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Corporate Governance and Risk Taking: Evidence from the U.K. and German Insurance Markets

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Abstract

We analyze the impact of factors related to corporate governance (i.e., compensation, monitoring, and ownership structure) on risk taking in the insurance industry. We measure asset, product, and financial risk in insurance companies and employ a structural equation model in which corporate governance is modeled as latent factor. Based on this model, we present empirical evidence on the link between corporate governance and risk taking, considering insurers from two large European insurance markets. Higher levels of compensation, increased monitoring (more independent boards with more meetings), and more blockholders are associated with lower risk taking. Our empirical results provide justification for including factors related to corporate governance in insurance regulation.

Keywords: Risk Management, Corporate Governance, Agency Theory, European Insurance Industry, Solvency II, Financial Market Crisis, Structural Equation Model, Asset Risk, Product Risk, Leverage

1 Introduction

We analyze the impact of the corporate governance environment on risk taking for insurance companies from the U.K. and Germany—an important topic in light of the financial crisis, which has illustrated the link between corporate governance and risk taking (see Fahlenbrach

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and Stulz, 2011; Eling and Schmeiser, 2010; Lehmann and Hofmann, 2010). This topic is also important in light of Solvency II, the redefinition of capital adequacy, risk management, and disclosure requirements for insurance companies in the European Union. Capital adequacy, risk management, and disclosure requirements are all areas related to corporate governance.

We build on recent advances from capital/risk and agency literature and proxy risk taking by asset, product, and financial risk measures (see Baranoff, Papadopoulos, and Sager, 2007). We use a structural equation model to establish the relationship among these three risk measures and a measure of corporate governance. Structural equation models are advantageous in this context because they allow the description of the insurer's corporate governance environment using multiple equations while accommodating unobservable, latent factors (see Bollen, 1989). In our model, we depict corporate governance as a latent factor related to five observable variables: executive compensation, supervisory board compensation, supervisory board independence, number of board meetings, and number of blockholders.

We analyze *compensation* (executive and supervisory board compensation), *monitoring* (supervisory board independence, number of board meetings), and *ownership structure* (number of blockholders). With regard to *compensation*, both the absolute level and the structure of compensation and their implications for risk taking have been topics of discussion during the recent financial crisis (see Fahlenbrach and Stulz, 2011). With regard to *monitoring*, the structure of the supervisory board has been identified as driver of firm risk (see Pathan, 2009). As to *ownership structure*, the existence of large shareholders might influence risk taking (see Shleifer and Vishny, 1986; Wright et al., 1996) as they attend shareholder meetings more often and have concentrated voting power.[1]

In this paper, we focus on stock insurance companies and follow John, Litov, and Yeung (2008) by considering corporate governance as the level of investor protection. The separation

[1] Due to the move away from local GAAP and toward International Financial Reporting Standards (IFRS), a major change in *disclosure requirements* is also included in our analysis.

of decision making and decision control leads to agency conflicts between investors (i.e., shareholders and policyholders) and executives that can be mitigated, for example, by incentive contracts, monitoring, and disclosure requirements (see, e.g., Jensen and Meckling, 1976; Fama and Jensen, 1983; Chen, Steiner, and Whyte, 1998).

Our main hypothesis is that corporate governance (i.e., the level of investor protection) is an important mechanism that directly influences insurance companies' risk taking. We thus empirically test for a relationship between the latent factor "corporate governance" and proxies for risk taking—namely, asset, product, and financial risk—while accounting for typical control variables such as size, year, and country. We consider a panel of 292 firm years for U.K. and German insurers, ranging from 1997 to 2010.[2]

In line with much of the extant literature (see, e.g., John, Litov, and Yeung, 2008; Laeven and Levine, 2009), we empirically document that corporate governance affects risk taking. All elements used in this paper to determine the corporate governance environment (compensation, monitoring, ownership structure) have a significant impact on risk taking, but the results partly depend on the considered risk measure. Our results indicate that higher compensation, more monitoring, and a higher number of blockholders are associated with lower risk taking. We conclude that corporate governance mechanisms need to be closely considered in insurance regulation as they affect these companies' risk taking.

To our knowledge, this analysis is the first attempt to analyze the effects of the insurers' corporate governance environment on its risk taking behavior in a structural equation modeling context. Furthermore, we are not aware of any empirical research that uses a dataset of U.K. and German insurers to evaluate risk taking at an international level. A great deal of literature has been published on governance and risk taking since the development of agency

[2] Choosing the U.K. and Germany for this investigation is expected to be especially fruitful as the corporate governance regimes in these two countries are fundamentally different. The U.K.'s one-tiered control system, with a combined board of executive and non-executive directors, makes its market-based system similar to that of the United States. Germany is an example of a control-based regime, which involves separate managing and supervisory boards, is similar to many continental European countries and Japan.

theory in the 1970s but the empirical evidence for insurance markets outside the United States remains limited (for an overview on corporate governance literature in the insurance industry see also Boubakri, 2011).

The remainder of this paper is structured as follows. In Section 2, we develop our hypotheses. In Section 3, we explain the modeling approach and Section 4 explains the data and variables. Section 5 presents our main results and Section 6 robustness tests. We conclude in Section 7.

2 Hypothesis Development

Corporate governance can be described as a set of mechanisms aimed at the alignment of interests between investors and executives and, therefore, the protection of investors' interests. Corporate governance thus addresses the mitigation of agency conflicts in a corporation. The theory of the firm (Jensen and Meckling, 1976) identifies, amongst others, three factors that can mitigate agency conflicts and that might affect risk taking: management incentives, monitoring, and ownership structure. Other factors related to corporate governance include the degree of regulation and disclosure requirements, which will be discussed later, but are not the focus of this paper.

Existing literature tends to focus on the relationship between certain elements of corporate governance and risk taking or firm performance, while using other elements related to corporate governance as control variables. For example Cole et al. (2011) analyze the effect of ownership concentration and John, Litov, and Yeung (2008) the effect of shareholder protection (i.e., the quality of accounting disclosure standards, the rule of law, and an index of anti-director rights) on risk taking. Core, Holthausen, and Larcker (1999) examine the effect of firm performance on executive compensation. He, Sommer, and Xie (2011) and He and Sommer (2011) explore the role of board monitoring and CEO turnover in the context of firm performance. In this paper, we analyze the effect of several elements, which are typically considered in the corporate governance literature, on risk taking. The extensive capital/risk literature developed in recent years provides another important foundation for this paper. We build upon this literature in two ways: in the way risk is modeled (considering asset risk, product risk, and financial risk, i.e., leverage, following Baranoff and Sager, 2002) and in the methodology employed (use of structural equation models following Baranoff, Papadopoulos, and Sager, 2007).[3]

Compensation. Interests between investors and executives may be aligned through compensation schemes (see Jensen and Meckling, 1976). One important aspect in this context is the level of the executive compensation compared to the market average.[4] In a free market with utility-maximizing managers, managers work for companies in which they receive the highest utility. In light of utility theory, the level of compensation might be positively correlated with business risk. The higher probability of losing a job due to insolvency calls for higher compensation. Managers of high-risk firms should thus receive higher compensation based on the uncertainty of future employment (see Grace, 2004; Gray and Cannella, 1997). Given that much of an employee's human capital (and thus value in the job market) is specific to the company, executives who are fired are unlikely to find new jobs that pay as well as their previous position (see Jensen and Murphy, 1990). Furthermore, Guay (1999) argues that executives' risk aversion may be negatively related to total compensation.

However, the empirical evidence regarding the relation of total executive compensation and firm risk is not entirely conclusive. Core, Holthausen, and Larcker (1999) and Gray and Cannella (1997) find a negative relation between risk taking and total compensation, but no significant relationship is found by Grace (2004). With regard to incentive compensation, option payments in particular are found to be positively related to firm risk (see Chen, Steiner, and Whyte, 2006; Milidonis and Stathopoulos, 2011). The alignment of interests through compensation schemes may thus lead to higher firm risk as potentially desired by the

[3] In addition to the risks modeled in this paper, other types of risk often cannot be quantified but should be considered in risk management, such as operational risk or legal risk (see, e.g., Baranoff and Sager, 2002; Santomero and Babbel, 1997).

[4] Another important aspect is compensation based on options, which has often been viewed as problematic during the recent financial crisis as this type of compensation could create an incentive to increase risk taking. In this paper, effects of higher variable compensation are covered by the higher variability of total compensation compared to the industry average. In our sample, especially for many German firms, the variable compensation itself is not completely observable and thus not included.

shareholders (see, e.g., John, Litov, and Yeung, 2008; Laeven and Levine, 2009). In addition, shareholders' and directors' interests may be aligned through accordingly structured compensation plans, as shown by Fich and Shivdasani (2005). We use the total executive and supervisory board compensation to depict the compensation level within the firm and expect a positive relation between the level of total compensation and firm risk.

Monitoring. The relationship between monitoring and risk taking is not clear cut. The monitoring by the board of directors is seen as an important corporate governance mechanism and a mean for shareholder influence (see John and Senbet, 1998). A board with more independent members and more meetings might monitor its executives more strictly.[5] Stricter monitoring should limit executive discretion and decrease opportunities for excess risk taking, which might ultimately lead to a negative relation between monitoring and risk taking. However, alignment of interests of investors and executives could also increase risk taking, if this is in the interests of investors. In this context, Pathan (2009) find a positive relationship between strong boards (measured by size and independence, amongst others) and banks' risk taking, but Brick and Chidambaran (2008) find the opposite relation of board monitoring (proxied by board independence) and firm risk in the absence of regulation.

The role of board independence, represented by the share of independent or outside directors, is thoroughly discussed in existing insurance literature. More outside directors are employed by mutuals (Mayers, Shivdasani, and Smith, 1997) and in firms with a higher degree of ownership concentration (He and Sommer, 2010). More outside directors are also related to higher executive pay for performance sensitivity (Mayers and Smith, 2010). Huang et al. (2011) analyze the role of independent directors in the context of firm efficiency. Outside the insurance literature, Hermalin and Weisbach (2003) argue that when CEOs have more bargaining power the board's independence decreases; Hermalin and Weisbach (1998) further

[5] In an insurance context, regulators, intermediaries such as brokers, and competitors also engage in monitoring, a phenomenon not widely prevalent in other industries. As these effects cannot be quantified with our data, we focus on the monitoring by the supervisory board.

argue that board effectiveness depends on its independence. Therefore, we assume that an increased number of independent directors signals stronger monitoring by the board. The same impact is assumed for the board meeting frequency: a higher number of meetings should be associated with increased monitoring. In general, an unusual number of meetings could indicate problems in the corporate governance regime or other possibly risky issues necessitating a higher number of meetings. In this context, Vafeas (1999) discusses increments in firm operating performance after years with abnormal board activity, highlighting the relevance of the board's meeting frequency. Overall, a positive as well as negative relation of monitoring to risk taking could be expected.

Blockholders. Because they attend shareholder meetings more often and have the advantage of concentrated voting power compared to small investors, large shareholders (or blockholders) might influence business decisions and, as a result, risk taking. Agrawal and Mandelker (1990) provide evidence for the active monitoring of large shareholders and that they increase shareholder wealth in the context of antitakeover charter amendments. In addition, Shleifer and Vishny (1986) argue that many small investors may have no incentive to control management due to free-riding. In this paper, we consider blockholders, i.e., shareholders holding more than 5% of the voting rights, as proxy for the ownership structure.[6] In general, shareholders may have the incentive to increase the value of their investment, which can be considered as a call option, by increasing the firm's risk, as demonstrated in the case of guarantee funds by Merton (1977) for banking and Cummins (1988) for insurance. However, as the number of blockholders increases, so may the number of investors holding a not optimally diversified portfolio (see Cole et al., 2011). Relying on Fama and Jensen (1983), Cole et al. (2011) further argue that increased ownership concentration raises "the cost

[6] An important aspect regarding the ownership structure in the insurance industry is the coexistence of stock and mutual insurers, which is not considered in this paper, as we focus on stock insurers. Several corporate governance mechanisms are impaired for mutual insurers as there are, for example, no stock analysts or impaired takeover threats. In this context, Lamm-Tennant and Starks (1993) demonstrated that stock insurers exhibit more risk than mutual, thereby emphasizing the relevance of ownership structure for risk taking.

of risk-bearing services" that may lead to "less investment in risky projects" (p. 54). Indeed, they identify a significant negative impact of ownership concentration on risk taking, generally consistent with the suboptimal diversification hypothesis. Also, Cheng, Elyasiani, and Jia (2011) find a negative impact of the ownership level and number of institutional investors on risk taking of insurance companies. Based on this evidence from the United States, we expect that in the U.K. and Germany the number of blockholders is negatively associated with risk taking.

Corporate governance. We use a structural equation model that allows us to analyze the combined effect of different variables on risk taking and derive an estimate for the total effect of corporate governance on risk taking. According to John, Litov, and Yeung (2008), the connection between corporate governance, interpreted as investor protection, and risk taking is not trivial as arguments can be mode for both a positive and negative link. On the one hand, higher investor protection may lessen managerial discretion and consequently limit opportunities for excess risk taking; thus, we might expect a negative relationship between corporate governance and risk taking. On the other hand, better investor protection could lead management to undertake riskier but value-enhancing activities, implying a positive relation between investor protection and risk taking.

Several studies empirically document a positive relationship between corporate governance mechanisms and risk taking for the United States (John, Litov, and Yeung, 2008; Chen, Steiner, and Whyte, 2006; Lamm-Tennant and Starks, 1993). In light of these results, we expect the relationship of corporate governance and risk taking to be positive. However, one particularly important aspect in the insurance context is that policyholders, regulators, and other market participants screen risk taking, which might again limit the opportunities for excessive risk taking.

Other factors. Other factors related to corporate governance are used as control variables in our study. A higher *degree of regulation* (such as price, product, or capital regulation) lowers competition in an industry. A low degree of competition without differentiation in products and prices might lower risk, but also has a dampening effect on innovation. Since 1994, all European insurers basically operate in a single market and are supervised by their home regulatory agency. Differences in the regulatory framework will be covered by country dummy variables. More *disclosure requirements* reduce information asymmetry between owners and managers. Consequently, less information asymmetry leads to more accurate estimates of future earnings, which determine the company's value. An important development in Europe during our investigation period is the change from local GAAP to IFRS, which were introduced to enhance the transparency and international comparability of financial reports by means of more and standardized disclosure requirements (see Daske et al., 2008).[7]

3 Methodology

The connection between the variables discussed in Section 2 and risk taking can be tested separately, e.g., by using panel data regression. However, the risk environment of an insurance company is a complex bundle of internal and external effects, which complicates the isolation of the effects of a single risk driver; moreover, risk drivers can also be determined endogenously (see Hermalin and Weisbach, 1998). Thus, in this paper, we follow recent capital/risk literature and use a structural equation model (SEM) to analyze the relationship between corporate governance and risk taking.

SEMs consist of multiple regression equations constructed to reveal the effects of different proxies on dependent measures simultaneously. This setup allows us to include several risk measures (asset, product, and financial risk) in parallel, thereby deriving a more complete picture of the relationship between corporate governance and risk measures. In SEMs, direct relations between endogenous (dependent variables) and other variables (endogenous as well

[7] Various other factors that might affect the risk and performance of an insurance company (e.g., interest rates, inflation, or GDP) are discussed in the literature, but not considered in this paper. See, for example Cummins and Outreville (1987); Lamm-Tennant and Weiss (1997); Grace and Hotchkiss (1995); Chen, Wong, and Lee (1999).

as exogenous) are specified. These relations are called "paths", and the effects of the variables can be studied along these paths. Model parameters are estimated so that the resulting model covariance matrix, at best, equals the observed covariance matrix.

SEMs have a number of advantages in our context. First, SEMs can accommodate complex model structures that cannot be analyzed in a simple panel data regression model. SEMs are thus more flexible than standard regression analysis. Second, SEMs allow for the inclusion of latent, unobserved effects in the model. This is an advantage because corporate governance is not a directly observable and measurable variable; rather, we have a set of observable measures related to the corporate governance environment in which the insurer is active. However, SEMs also have disadvantages. Its flexibility offers a great number of possible modeling approaches for the same theory, making identification of the "right" model difficult as real-world causal relationships are rarely known. Furthermore, fitting the modeled covariance structure requires non-linear optimization methods that do not necessarily converge or may produce implausible solutions, such as negative variance estimates. Also, the stability of results depends on the number of observations (for more details on structural equation modeling, see Bollen, 1989).

We assume that five observable variables from three categories (i.e., compensation, monitoring, and ownership structure) proxy the insurer's corporate governance environment and determine the unobservable corporate governance factor.[8] The selection of the five proxies is based on the existing literature and, as in many international studies, is restricted by data availability. Figure 1 summarizes the model and interaction among variables. Rectangles represent manifest (i.e., observable) variables; ellipses represent latent factors. Latent factors are not measurable and represent unobservable effects that are modeled and estimated by their influence (in terms of covariance) on other variables according to the specified paths. A path

8 We also include disclosure requirements by considering different accounting standards. Our focus, however, is on internal risk drivers so that accounting standards are included as a control variable in this analysis.

is symbolized by a straight arrow from one variable to another and signifies direct influence. Figure 1 does not include estimated covariances among all exogenous variables. A mathematical formulation of the model is presented in Appendix A.

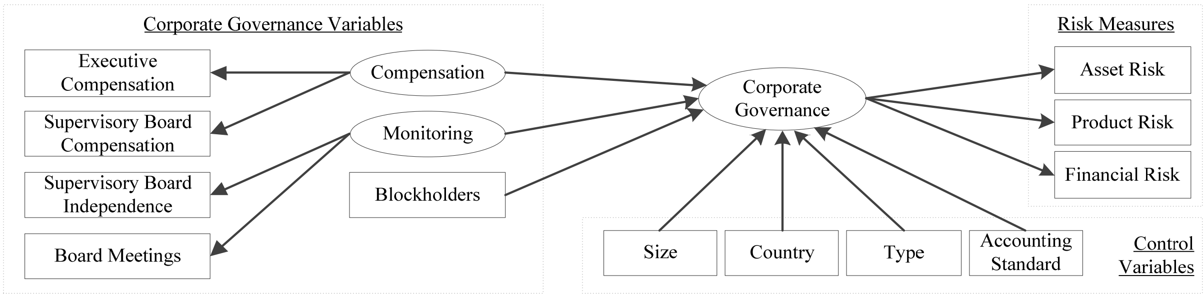

Figure 1: Path Diagram of Structural Equation Model

The centerpiece of Figure 1 is the latent corporate governance factor, representing investor protection. We consider five observable variables related to corporate governance and control variables for size, country, line of business (type), and accounting standard. In addition to corporate governance, compensation and monitoring are modeled as latent factors, while all other variables are manifest. The compensation factor is measured by executive and supervisory board compensation and the monitoring factor by supervisory board independence and number of supervisory board meetings. The rationale for modeling compensation and monitoring as latent variables is the same as for the corporate governance factor: we want to use the main advantage of SEMs as the monitoring and compensation level and mechanisms are not entirely observable.[9]

As shareholders also conduct a monitoring task (Agrawal and Mandelker, 1990), the number of blockholders could also be interpreted as part of monitoring. In this case, the blockholder variable would be a third manifest variable, along with the number of independent directors and board meetings. However, the role of blockholders can be more diverse than that of

9 An alternative way to model corporate governance is through corporate governance indices, such as the institutional GovernanceMetrics rating. These indices cannot be used for this analysis because they are neither available for all companies nor for a sufficiently long-time horizon. However, our variable selection is motivated by variables used in these indices, although these indices are much more detailed. See also Gompers, Ishii, and Metrick (2003) for the construction of corporate governance indices.

monitoring management activity. For example, they might exert influence on business decisions through their voting power, effects that could either increase or decrease risk. To reflect this potentially active role, blockholders are integrated separately, with a path pointing toward the corporate governance factor, thus indicating a direct influence on corporate governance.

4 Data and Variables

We employ data from publicly traded insurance companies in the U.K. and Germany. Our data contain insurers active in personal and commercial lines of business as well as reinsurance companies. We consider three risk measures, five corporate governance variables, and four control variables. As is the case with other cross-country analyses, we are restricted with respect to data availability and compatibility; in other words, all data have to be available in both countries, and the definition of variables needs to be comparable. For comparative purposes, all monetary values are converted into U.S. dollars using a fixed exchange rate and denoted in 1997 prices. All variables used in this paper are summarized in Appendix B.

4.1 Definition of Risk Measures

We follow classical capital structure literature (see Modigliani and Miller, 1958) and distinguish among business risk and financial risk when defining our risk measures. Regarding business risk, we cover the two main areas of business activity of insurance companies: investing and underwriting. We consider two (alternative) asset risk measures—namely, the opportunity asset risk (OAR) and the regulatory asset risk (RAR) factors defined by Baranoff, Papadopoulos, and Sager (2007)—and one product risk measure based on loss and benefit ratios. Regarding the distribution of business risk among shareholders and policyholders, we consider the ratio of total investments to equity as leverage or financial risk measure.[10]

The OAR measure is based on the standard deviation of a theoretical asset return. Calculation of a theoretical asset return is necessary because an insurer's investment returns cannot be directly observed in sufficient frequency. Moreover, the published return data are often influenced by accounting measures, so that even more frequent data might not be appropriate for our purpose. The principal idea of OAR is to combine individual company asset allocation data with return data on these assets. The resulting weighted return is used to derive a volatility-of-returns-based indicator for the asset risk. Insurance companies allocate their funds to a variety of asset classes: stocks, bonds, money market, real estate, hedge funds, private equity, commodities, and many more. However, typically, an insurer's investment portfolio can be well approximated by considering the asset classes of stocks, bonds, money market, and real estate (see, e.g., Eling and Schuhmacher, 2007, who analyze the typical investment portfolio of an insurance company). In general, alternative asset classes such as hedge funds, private equity, or commodities account for only a small portion of the total investments (typically less than 5%). It is possible to extend the model to more asset classes, but because of data availability, we restrict ourselves to these four asset classes. Note that we assume that the insurer's portfolio is entirely composed of these four asset classes; thus, the portion of other asset classes is zero.

To derive a value for the OAR measure, the asset structure (portion of stocks, bonds, money market, and real estate), which is determined based on individual company data, is multiplied by index returns for predefined stock, bond, money market, and real estate indices.[11] The

[10] Alternatively, leverage might also be considered as a control variable in our model. Since the focus of this analysis is on risk taking, we decided to integrate leverage as a measure for financial risk instead.

[11] The Bloomberg data used in this analysis for the calculation of the asset weights are oriented at the IFRS balance sheet. Other asset positions, such as assets available for sale, may include assets from the four considered assets classes, but are not used in this analysis because the Bloomberg data do not allow for the

indices used for the calculation are summarized in Table 1. It is important to consider a set of consistent indices by, for example, applying the Sharpe (1992) rules for selecting benchmark indices. Using weekly index return data for the four asset classes, 52 weekly asset returns per year are calculated. The portfolio weights are available only once a year and thus kept constant throughout the year. The logarithm of the annualized standard deviation of these 52 observations equals the OAR factor.

Asset Class	U.K.	Germany
Stocks	S&P United Kindgom BMI £ Total Return Index (SBBUKD£)	S&P Germany BMI Total Return Index (SBBGERL)
Bonds	U.K. Benchmark 10-Year Datastream Govt. Index Total Return Index (BMUK10Y)	Germany Benchmark 10-Year Datastream Govt. Index Total Return Index (BMBD10Y)
Money Market	JPMorgan U.K. Cash 3-Month Total Return Index (JPUK3ML)	JPMorgan Germany Cash 3-Month Total Return Index (JPBD3ML)
Real Estate	GPR General PSI U.K. Total Return Index (GPRGUKL)	GPR General PSI Germany Total Return Index (GPRGGYL)

Table 1: Indices for calculation of opportunity asset risk measure

The second asset risk measure, the regulatory asset risk (RAR) factor, is calculated as the asset allocation multiplied by fixed penalty weights used in the U.S. risk-based capital formula. RAR is defined as the logarithm of 0.3 · weight stocks + 0.1 · weight real estate + 0.065 · weight bonds + 0.003 · weight money market (the weights are oriented to the values used in Baranoff, Papadopoulos, and Sager, 2007). As such, RAR only covers changes in asset allocation and might be a more robust measure than OAR, which covers changes in asset allocation and the volatility of the underlying asset classes.

As a product risk measure, Baranoff, Papadopoulos, and Sager (2007) use, due to data limitations, the proportion of premiums from health and annuity lines, but note that loss ratios might be better proxies for the liability-side risk. Therefore, we use loss and benefit ratios to calculate the product risk measure. Also, Lamm-Tennant and Starks (1993) base their risk

precise allocation of these assets to one of our four asset classes. The used asset allocation thus has to be interpreted as an approximation of the true asset allocation.

measure on the variance of loss ratios. The loss ratio for non-life insurance companies is defined as the ratio of total net claim payments and reserve adjustments to earned net premiums. For life insurers, the benefit ratio is calculated as the ratio of net benefit payouts to earned net premiums. For the calculation of the product risk measure, the variation of the weighted sum of the respective loss and benefit ratio on a yearly basis is used. The weights are calculated according to the earned net life and non-life premiums. Thus, for insurers writing exclusively life or non-life business, the product risk measure equals the standard deviation of the benefit or loss ratio. The weighing is necessary to allow for the inclusion of multi-line insurance companies. The product risk is then calculated as the logarithm of the 12-year rolling standard deviation of the weighted sum. We calculate the volatility only when all 12 data points are available; thus, missing values for early years are extrapolated by means of country-specific changes in industry-wide loss and benefit ratios.[12]

To measure financial risk, we use the logarithm of the ratio of total investments to total shareholder equity—namely, a measure for the leverage or capital structure of the insurer.[13] Total investments are defined as the sum of short-term investments, loans and mortgages, fixed income securities, equity securities, real estate investments, and other investments. Total shareholder equity is composed of common equity, minority interest, and preferred equity.

12 The benefit ratio might be influenced by the portfolio composition (insurance vs. investment contracts; older portfolios might have higher payouts). However, we consider the variation of the benefit ratio, so that the portfolio composition should not affect our results too much. It might be more adequate to build a product risk measure based on expected losses, but unfortunately we have no data on expected losses available. Our measure of product risk is thus limited and only provides a rough proxy of the true underwriting risk.

13 Much research has been done in recent years regarding capital structure and risk taking. The two most important hypotheses in the capital/risk literature are the finite risk and excessive risk paradigms. The finite risk paradigm claims that capital and risk are positively related (see, e.g., Berger, 1995 for banking, Cummins and Sommer, 1996 for property/casualty, and Baranoff and Sager, 2002, 2003; Baranoff, Papadopoulos, and Sager, 2007 for the life and health insurance industry). The excessive risk paradigm claims that capital and risk are negatively related (see, e.g., Cummins, 1988; Berger, Herring, and Szegö, 1995; Downs and Sommer, 1999). Most studies suggest that the insurance industry operates within the finite risk rather than the excessive risk paradigm (Cummins and Sommer, 1996; Baranoff and Sager, 2002, 2003); however, more recent evidence related to the financial crisis by Baranoff and Sager, 2009 does not support the finite risk paradigm.

4.2 Definition of Corporate Governance Variables

For executive compensation, the logarithm of the total compensation per executive is used, that is, fixed and variable salaries are integrated into our measure. This encompasses only payments made in the respective year and thus excludes the current value of granted options or value of granted but deferred compensation. For the U.K., the executive officers of the board of directors and for Germany the members of the management board are counted as executive officers. Officers replaced throughout the year are counted only once. Accordingly, the total compensation for all executives—both active and those who resigned during the year—is used in calculating the average compensation in order to mitigate distortions from officers being replaced or resigning.

Supervisory board compensation is the logarithm of the total compensation per board member. As for the executive compensation, replaced members are counted only once, and the complete supervisory board compensation is considered. All non-executive directors (for the U.K.) and all members of the control board (for Germany) are considered to be members of the supervisory board.

Two variables are included to represent monitoring of executives by the supervisory board: supervisory board independence and number of board meetings. Supervisory board independence is the ratio of independent supervisory board members to the total number of supervisory board members. In the U.K., there are objective criteria on independence of non-executive directors and this independence status is disclosed in annual reports. No such reporting of independence of supervisory board members is available for German firms. As an approximation, all executive officers (including former executives and those of parent companies) and regular employees who are on the supervisory board are considered to be non-independent. The board meeting variable denotes the absolute number of meetings of the supervisory board held throughout the year. Thus, for the U.K. the total number of meetings of the board of directors and for Germany the total number of meetings of the supervisory board are considered.

The blockholders variable represents the number of groups or individuals holding a significant portion (5% or more) of voting shares at a certain reporting date. It might be that the number of large blockholders changes during the year, but ignoring any such changes should not be a serious issue for our analysis as large ownership positions usually do not change more than once a year.

4.3 Definition of Control Variables

Size, defined as the logarithm of total assets, is frequently employed as a control variable in empirical studies (see, e.g., John, Litov, and Yeung, 2008; Laeven and Levine, 2009). Larger companies realize economies of scale; in addition, their insurance portfolios should be more diversified, and claims or benefits should be more predictable. Larger companies on average also receive more media attention than smaller companies, which may also affect managerial behavior and thus the level of investor protection.

The country variable is a dummy variable, with a value of 1 for German insurance companies and 0 for U.K. insurance companies. The classification is based on the country of domicile of the insurer. Because of the differences between the U.K. market-based and the more prudent German regulation, we expect that both corporate governance and risk taking depend on the firm’s country of origin. German and U.K. insurance companies face different requirements regarding disclosure. German companies can, but are not required to, follow the German Corporate Governance Code (see http://www.corporate-governance-code.de), a set of non-binding rules on disclosure and internal governance. The U.K. publication rules are mandatory. For example, under the German Corporate Governance Code, executive compensation can be published on an individual basis; in the U.K., individual publication is mandatory. Combined with the cultural differences between U.K. and German insurers, this difference in regulatory regime seems likely to lead to regional differences.

The type of insurance is used as a control variable because life and non-life insurance are different business models with differences in premium calculation, reserving, and investment strategy. The type variable is constructed as a combination of two dummy variables because we consider three types of insurance companies: life, non-life, and multi-line. Therefore, a life dummy and a non-life dummy variable are included in the model. If more than 75% of the net premiums are from life insurance business, this line is considered to be dominant and the life dummy takes the value 1, while the non-life dummy takes a value of 0. The opposite is true if more than 75% of total earned net premiums stem from non-life business. Both dummies are set to 0 and the insurer is treated as a multi-line insurance company if no line is dominant (reinsurers are treated accordingly). The accounting standard is represented by a dummy variable that takes the value 0 if the firm uses local GAAP and 1 if IFRS is used.

4.4 Data Preparation and Summary Statistics

The base sample is an unbalanced panel of 307 firm years from 1997 to 2010, with 185 observations from German and 122 from U.K. insurers. A total of 35 companies are included in the analysis.[14] All variables—except for the control variables country, type, and accounting standard—are standardized to a mean of 0 and a variance of 1 within each year prior to the model estimation to adjust for time fixed effects and time heteroskedasticity (see Baranoff, Papadopoulos, and Sager, 2007).

SEM estimation results can be distorted by high kurtosis or deviation from multivariate normality. We therefore trim the 5% observations from the standardized base sample contributing the most to the sample kurtosis, measured by Mardia's distance, which is based

[14] In Germany and the U.K., many stock insurers are not publicly traded and many other insurers are mutuals. Nevertheless, for the year 2008, our sample covers about 70% of German and 33% of U.K. gross insurance premiums earned.

on deviations from means under consideration of the covariance structure. After trimming, we consider a sample of 292 observations for our regressions.

For calculation of the risk measures, return data from several market indices as well as balance sheet data from insurer annual reports are needed. The balance sheet data are obtained from the Bloomberg Professional database and the capital market data from Thomson Reuters Datastream. Data on corporate governance are hand-collected from the companies' annual reports. Exchange rates and consumer price indices for conversion into U.S. dollars and correction for inflation are obtained from the OECD statistics database (http://stats.oecd.org).

Table 2 presents average values for the risk measures, the corporate governance variables, and selected control variables (all numbers are before standardization). Results are reported for the full base sample, by type (life, non-life, multi-line), and country (Germany, U.K.).

The OAR, i.e., the volatility of theoretical asset returns, is higher for life insurance companies than for non-life insurance companies. This result is expected, as life insurance business typically encompasses a long-term savings component and invests in riskier assets compared to the shorter-term non-life business. The fact that life insurers on average invest in riskier assets is also reflected in the regulatory asset risk measure (RAR), which penalizes riskier assets with higher weights. On average, German insurers have significantly higher OAR values than U.K. insurers. Due to regulatory restrictions on asset allocation, it has traditionally been believed that U.K. insurers are riskier investors than German insurers (for a description of the pre-1994 regulation in these two markets see Rees and Kessner, 1999). However, we do not find significant differences for U.K. and German insurers regarding RAR. The differences in OAR might also be explained by the indices chosen to proxy portfolio returns.

Variables	Full sample	Life	Non-Life	Multi-Line	U.K.	Germany
Opportunity Asset Risk (%)	6.14	6.90 †/‡	5.49	6.00	5.65 +	6.46
Regulatory Asset Risk (%)	12.21	14.70 †/‡	9.58 *	12.24	11.66	12.57
Product Risk (%)	14.97	25.44 †/‡	11.35 *	8.31	24.17 +	8.91
Financial Risk	28.57	53.66 †/‡	15.32	16.78	16.73 +	36.38
Executive Comp. (US-$)	843,551	794,850 ‡	735,326 *	989,098	1,150,116 +	641,384
Supervisory Board Comp. (US-$)	78,477	83,824	76,147	75,515	113,364 +	55,471
Supervisory Board Indep. (%)	65.28	67.48 ‡	69.35 *	59.46	86.96 +	50.99
Board Meetings	6.08	7.01 ‡	6.27 *	5.02	8.89 +	4.23
Blockholders	1.75	1.31 †/‡	2.93 *	1.07	2.41 +	1.31
Size (million US-$)	62,599	40,009 †/‡	6,828 *	135,214	34,141 +	81,366
Accounting	0.54	0.51	0.52	0.58	0.61 +	0.49
Sample size (Germany)	307	102 (52)	98 (40)	107 (93)	122	185

Table 2: Summary statistics (differences in means on at least a 10% level based on a t-test with unequal variances are indicated by † for Life vs. Non-Life, ‡ for Life vs. Multi-Line, * for Non-Life vs. Multi-Line and + for U.K. vs. Germany)

The product risk measure is higher for life insurance companies than for non-life insurance companies. At first glance, this is not in line with expectations since non-life insurance is intuitively riskier than life insurance.[15] However, the volatility of the benefit ratio is—especially for U.K. life insurers—driven by companies relying more on investment contracts than classical insurance contracts. Although these contracts transfer part of the investment risk to the policyholder, payouts are more volatile, resulting in high values for the product risk measure. For non-life insurance companies, the product risk measure is based on the volatility of the loss ratio, which is—due to the absence of a savings process and a more timely alignment of premium and claim payments—usually smaller than the benefit ratio for life insurance companies. For multi-line insurance companies (i.e., companies with no dominant line of business), product risk takes the lowest values, representing diversification between life and non-life insurance business. The financial risk measure shows that life insurance

[15] The main drivers of product risk in life insurance are mortality, lapses, and expenses, whereas non-life is typically subject to a much higher degree of uncertainty with regard to claims payments, especially in lines of business exposed to catastrophe risk.

companies on average hold less equity than non-life insurers. Moreover, German insurers exhibit higher leverage than U.K. insurers.

Regarding the corporate governance variables, the executive compensation is on average higher for multi-line insurers than for life and non-life insurers. We attribute this to the differences in firm size since larger firms tend to pay more (see, e.g., Mayers and Smith, 1992). In our sample, multi-line insurers are on average larger than life insurers, which are on average larger than non-life insurers. Furthermore, U.K. companies pay on average more than their German counterparts.

We also find significant differences for supervisory board independence and the number of board meetings. The supervisory board independence is higher for U.K. companies. One explanation for this could be that, in the U.K., an insurer is required to make public the independence status of its supervisory board; however, this is not the case in Germany. Thus, in the U.K., the independence of non-executive board members might be subject to more public scrutiny. Furthermore, U.K. supervisory boards meet on average approximately twice as often as their German counterparts. This might be explained by different corporate control systems: Germany has a two-tiered system in which executive and supervisory boards are organizationally separate and thus hold separate meetings whereas the U.K. has a one-tiered control system with combined meetings involving the complete board.

The literature documents differences in the ownership structure between Anglo-Saxon and continental European markets (see, e.g., Franks and Mayer, 1997), with ownership in U.S. and U.K. companies typically dispersed among a large number of minority shareholders. In contrast, many German corporations have concentrated ownership structures, with one large shareholder typically controlling more than 25%. Although the exact share held by a blockholder is not incorporated in this analysis, we can generally confirm these differences in ownership structures by finding significantly more blockholders for U.K. companies. Finally, U.K. insurers on average adopted IFRS earlier than German insurance companies.

Table 3 shows Pearson's correlation coefficients for the base sample (except dummy variables) before standardization. The correlation between the two asset risk measures is positive and significant. This is plausible since OAR and RAR both consider the asset allocation and weigh it using different factors (returns for the OAR; fixed penalty weights for the RAR). No significant correlation exists between the two asset risk measures and product risk. The correlations of size with asset and product risk are both negative, but only the correlation for OAR is significantly different from zero. Furthermore, as documented in the literature (see Finkelstein and Hambrick, 1988), a strong size effect exists for compensation. No significant correlation exists between size and supervisory board independence, although Boone et al. (2007) find that board size and independence increase as firms grow over time.

Considering U.K. stock firms, Conyon and Peck (1998) identify only weak relations between board monitoring (measured in terms of board independence, presence of compensation committees, and CEO duality) and executive compensation. However, for our sample, the correlation between the monitoring-related variables (supervisory board independence and board meetings) and compensation variables is significantly positive. The interaction between board meetings and compensation might be attributable to size effects that impact both variables and a different definition of executive compensation used by Conyon and Peck (1998). The correlation for blockholders and executive compensation is in line with Core, Holthausen, and Larcker (1999), who find that CEO compensation is negatively related to blockholder ownership.

	OAR	RAR	PR	FR	EC	SBC	SBI	BM	BH	Size	AS
Opportunity Asset Risk (OAR)	1.00										
Regulatory Asset Risk (RAR)	0.65 ***	1.00									
Product Risk (PR)	0.05	0.07	1.00								
Financial Risk (FR)	0.15 ***	0.26 ***	-0.04	1.00							
Executive Comp. (EC)	-0.19 ***	-0.14 **	0.13 **	-0.19 ***	1.00						
Supervisory Board Comp. (SBC)	0.00	0.02	0.21 ***	-0.17 ***	0.57 ***	1.00					
Superv. Board Indep. (SBI)	-0.08	-0.02	0.34 ***	-0.04	0.39 ***	0.39 ***	1.00				
Board Meetings (BM)	-0.13 **	0.00	0.44 ***	-0.09	0.44 ***	0.51 ***	0.66 ***	1.00			
Blockholders (BH)	-0.17 ***	-0.35 ***	0.03	-0.22 ***	-0.13 **	0.05	0.04	0.05	1.00		
Size	-0.11 *	-0.08	-0.07	-0.05	0.54 ***	0.17 ***	0.02	-0.04	-0.30 ***	1.00	
Accounting Standard (AS)	-0.22 ***	-0.20 ***	0.23 ***	-0.09	0.41 ***	0.28 ***	-0.03	0.18 ***	0.07	0.29 ***	1.00

Table 3: Correlation for risk measures and corporate governance variables (***, **, and * indicate significance at the 1%, 5%, and 10% levels)

5 Results

To verify our hypotheses, we estimate direct effects (see Tables 4 and 6) as well as total effects (see Tables 5, 7, and 8) of variables on each other, using the structural equation model presented in Section 3. Total effects include, in addition to direct effects, the effects of variables mediated by other variables. One example of a total effect is the effect of the blockholder variable on the risk measures, which is mediated by the corporate governance factor (see Figure 1). Considering both direct and total effects provides a more complete picture of the effects and helps verify our hypotheses. All variables (except for the country, type, and accounting standard variables) are standardized, so that a positive estimate indicates an over-proportional effect and a negative estimate an under-proportional effect on the respective variable. Estimations are conducted using the business analytics software SAS.

We report several measures of model fit. The root mean square residual (RMSR) is calculated as the square root of the sum of quadratic residuals of the entries of the covariance matrix. If the predicted model covariance matrix equals the empirical covariance matrix, the RMSR estimate is 0. Thus, a smaller RMSR indicates a better fit. The goodness-of-fit index (GFI) represents the relative amount of covariance explained by the model. The index takes a value of 1 when the predicted model and observed covariance matrix are equal. The Bentler-Bonett normed fit index (NFI) compares the model to a baseline model for which only variances are modeled. Again, a value of 1 indicates the best possible fit. In all our models, GFI and NFI are close to 0.9.[16]

Path Base	Path Target	Estimate	t-Value	Significance
Corporate Governance	Opportunity Asset Risk	0.159	4.85	***
Corporate Governance	Product Risk	0.074	2.50	**
Corporate Governance	Financial Risk	0.438	4.74	***
Compensation	Corporate Governance	-1.179	-3.01	***
Monitoring	Corporate Governance	-0.924	-1.61	
Blockholders	Corporate Governance	-0.256	-1.62	
Monitoring	Supervisory Board Independence	0.858	18.61	***
Monitoring	Board Meetings	0.776	17.10	***
Compensation	Executive Compensation	0.853	18.05	***
Compensation	Supervisory Board Compensation	0.739	15.00	***
Size	Corporate Governance	1.363	3.27	***
Country	Corporate Governance	-2.289	-1.81	*
Type (Life Insurance)	Corporate Governance	1.150	3.37	***
Type (Non-Life Insurance)	Corporate Governance	-1.368	-3.58	***
Accounting	Corporate Governance	-0.827	-2.28	**
Goodness-of-fit measures: RMSR / GFI / NFI		0.0871 / 0.8919 / 0.8791		

Table 4: Direct effects for model with opportunity asset risk (***, **, and * indicate significance at the 1%, 5%, and 10% levels; N=292)

In Table 4 we find a positive and significant estimate for the effect of the corporate governance factor on opportunity asset risk, product risk, and financial risk. Thus, a positive relationship exists between corporate governance and risk taking for all three considered risk categories. The association of the monitoring factor with supervisory board independence and

[16] GFI and NFI values higher than 0.98 are considered excellent, while values higher than 0.9 indicate good or acceptable fit (see Bagozzi and Yi, 1988; Schermelleh-Engel and Moosbrugger, 2003; Bollen, 1989). Bollen (1989) also notes that it is generally difficult to set a cutoff value for good or bad models, so that lower values may be acceptable as well.

board meetings as well as the association of the compensation factor with executive and supervisory board compensation is entirely positive and significant. Therefore, these factors can be interpreted as measures for the level of monitoring and compensation. Of the three factors constituting the corporate governance environment, only the effect of the compensation factor on corporate governance is significant. This estimate is negative; thus, a higher level of compensation is associated with lower levels of corporate governance. This is in line with Core, Holthausen, and Larcker (1999), who also relate lower levels of corporate governance to higher compensation, as executives have more power to enforce higher compensation.

Table 4 also shows the effect of various control variables on the corporate governance factor. Firm size is positively associated with the level of governance, implying that larger firms exhibit better investor protection. The estimate for the country variable is negative, indicating a lower level of investor protection for German insurers. In this context, one should keep in mind that (compared to the U.K.) Germany is a traditional and control-based regime.[17] In addition, the type of insurance is significant; differences in the business model might thus also shape a firm's corporate governance environment. Finally, the change from local GAAP to IFRS negatively impacts the governance level, which is surprising as IFRS should increase transparency and comparability of reported figures and thus lead to better investor protection.

The main result from Table 4 is that the level of corporate governance is positively associated with all risk measures. This result is consistent with our hypothesis; thus, the corporate governance environment indicates that increased investor protection is associated with higher risk taking. To further analyze this result and the remaining hypotheses, we report the total

[17] Rees and Kessner (1999) document significant country differences in efficiency, comparing U.K. and German insurers at the time of deregulation of European insurance markets in 1994. Hussels and Ward (2007) and Eling and Luhnen (2008) confirm this finding for other time periods.

effects of the variables related to our four hypotheses (corporate governance, compensation, monitoring, blockholders) on the risk measures in Table 5.

Total Effect of \ on	Expected Relation to Risk	Opportunity Asset Risk	Product Risk	Financial Risk (Leverage)
Corporate Governance	+	0.16 ***	0.07 **	0.44 ***
Compensation	+	-0.19 ***	-0.09 **	-0.52 ***
Monitoring	+ / -	-0.15 *	-0.07	-0.40 *
Blockholders	-	-0.04 *	-0.02	-0.11 *

Table 5: Total effects of corporate governance, compensation, monitoring, and blockholders on opportunity asset risk, product risk, and financial risk (***, **, and * indicate significance at the 1%, 5%, and 10% levels; N=292)

The estimates of the latent corporate governance factor are equal to those reported in Table 4, as this factor is not mediated by other variables and the direct effects equal the total effects. Interestingly, we do not find support for the hypothesis that higher compensation leads to higher risk taking; rather, we find evidence for the opposite relation. Monitoring is negatively related to risk taking, thereby providing evidence for the hypothesis that stricter monitoring limits risk taking. As hypothesized, more blockholders are associated with less risk taking. Blockholders also exhibit a monitoring function and might be less diversified than other investors, which is reflected in the negative and significant association of the blockholder variable with opportunity asset risk and financial risk. This finding is also in line with the suboptimal diversification hypothesis (see Cole et al., 2011). The effects of monitoring and blockholders on product risk are—compared to all other estimates—not significant.

Table 6 reports the results for the model using the second asset risk measure RAR. This measure might be considered more robust because its calculation requires only one group of input parameters (the asset allocation), while the OAR factor calculation requires two parameters—namely, the asset allocation and asset returns—which vary. The table shows that the estimated signs of all direct effects are identical to the model with the OAR measure presented in Table 4. In addition, the same variables are significant. Thus, we conclude that our results are robust against changes in the used asset risk measure.

Path Base	Path Target	Estimate	t-Value	Significance
Corporate Governance	Regulatory Asset Risk	0.212	5.71	***
Corporate Governance	Product Risk	0.070	2.67	***
Corporate Governance	Financial Risk	0.361	5.55	***
Compensation	Corporate Governance	-1.301	-2.83	***
Monitoring	Corporate Governance	-1.067	-1.48	
Blockholders	Corporate Governance	-0.300	-1.56	
Monitoring	Supervisory Board Independence	0.865	18.93	***
Monitoring	Board Meetings	0.775	17.14	***
Compensation	Executive Compensation	0.848	17.59	***
Compensation	Supervisory Board Compensation	0.725	14.71	***
Size	Corporate Governance	1.532	3.24	***
Country	Corporate Governance	-2.636	-1.72	*
Type (Life Insurance)	Corporate Governance	1.513	3.99	***
Type (Non-Life Insurance)	Corporate Governance	-1.770	-4.02	***
Accounting	Corporate Governance	-0.925	-2.23	**
Goodness-of-fit measures: RMSR / GFI / NFI		0.0933 / 0.8867 / 0.8769		

Table 6: Direct effects for model with regulatory asset risk (***, **, and * indicate significance at the 1%, 5%, and 10% levels; N=292)

Table 7 summarizes the total effects of the four variables representing our hypotheses on the three risk measures for the model with RAR. Again, the results are robust as all estimated signs are identical to those reported in Table 5. However, in this model, the monitoring variable is not significant for any of the risk measures.

Total Effect of \ on	Expected Relation to Risk	Regulatory Asset Risk	Product Risk	Financial Risk (Leverage)
Corporate Governance	+	0.21 ***	0.07 ***	0.36 ***
Compensation	+	-0.28 ***	-0.09 **	-0.47 ***
Monitoring	+ / -	-0.23	-0.08	-0.39
Blockholders	-	-0.06	-0.02	-0.11 *

Table 7: Total effects of corporate governance, compensation, monitoring, and blockholders on regulatory asset risk, product risk and financial risk (***, **, and * indicate significance at the 1%, 5%, and 10% levels; N=292)

In conclusion, the corporate governance factor is significant for all risk measures in both the OAR and RAR model and as expected, the relation of corporate governance and risk is positive. A higher level of corporate governance is therefore associated with higher risk taking in all considered risk areas (asset, product, and financial risk). As previously discussed, an explanation for this finding might be that—as investor protection and therefore alignment of interest between investors and executives increases—executives undertake riskier, but value-enhancing activities (see John, Litov, and Yeung, 2008). This increased risk taking must not necessarily be unfavorable for policyholders (at least as long as the risk taking does not reach an excessive level); policyholders are interested in premiums and surplus participation that are adequate in relation to the risk taken. A very low insolvency risk can only be achieved at the cost of high premiums and a low-risk investment strategy, yielding only small pecuniary benefits for policyholders. Riskier, but value-enhancing investment and underwriting strategies can thus be beneficial for shareholders as well as policyholders as long as the insolvency risk is kept at a reasonable level. However, regulators need to identify and avoid situations of excessive risk taking at the costs of policyholders.

Contradicting our hypothesis, we find that the level of compensation is negatively related to insurance companies' risk taking. This result concurs with that of Gray and Cannella (1997), who consider measures for systematic and unsystematic risk, and Core, Holthausen, and Larcker (1999), who consider return on assets (ROA) volatility as a risk measure. With respect to incentive compensation, which is partly included in our compensation variable, Grace (2004) relate higher firm risk—also measured as ROA volatility—to higher executive incentive payments. Milidonis and Stathopoulos (2011) find a positive relationship between option payments and default risk. Therefore, existing empirical findings suggest that an increased use of certain types of incentive payments can induce risk taking, while total compensation granted in the respective year is negatively related to risk. We can confirm the second part of this result, but more research is needed to better understand the role of different compensation elements on risk taking in a corporate governance context, such as by consideration of fix and variable compensation (due to data limitations, especially in the earlier years of our sample period, we are restricted to total compensation).

Regarding the effect of monitoring on risk taking, justifications for a positive as well as negative association may be given. In our data, we find a negative relation of monitoring with risk taking, although the effect is statistically significant only for the model with the opportunity asset risk factor. Still, the board and the exhibited monitoring task can be seen as a mean for shareholder influence, as expressed by John and Senbet (1998), and thus a mean for investor protection. In this context, boards with a higher number of independent members and more board meetings control the opportunities for excessive risk taking.

As hypothesized, the number of blockholders is negatively associated with risk taking. Blockholders may thus have a disciplining effect on the management, what is meaningful if their investments in the firm are not well diversified. Therefore, our results are compatible with the findings from Cole et al. (2011) and Cheng, Elyasiani, and Jia (2011) for the U.S. insurance market. However, estimates for the effect on product risk are not significant for the OAR and RAR models, what may partly be explained by the rough proxy for product risk.

6 Robustness

To analyze the robustness and validity of our findings, we vary the data basis for our regressions. We focus on differences in the estimation results compared to the results for the full sample presented in Section 5. The results have to be viewed with some caution as the sample size is relatively small.[18]

6.1 Variation of Time Horizon

The time period of our study (1997 to 2010) allows to analyze whether the financial crisis impacted the relationship between corporate governance and risk taking. Panels A and B of Table 8 summarizes results for a subset of our data that excludes the data since the beginning of the financial crisis (data from 2008 to 2010). Significant changes in the results might be interpreted as an impact of the financial crisis on our variables. The estimates show no

[18] According to a simplified rule of thumb by Bentler and Chou (1987), the ratio of sample size to number of free parameters may go as low as 5:1 under normal and elliptical theory. This rule of thumb is fulfilled for our full samples in Section 5, but it is not fulfilled for the smaller subsamples.

structural change compared to the estimates in Table 5 and Table 7. Only one estimate is no longer significant in the reduced sample (blockholders with financial risk, see Panel B). Therefore, we conclude that the financial crisis had no substantial impact on our results. Although the values of the variables (like absolute compensation or board meetings) may have changed during the financial crisis, their relation to risk taking and the relation of corporate governance to risk taking in general has not been altered.[19] However, it might also be that potential implications of the financial crisis on corporate governance and risk taking come into effect with a time delay, meaning that these are not yet reflected in our data.

6.2 Results for Different Countries

In the main analysis, we incorporate dummy variables to indicate the country of origin. In Table 8, we report the estimation results for separate countries in Panels C through F, while omitting the country variable. The estimates are robust for both countries and comparable to the previous analysis. Comparing the results of both countries' datasets, we identify variations in the significance estimates, but no changes in signs. While all estimates for total effects for the U.K. sample are significant, only the corporate governance effect is significant for the German sample. Country differences are thus reflected in the varying relevance of corporate governance mechanisms. The significance for the compensation and monitoring factor for the U.K. sample may be explained by the U.K. being more market oriented compared to Germany.

[19] In order to confirm robustness of these results, we also vary the estimation technique, changing from the maximum likelihood method to the generalized least squares (GLS) method. For the GLS method, all significant estimates are robust.

Total Effect of \ on	Expected Relation to Risk	Asset Risk	Product Risk	Financial Risk (Leverage)	N/RMSR/ GOF/NFI
Panel A: Data up to the year 2007 – Model with Opportunity Asset Risk					
Corporate Governance	+	0.14***	0.08**	0.43***	239 / 0.0881 / 0.8905 / 0.8776
Compensation	+	-0.13**	-0.07*	-0.40***	
Monitoring	+ / -	-0.23*	-0.12	-0.70*	
Blockholders	-	-0.06*	-0.03	-0.19*	
Panel B: Data up to the year 2007 – Model with Regulatory Asset Risk					
Corporate Governance	+	0.18***	0.07**	0.31***	239 / 0.0927 / 0.8885 / 0.8780
Compensation	+	-0.18*	-0.07	-0.32*	
Monitoring	+ / -	-0.43	-0.16	-0.76	
Blockholders	-	-0.11	-0.04	-0.20	
Panel C: U.K. – Model with Opportunity Asset Risk					
Corporate Governance	+	0.00***	0.00***	0.00***	116 / 0.0612 / 0.8385 / 0.8786
Compensation	+	-0.41***	-0.21***	-0.59***	
Monitoring	+ / -	-0.23***	-0.12**	-0.33***	
Blockholders	-	-0.17***	-0.09**	-0.24***	
Panel D: Germany – Model with Opportunity Asset Risk					
Corporate Governance	+	0.14**	0.32***	0.60***	176 / 0.0724 / 0.8991 / 0.8298
Compensation	+	-0.13	-0.31	-0.58	
Monitoring	+ / -	-0.02	-0.04	-0.07	
Blockholders	-	-0.04	-0.09	-0.16	
Panel E: U.K. – Model with Regulatory Asset Risk					
Corporate Governance	+	0.00***	0.00***	0.00***	116 / 0.0581 / 0.8423 / 0.8875
Compensation	+	-0.65***	-0.27***	-0.73***	
Monitoring	+ / -	-0.31***	-0.13**	-0.35***	
Blockholders	-	-0.24***	-0.10**	-0.27***	
Panel F: Germany – Model with Regulatory Asset Risk					
Corporate Governance	+	0.21***	0.34***	0.64***	176 / 0.0696 / 0.9067 / 0.8361
Compensation	+	-0.13	-0.21	-0.40	
Monitoring	+ / -	-0.03	-0.05	-0.10	
Blockholders	-	-0.05	-0.08	-0.14	

Table 8: Total effects for variation of time horizon and country of origin (***, **, and * indicate significance at the 1%, 5%, and 10% levels)

7 Conclusion

The main result of this analysis is that corporate governance significantly affects risk taking in insurance companies. John, Litov, and Yeung (2008) discuss possible negative and positive effects of corporate governance, interpreted as investor protection, on risk taking and find evidence for a positive relation in the United States. We can confirm this finding for our sample of U.K. and German insurance companies. The elements depicting the corporate governance environment—compensation, monitoring, and ownership structure—all have significant influence on risk taking; however, the results partly depend on the considered risk measure. Regarding our empirical results, product risk is—compared to asset and financial risk—least affected by the elements of corporate governance.

We find that the level of total compensation is negatively related with risk taking. It is difficult to interpret this finding since we cannot decompose our compensation data into fixed and variable components and do not consider firm performance, which may affect variable compensation. However, after interpreting this finding together with results from other studies, it seems that variable compensation might induce higher risk taking while the overall level of compensation is negatively related to risk taking. More research is necessary to better explore the relationship between compensation and risk taking in the insurance industry, especially for non-U.S. markets.

In our sample, companies with increased monitoring (i.e., more independent board members and more board meetings) exhibit lower risk. For these companies, stricter monitoring of executives thus limits the opportunities for excessive risk taking. The fact that the number of blockholders is negatively related to firm risk supports the idea of an active monitoring of large investors, as found by Agrawal and Mandelker (1990), as well as the suboptimal diversification hypothesis, which can be traced back to Fama and Jensen (1983) and was recently discussed by Cole et al. (2011) in an insurance context.

One of the main goals of Solvency II is to take into account all relevant aspects of risk. A pertinent conclusion from our analysis is that corporate governance mechanisms, such as compensation, the role of independent directors, or major stakeholders, need to be more closely considered in insurance regulation because they affect risk taking in these companies. To date, corporate governance is addressed in the second and third pillar of Solvency II by means of qualitative requirements. For example, regulators set requirements with respect to internal control. Our results can be used by policymakers as empirical justification for considering corporate governance elements when designing insurance regulation. We also demonstrated that the relationship between corporate governance and risk taking is not a trivial one. Overall, corporate governance and risk taking need close consideration by regulators and policymakers—not only in the design of regulation, but also after its implementation.

The interpretation of our results should proceed in light of the limited sample investigated, which consists of publicly traded insurers from only two countries. Thus, significant room exists for future research to validate the findings presented here. To identify sources of variation in risk across firms in more countries, other types of insurers (especially mutual insurers) and more country-specific variables may need to be analyzed. Specific regulatory variables might capture the transparency and disclosure requirements, which were not the main focus of this work, in more detail.

Another extension of this work could be an analysis of companies in financial distress based on financial ratios, as Chen and Wong (2004) and Sharpe and Stadnik (2007), which would allow for a comparison of the results from Asia and Australia with results from Europe. Such an approach would also confirm (or not) the relevance of selected corporate governance elements used in this study by applying another methodology. Furthermore, an avenue for future research is to compare the results for the insurance industry with other financial services providers, such as banks or pension funds, so as to identify similarities and differences in these sectors. Another project would be to analyze how risk taking changes after Solvency II comes into force. Thus, the research design laid out in this paper provides the basis for benchmarking in different directions and allows for identifying relevant corporate governance mechanisms as well as best practices in the insurance industry.

Appendix A Mathematical Formulation of the Model

$$\text{(I)}\quad \text{Corporate Governance} = \begin{pmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \\ \alpha_5 \\ \alpha_6 \\ \alpha_7 \\ \alpha_8 \end{pmatrix}^T \cdot \begin{pmatrix} \text{Compensation} \\ \text{Monitoring} \\ \text{Blockholders} \\ \text{Size} \\ \text{Country} \\ \text{Type}_{\text{Life}} \\ \text{Type}_{\text{Non-Life}} \\ \text{Accounting} \end{pmatrix} + \epsilon_{1,1}$$

$$\text{(II)}\quad \begin{pmatrix} \text{Asset Risk} \\ \text{Product Risk} \\ \text{Financial Risk} \end{pmatrix} = \begin{pmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \end{pmatrix} \cdot \text{Corporate Governance} + \begin{pmatrix} \epsilon_{2,1} \\ \epsilon_{2,2} \\ \epsilon_{2,3} \end{pmatrix}$$

$$\text{(III)}\quad \begin{pmatrix} \text{Executive Comp.} \\ \text{Sup. Board Comp.} \\ \text{Sup. Board Indep.} \\ \text{Board Meetings} \end{pmatrix} = \begin{pmatrix} \gamma_1 & 0 \\ \gamma_2 & 0 \\ 0 & \gamma_3 \\ 0 & \gamma_4 \end{pmatrix} \cdot \begin{pmatrix} \text{Compensation} \\ \text{Monitoring} \end{pmatrix} + \begin{pmatrix} \epsilon_{3,1} \\ \epsilon_{3,2} \\ \epsilon_{3,3} \\ \epsilon_{3,4} \end{pmatrix}$$

All variables on the right-hand side of Equation (I) are exogenous and covariances among these variables free parameters. The variance of latent factors is restricted to 1. Time and company indices are omitted in the above formulas.

Appendix B Summary of Variable Definitions

Variable	Definition
Opportunity Asset Risk	LN(Annualized standard deviation of (stock index return · weight stocks + real estate index return · weight real estate + bond index return · weight bonds + money market index return · weight money market)); all index returns are on a weekly basis
Regulatory Asset Risk	LN(0.3 · weight stocks + 0.1 · weight real estate + 0.065 · weight bonds + 0.003 · weight money market)
Product Risk	LN(Standard deviation over last 12 years of (life insurance net premiums · benefit ratio + non-life insurance premiums · loss ratio) / total net premiums)
Financial Risk	LN(Total investments / total shareholder equity)
Executive Compensation	LN(Total compensation per executive); US-$
Supervisory Board Compensation	LN(Total compensation per supervisory board member); US-$
Supervisory Board Independence	Ratio of independent members of the supervisory board
Board Meetings	Number of meetings held by the supervisory board
Blockholders	Number of shareholders holding more than 5% of the voting rights
Size	LN(Total assets); US-$
Country	0 = U.K.; 1 = Germany
Type (Life Insurance)	0 = Life business not dominant (net premiums earned from life insurance < 75% of total net premiums earned); 1 = Life business dominant
Type (Non-Life Insurance)	0 = Non-life business not dominant (net premiums earned from non-life insurance < 75% of total net premiums earned); 1 = Non-life business dominant
Accounting Standard	0 = local GAAP; 1 = IFRS

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