673 (0.798836)	
LnLagSdReturns	-0.479884 (0.140302)***	
Constant	-5.933666 (1.128807)***	1.379981 (0.136767)***
Number of observations	177	
Likelihood-ratio test	96.51***	
Wald test	133.66***	

Notes: Standard errors are given in parentheses, whereas statistical significance is denoted by '**' for the 5% level and '***' for the 1% level.

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