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# The Impact of Firm-Level Transparency on the Risk Decisions of Insurers: Evidence from an Empirical Study

Ming (Ivy) Dong*

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**Abstract**

A greater firm-level transparency through enhanced disclosure provides more information regarding the risk situation of an insurer to its outside stakeholders such as stock investors and policyholders. The disclosure of the insurer's risk-taking can result in negative influences on, for example, its stock performance and insurance demand when stock investors and policyholders are risk-averse. Insurers, which are concerned about the potential ex post adverse effects of risk-taking under greater transparency, are thus inclined to limit their risks ex ante. In other words, committing to a higher level of transparency can induce less risk-taking incentive of insurers. This article investigates empirically the relationship between firm-level transparency and insurers' strategies on capitalization and risky investments. By exploring the disclosure levels and the risk behavior of 52 European stock insurance companies from 2005 to 2012, the results show that insurers tend to hold more equity capital when committing to greater transparency, and this strategy on capital-holding is consistent for different types of insurance businesses. When considering the influence of transparency on the investment policy of insurers, the results are mixed for different types of businesses.

***Keywords***: Transparency, risk-taking, market discipline
***JEL classification***: G22; G31; M41

* The author is a doctoral student at Goethe University Frankfurt a.M., Germany; her e-mail address is dong@finance.uni-frankfurt.de. I am grateful to Mike B. Adams, Elia Berdin, Jannis Bischof, Helmut Gründl and Gregor N.F. Weiß for useful comments and discussions.

## 1 Introduction

Empirical studies show that stock investors adjust their investment decisions with respect to the riskiness of stock companies.[1] When considering the insurance field, Zimmer et al. (2009) find, in an experimental study, that the awareness of insurers' default risk affects policyholders' willingness-to-pay extensively and consequently their demand for insurance contracts. Therefore, excess risk-taking can be detrimental to insurers in terms of their external financing. Eling (2012) summarizes this ability of outside stakeholders to monitor the managerial behavior of insiders and take corresponding actions as one of the components of "market discipline"[2]. However, previous finance studies show that this monitoring ability of outside stakeholders can be limited due to principal-agent problems and costly monitoring.[3] High-risk insurers tend to hide information about their risk-taking behavior, which is detrimental to outside stakeholders, particularly when acquiring information for monitoring purposes is costly. One approach to resolve this issue is through the timely disclosure of value-relevant information to outside stakeholders.[4] Enhanced disclosure improves the transparency of company risk profiles, and thus enables outside stakeholders to better monitor and respond to the risk-taking behavior of insurers. Consequently, insurers, which are concerned about the potential ex post adverse effects of risk-taking under greater transparency, are inclined to control their risks ex ante.

This article investigates the relationship between firm-level transparency and the risk of stock insurance companies. It aims to provide empirical evidence that the anticipation of committing to a high level of transparency can lead to the limited risk-taking behavior of insurers, based on the principle of market discipline.

Previous empirical studies on disclosure show that companies benefit from a higher level of transparency by obtaining increased stock liquidity, reduced cost of capital and increased firm value.[5] However, the influence of the enhanced disclosure on a company's risk has, to the best of my knowledge, not yet been studied in an empirical format. Furthermore, the envisaged European regulatory regime on insurers – Solvency II – aims to improve market transparency through more strict disclosure requirements. It requires insurance companies to disclose their essential solvency and financial information on an annual basis. The implementation of Solvency II in the future would generate a substantial increase in information for the public. This challenge requires European insurers to achieve a better understanding of the consequences of enhanced disclosure.

[1] See, for example, Leuz and Verrecchia (2000), Lang and Maffett (2011) and Balakrishnan et al. (2013). The effect is captured by the changes in the bid-ask spreads or in the trading volume of shares.

[2] In detail, monitoring in the insurance field is defined as the behavior whereby policyholders, regulators or other intermediaries such as insurance agents and brokers accurately assess insurers' financial conditions. Another component of market discipline in the insurance concept – influencing – is defined as when market participants have enough market power to influence the managerial decisions of insurers. See Eling (2012, p. 186).

[3] See, for example, Bliss and Flannery (2002).

[4] See Frankel and Li (2004). Other possible approaches to solve the issue of information asymmetry are, for example, through contracts and ex-post monitoring.

[5] See Leuz and Wysocki (2008, p. 6) .

I explore the disclosure levels and the risk activities of European stock insurers from 2005 to 2012. The sample of this article consists of 52 listed insurers which have diversified business profiles including life insurance, non-life insurance and multi-line insurance. By investigating a data sample over a period from 2005 to 2012, the analysis of this article focuses on the impact of the changes in insurers' voluntary disclosure activities, rather than on the influence of adopting a new mandatory disclosure requirement.[6]

The major difficulty in the estimation is that the voluntary disclosure level and the risk of an insurer can be simultaneously determined, i.e. the voluntary disclosure level can be a decision variable based on the risk behavior of an insurer.[7] Therefore, in addition to the benchmark regression using the ordinary least squares (OLS) estimation, the robustness check applies the simultaneous equations model (SEM) with the Two Stage Least Squares (2SLS) estimation in order to resolve this endogeneity issue. In the 2SLS regression, I use the average disclosure level of an insurer's top 3 competitors as the instrumental variable (IV) for the endogenous explanatory variable – the disclosure level of this insurer. Finally, I discuss the limitations of this instrumental variable and provide other possible IV options such as the distance (in kilometers) from an insurer's 10 largest investors to the insurer.

In general, the results of the OLS estimation show significant negative relationships between transparency and insurers' risk, and the 2SLS estimation confirms these findings. In specific, the results of the 2SLS estimation demonstrate that insurers with higher disclosure levels tend to hold more equity capital, and this strategy on capital-holding is consistent for different types of insurance businesses. When considering the influence of firm-level transparency on the investment strategy of insurers, the results are mixed for different types of insurers. The findings of this article implicate that (*i*) the implementation of Solvency II, which improves market transparency, might have different effects on the risk-taking behavior of heterogeneous insurers; (*ii*) market discipline may still fail, despite under a high level of transparency, in which case regulation on insurer risk-taking is necessary.

The remainder of this article is organized as follows. Section 2 reviews the related literature which provide the conceptual background and motivation for the study. Section 3 introduces the theoretical arguments and develops the testing hypothesis. In Section 4, I describe the research design with the explanations of the variables, the methodologies and the data. Section 5 presents the empirical results of the OLS estimation. Section 6 shows the findings of the robustness check using the 2SLS estimation. The last section concludes with some discussions over the limitations of this article and provides relevant policy implications.

[6] The implementation of the International Financial Reporting Standards (IFRS) at the beginning of 2005 required all listed European financial companies to disclose in accordance with the IFRS. The period of analysis in this article excludes the event of adopting IFRS, which rules out the influence of mandatory disclosure.

[7] Höring and Gründl (2011) find that the risk level of insurers has a significant positive impact on their disclosure activities.

## 2 Related Literature

The primary interest of this article lies in the impact of firm-level transparency on the risk-taking behavior of insurers. The previous study closest to this research question is by Nier (2011) who investigates the relationship between bank stability and transparency. Nier (2011) indicates that, on the one hand, bank transparency increases the sensitivity of the bank's funding terms to its risk and that this in turn can induce less incentives in risk-taking ("ex ante discipline"). On the other hand, transparency can have destabilizing effect ex post, when a bank might have hit hard times. His findings in identifying the synopsis of these two different effects suggest that transparency reduces the chance of severe banking problems and thus improves overall banking stability, based on the principle of the "ex ante discipline".

In the insurance field, there has been, to best of my knowledge, no direct research which discusses this issue. However, there are two streams of literature that provide the conceptual background and motivation for the investigated question. The first stream of literature focuses on the economic consequences of the change in voluntary disclosure activities. The second stream of literature relates to market discipline. In the following, I review these two streams of literature.

Firstly, the disclosure activities of companies can either be voluntary or due to disclosure regulation. Concerning voluntary disclosure, previous empirical studies show that companies benefit from enhanced disclosure by gaining higher stock liquidity (captured by lower bid-ask spreads and higher trading volumes) and (possibly) a reduction in the cost of capital. Welker (1995) and Healy et al. (1999) use AIMR disclosure rankings[8] as the measurement of companies' voluntary disclosure levels and identify the relationship between companies' disclosure rankings and their stock liquidity. Both empirical studies find that a higher voluntary disclosure level increases the stock liquidity of companies. A more recent work by Ng (2011) demonstrates that the information quality of companies' voluntary disclosure positively affects the stock liquidity of companies. Furthermore, previous empirical studies document mixed evidence for the link between voluntary disclosure level and companies' cost of capital. Sengupta (1998) uses AIMR disclosure rankings and finds a negative relationship between companies' voluntary disclosure levels and the cost of debt capital. Botosan and Plumlee (2002) provide evidence that a higher disclosure level in the annual reports of companies reduces companies' cost of equity capital. However, the cost of capital is higher for companies that disclose more frequently.

Secondly, previous studies in the insurance field show that policyholders and stock investors have incentives to monitor the risks of insurers. For the reaction of policyholders, empirical studies by Sommer (1996) and Cummins and Danzon (1997) indicate that insurance prices are negatively correlated to the insolvency risks of property-liability insurers. Phillips et al. (1998) provide similar empirical evidence based on a sample of multi-line insurance companies. In the life insurance field, Zanjani (2002) finds that policyholders' termination rates positively relate to the default risks of

[8] The AIMR disclosure rankings provide a general assessment on companies' voluntary disclosure levels based on information from companies' annual and interim financial reports, analyst meetings and conference calls.

life insurers. Baranoff and Sager (2007) use external financial ratings as proxies of life insurers' default risks and show that downgrades in the ratings of life insurers lead to a decline in demand for insurance policies. A more recent work by Eling and Schmit (2012) indicates that market discipline exists in the German life insurance market. Specifically, they find that downgrades in the external ratings of insurers or reductions in consumer satisfaction result in declined premiums and increased contract termination rates. Furthermore, as to stock investors, previous empirical findings suggest that high-risk insurers receive negative responses from outside investors to their stock performance, which can also be seen as an example of market discipline. Specifically, both Fenn and Cole (1994) and Brewer and Jackson (2002) show that insurers which hold risky asset portfolios face larger reductions in their stock prices than those which hold more low-risk assets. Halek and Eckles (2010) use external ratings as the measure of insurers' risks and find that downgrades in external ratings have a larger (negative) impact on the stock prices of insurers than that upgrades in ratings do on raising stock prices. In addition, certain government protection mechanisms (in our case especially insurance guarantee schemes) are found to distort the monitoring incentives of outside stakeholders. Lee et al. (1997) and Downs and Sommer (1999) investigate the risk-taking behavior of insurers under insurance guarantee schemes. The results of both studies fail to provide empirical evidence to support the "monitoring hypothesis"[9]. The benefits of risk-taking for insurers outweigh the effects of market discipline.

Bliss and Flannery (2002) state: "The market discipline paradigm requires (a) that the necessary information is publicly available and that the private benefits to monitoring outweigh the costs, (b) that rational investors continually gather and process information about traded firms whose securities they hold and about the markets in which they operate, ...". This implies that the effects of market discipline can be undermined due to informational limitations. Informational limitations can arise when, for example, managers tend to reduce information or falsify reported contents. The behavior of deviating in disclosure raises information asymmetry between insurers and outside stakeholders, and consequently generates barriers for the latter to monitor the risk-taking of insurers. This distortion of market discipline due to informational limitations is the fundamental idea for developing the testable hypothesis of this article.

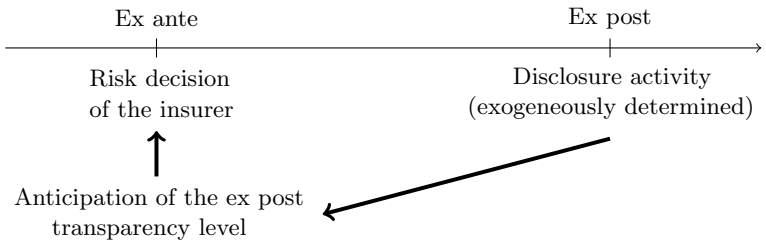
[9] Lee et al. (1997) propose the "monitoring hypothesis" which indicates that the post-insolvency funding mechanism of guarantee funds generates incentives for participating insurance members to monitor their peers' risk-taking behavior. Downs and Sommer (1999) extend this hypothesis by adding the monitoring incentives of other agents such as regulators, consumers, insurance agents and brokers as well as reinsurers. In particular, regulators have an incentive to limit excess risk-taking for consumer protection.

## 3 Hypothesis Development

The principal-agent problem can arise from either "hidden actions" or "hidden information".[10] This article deals with the first category of the principal-agent problem, i.e. "hidden actions".[11] Specifically, the manager of an insurance company (the agent) cannot commit to a low-risk policy, and can thus benefit from risk-taking by hiding risk information from its stock investors or policyholders (the principal). Enhancing disclosure can thus be detrimental for the high-risk insurer, since it may suffer from potential adverse effects on its stock performance or insurance demand. Therefore, it is optimal for the high-risk insurer to first decide on its (high) risk policies, and choose the (low) level of disclosure subsequently. However, in the following, I provide three possible theories arguing that the ex post disclosure level of insurers is, to large extents, exogenously determined, and can be anticipated by insurers ex ante. In other words, insurers face certain levels of disclosure that they have to commit to, and they decide on their risk policies according to the anticipation of this committed transparency level. Figure 1 provides the illustration for the disclosure activity and the decision of the insurer on risk-taking.

The first argument is that insurers should commit to at least their levels of disclosure in the previous period(s), since reducing information can generate adverse effect on their external funding. Verrecchia and Weber (2006) investigate the impact of a firm's decision to redact proprietary information from its material contract filings. They find that when firms redact information, the adverse selection issue[12] in the capital market deteriorates. Epstein and Schneider (2008) show in a theoretical format, that when ambiguity-averse outside stakeholders receive uncertain signals (in terms of being opaque) from insiders, they react to the vague information as if they were facing the worst scenario.[13] This implies that ambiguous-averse outside stakeholders might overestimate the risk of insurers when insurers tend to hide information.

Figure 1: Illustration for the Disclosure Activity and The Risk Decision of the Insurer




[10] See, for example, Mas-Colell et al. (1995, Ch. 14, pp. 477-506).

[11] Although this article investigates the incentive of an insurer to hide information from its outside stakeholders, the hidden information refers to the risk-taking action of the insurer.

[12] The measures of adverse selection are the bid-ask spread, market depth and market turnover.

[13] Epstein and Schneider (2008) model the situation in which investors perceive a range of signal precision and make a worst-case assessment of precision when the quality of information is uncertain. Therefore, investors require compensation for low future information quality.

The second reason for insurers to anticipate a high level of transparency ex post is competition for market share, based on a game-theoretical argument. Consider a competitive insurance market where insurers are ranked according to their risk levels (i.e. Rank 1 – low-risk insurers, Rank 2 – medium-risk insurers and Rank 3 – high-risk insurers). In order to gain a larger market share, the low-risk insurers disclose more in order to distinguish themselves from their higher-risk (Rank 1 and Rank 2) competitors.[14] This disclosure strategy of the low-risk insurers induce the medium-risk insurers also to improve their transparency, since the medium-risk insurers cannot otherwise separate themselves from the high-risk (Rank 3) insurers. Therefore, this mechanism driven by the competition for market share induces companies, except for the highest-risk insurers, to commit to a high level of transparency.

Last but not the least, companies that are identified in the high-risk category in the previous example (Rank 3 insurers) might also have the incentive to enhance their transparency. Helbok and Wagner (2006) show that banks with higher levels of debt increase their transparency in order to avoid regulatory attention. Therefore, committing to a high level of transparency can be a strategy for high-risk insurers to refrain regulators from close and frequent monitoring/screening. In other words, hiding information about the high risks might not be optimal for insurers when considering the possible regulatory intervention.

To sum up, insurers can anticipate ex ante a certain level of transparency that they have to commit to ex post according to the above-mentioned "ambiguity", "market competition" and "regulatory attention" arguments, while deciding on their risk policies. Market discipline indicates that investors and policyholders can punish insurers for excess risk-taking. Therefore, by considering the potential ex post adverse effects of risk-taking on external financing, insurers might be inclined to control risks ex ante. This theory suggests a hypothesis that greater firm-level transparency can lead to less risk-taking.

However, improved transparency might also cause more risk-taking. One possible explanation is that outside stakeholders perceive greater transparency as a sign of the robust financial conditions of insurers and thus place blind trust on insurers. In this case, market discipline loses effect, and insurers can thus deviate even more easily from the risk perceived by outside stakeholders. Epermanis and Harrington (2006) state a situation in which insurance demand is risk insensitive. In other words, policyholders do not react to the insolvency risk of insurers, and insurers are more likely to conduct risk-taking ("i.e. gambling for resurrection").

Based on the discussions above, I form the testing hypothesis of this article as follows (stated in the null hypothesis format):

$\boldsymbol{H_0}$ *The firm-level transparency has no impact on the risk decisions of insurers.*

[14] The basic idea comes from the model of Spence (1973), in which high-ability workers attempt to send signals to the employer in order to separate themselves from low-ability workers.

## 4 Research Design

### 4.1 Risk Measure

Previous studies use various indicators as proxies for the risk-taking behavior of insurance companies, such as the proportion of investment in stocks[15], the companies' market beta, and the standard deviation of the companies' stock returns[16]. Cummins and Sommer (1996) propose the equity capital-to-asset ratio as a more appropriate indicator to capture the risks of insurers compared to other methods, since the equity capital-to-asset ratio reflects the overall risks of insurers by assessing both the asset and the liability side. Fields et al. (2012) further suggest using the normalized dispersion in companies' capitalization as the risk-taking proxy, which is measured by the difference between the individual firm's capitalization ratio and the mean of the capitalization ratio of the sample. This measure enables them to conduct cross-country comparisons while analyzing the variation of risk-taking behavior among companies from the same country. In this article, I investigate two formats of the insurers' risk-taking behavior: by lowering its equity capital and by conducting riskier investments. The equity capital-to-asset ratio ($CAP$) captures the risk decision of an insurer on capitalization. The higher the $CAP$ is, the less risky the insurer is. The portion of stock investment ($STOCK$) as another risk indicator maps the risk strategy of an insurer on asset allocation. The larger the $STOCK$ is, the more stocks the insurer holds in its asset portfolio, and the more risk it takes.

### 4.2 Firm-level Transparency

I use the disclosure level of an insurer as the proxy for its transparency. The commonly used metrics for measuring the disclosure level are management forecast, analyst ratings of disclosure and self-constructed disclosure indices (for example based on annual reports). The first two measures depend largely upon data availability, and this feature limits this article using management forecast or analyst ratings of disclosure as the proxy for firm-level transparency. Furthermore, the efficiency of a self-constructed disclosure index relies on the standards of the self-scoring system. The main drawback of a self-constructed disclosure index is the difficulty in keeping the objectiveness throughout the assessment. Höring and Gründl (2011) examine the relation between the extent of risk disclosure and the characteristics of insurers based on a European sample from 2005 to 2009. They investigate the European primary insurers in the Dow Jones STOXX 600 Insurance Index and self-construct a risk disclosure index of European insurers by assessing and scoring the information quality of the sample insurers' annual (risk) reports.[17] Their index results from quali-

[15] See Harrington and Nelson (1986).

[16] See Borde et al. (1994).

[17] The self-constructed index by Höring and Gründl (2011) measures the risk disclosure levels of insurers according to the disclosure standards in the Chief Risk Officer (CRO) Forum (2008). The CRO Forum (2008) proposes the requirements of public risk disclosure under Solvency II, which includes both qualitative and quantitative risk information of insurers.

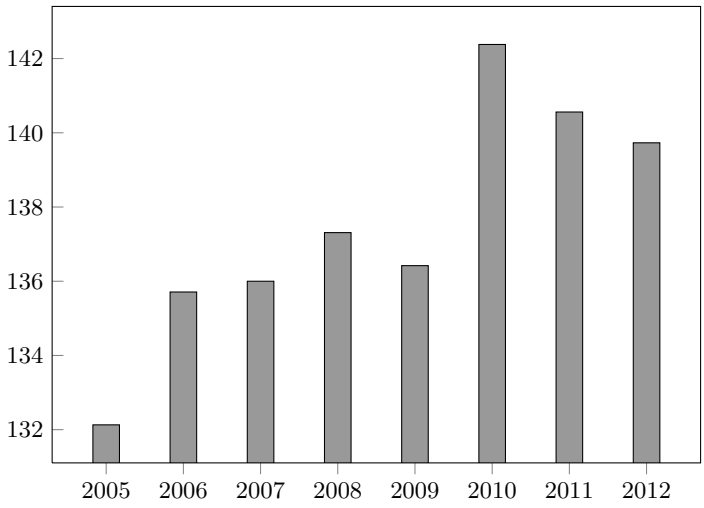
tative rather than quantitative assessments of insurers' risk profiles, which is an advantage of their disclosure index. However, replicating this index requires consistent assessments which are difficult to apply when the sample size is large.

This article measures the disclosure level of an individual company each year by counting the corresponding numbers of available financial items ($ITEM$) summarized in the Thomson One database. The financial information in the Thomson One database is gathered from all the publicly disclosed documents (for example annual reports, interim reports, meeting notes, press briefings etc.) of each company. The advantages of applying this disclosure measure are, firstly, that it is feasible to apply to a large sample. Secondly, it focuses on quantitative analysis and thus avoids subjective biases on assessments. Thirdly, the search coverage is large, which makes it subject to all types of publicly available information, rather than being restricted to the annual reports of companies. The Appendix 1 lists all the 163 targeted financial items incorporated in the database. All the financial items are categorized into the insurers' balance sheet, income statement, cash flow statement and financial ratios. The maximum disclosure level of an insurance company each year is thus 163, and any missing information for specific financial items during the year leads to a lower disclosure level of the insurance company.

Figures 1 – 4 plot the average disclosure levels with respect to different characteristics of the sample insurers. Specifically, Figure 1 illustrates the change of the average disclosure level of the complete sample from 2005 to 2012, and the percentage changes fo the average disclosure level throughout the years are presented in the table below. The graph reveals a general increase in the average disclosure level during the period analyzed. During the crisis period from 2008 to 2012, the growth rates of disclosure levels are negative. In other words, companies tend to reduce their voluntary disclosure activities during the market downturn. However, the average disclosure level remains at high levels.

Furthermore, Höring and Gründl (2011) find that firm size and the insurers' risk are positively correlated with the disclosure level, and that the insurers' profitability is negatively related to the disclosure level. Figures 2 – 4 illustrate the average disclosure levels of companies with different sizes, risks and investment incomes, and the figures demonstrate relations that are consistent with the results in Höring and Gründl (2011). Specifically, Figure 2 indicates that large insurance companies tend to have higher disclosure levels compared to small and medium insurance companies. This may result from the more complex business lines of large firms or may simply be due to the fact that large insurers have more financial resources spent on reporting and marketing. Figure 3 shows that insurers with higher risks disclose more. As explained earlier, high-risk insurers may have incentives to be more transparent so that they can prevent themselves from troublesome regulatory attention. Similarly, Figure 4 demonstrates that insurers with lower investment incomes exhibit higher transparency levels. Greater transparency may help reduce the adverse effects on consumers' or investors' trust, particularly for insurers with bad investment outcomes.

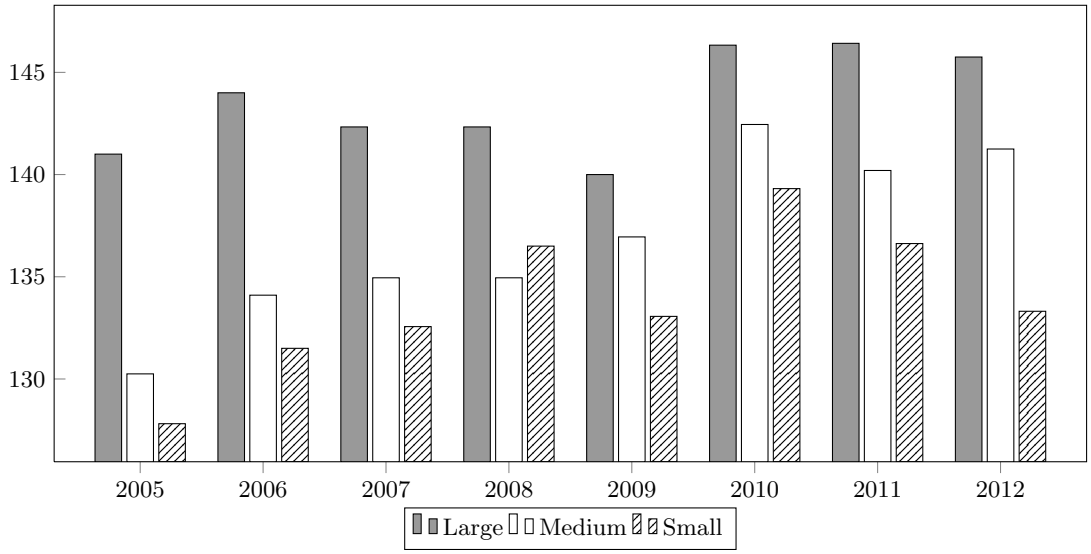
Figure 2: Average Disclosure Levels from 2005 to 2012




| Year | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| $ITEM$ | 132.13 | 135.7 | 136 | 137.3 | 136.4 | 142.4 | 140.6 | 139.7 |
| % *Change* | - | 2.71% | 0.21% | 0.97% | -0.65% | 4.37% | -1.27% | -0.59% |

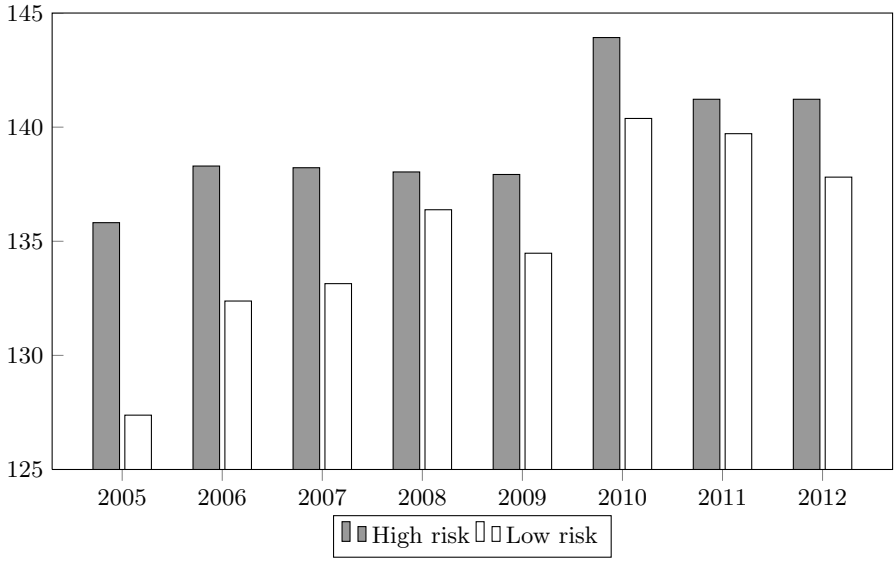
This figure plots the average number of disclosure items ($ITEM$) of all companies in the sample from 2005 to 2012. The table below the figure presents the growth rate of the average disclosure level each year (% *Change*).

Figure 3: Average Disclosure Levels for Companies with Different Sizes from 2005 to 2012



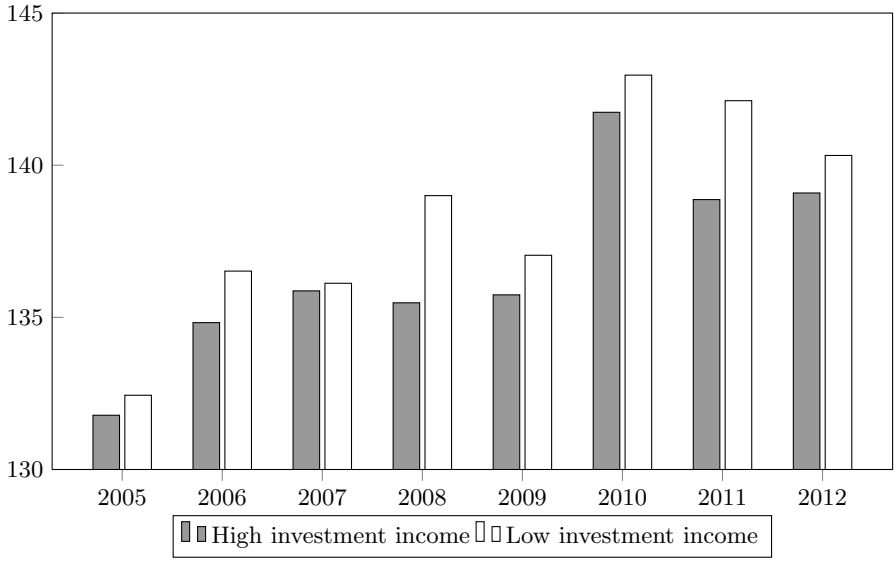

This figure separates companies into three categories according to their market capitalizations and shows the changes of disclosure activities in each category. "Large" represents companies with their market capitalizations above €10 billion; "Medium" are companies that have their market capitalizations between €2 and €10 billion; "Small" stands for companies with their market capitalizations below €2 billion. The market capitalizations data are based on the firm-level statistics at the end of 2012.

Figure 4: Average Disclosure Levels for Companies with Different Risk Levels from 2005 to 2012




This figure distinguishes between companies according to their risk levels and illustrates the development of the average disclosure levels for companies with different levels of risks. The risk levels of insurers are captured by their equity-capital-to-asset ratios ($CAP$s). Higher $CAP$s, lower insurers' risks. The "High Risk" group denotes insurers with their $CAP$s lower than 10%, whereas insurers who belong to the "Low Risk" group have $CAP$s above 10%.

Figure 5: Average Disclosure Levels for Companies with Different Investment Incomes from 2005 to 2012




This figure demonstrates the average disclosure levels for companies with high/low investment incomes from 2005 to 2012. The investment performance of insurers are calculated as the investment income divided by premiums earned ($INV$). The higher $INV$s, the better insurers perform in investment. The "High Investment Income" group stands for insurers whose $INV$s are above 15%, whereas the "Low Investment Income" group includes insurers whose $INV$s are lower than 15%.

### 4.3 OLS Estimation and Control Variables for Insurer Risk

To test the null hypothesis, I first perform the ordinary least squares (OLS) estimation as the benchmark regression, assuming that the disclosure level of an insurer is an exogenous variable. This assumption holds when, for example, the disclosure level of an insurer is determined or mainly influenced by its shareholders or outside stakeholders such as large investors or regulators. The manager of the insurance company thus only decides on its risk policy. In this case, the disclosure level of a firm is exogenous to the risk decision of the firm manager.

For the OLS regression, I control for four time-varying risk indicators – the growth rate of insurance premiums, the investment performance, the liquidity and the size of insurers – which are the most important risk factors in terms of significance according to previous empirical studies in the insurance field. The detailed definitions of the four risk indicators are summarized in Table 1. In the following, I review previous findings on the relationships between these four control variables and the risk-taking behavior of insurers.

Firstly, Kim et al. (1995) find that the rapid growth of insurance premiums (combined with other factors) leads to vulnerable financial situations for insurance companies, especially during the crisis period. Although an increase in the growth rate of insurance premiums can be a good sign for insurers' incomes, weak insurers have an incentive to carry out a risky firm policy by charging insufficient insurance prices and expanding business rapidly. This incentive is especially magnified under a high level of competition, in which case insurers involve in price competition in order to secure market share.[18] I thus incorporate the underwriting behavior of insurance companies as one of the control variables for risk-taking, which is measured by the growth rate of insurance premiums[19](denoted as $GPREM$).

Secondly, Chen and Wong (2004) study the drivers of the financial health of insurance companies in Asia. They find that the investment performance of an insurer positively affects its financial solidity.[20] In other words, a bad investment income can be a sign of a weak balance sheet of an insurer, and can consequently affect the insolvency of the insurer. Therefore, I include the investment performance as a control variable for the insurers' risk, which is denoted as $INV$. The $INV$ is calculated as the investment incomes of an insurer divided by its premiums earned.

Thirdly, firm liquidity reflects its ability to pay its liabilities on time. Lee and Urrutia (1996) show, in an empirical format, that the current liquidity ratio of an insurance company is a significant indicator for predicting its insolvency. The lower the liquidity of an insurer, the higher the insolvency risk of the insurer is. In this article, firm liquidity (denoted as $LIQ$) is measured by the ratio of cash and cash-equivalent assets to total reserves. However, it is important to notice that the relationship between the level of liquidity and insurer risk should not be linearly negative. If

[18] See Harrington and Danzon (1994).

[19] Insurance premiums equal the price of single insurance policy multiplied by the number of contracts.

[20] Kim et al. (1995) and Kramer (1996) show the same evidence in the U.S. and the Dutch insurance markets respectively.

an insurer holds a large portion of its assets as cash or cash-equivalent assets, the low asset return may not be sufficient to satisfy the payments against liabilities.

Last but not least, firm size is supposed to be negatively related to insurer risk. This is due to the fact that larger companies usually hold relatively more diversified insurance products and investment portfolios. The diversification effects enable larger companies to resist market uncertainties and to obtain more predictable returns.[21] Besides, from the perspective of regulators/governments, large financial companies may be "too big to fail" due to their close interconnections with the rest of the economy. Therefore, small insurers are usually more in danger of being liquidized when an insolvency situation occurs.[22] However, the advantage of being "too big to fail" can be exactly the reason for the managers of large firms to pursue risky strategies. A recent empirical work by Bhagat et al. (2012) finds a positive relation between firm size and the risk-taking of financial institutions. They interpret this result as an outcome for the risk incentive distortion by the "too big to fail" policy, in which case large firms are inclined to take risks because their bankruptcy risk is low. Following the existing literature, I use the natural logarithm of total assets as the proxy for firm size (denoted as $SIZE$).

Table 1: Variable Definitions

| Variable | Notation | Definition |
|---|---|---|
| Capitalization | $LN(CAP)$ | Natural logarithm of the equity capital-to-asset ratio |
| Disclosure Level | $ITEM$ | Number of financial items available in the Thomson One database for each company |
| Disclosure Level of Peer Insurers | $PITEM$ | Average number of financial items available in the Thomson One database for the top 3 peer companies of each company |
| Growth Rate of Insurance Premium | $GPREM$ | Growth rate of net sales or revenues |
| Investment Risks | $LN(STOCK)$ | Natural logarithm of the stock-to-total investments ratio |
| Investment Performance | $INV$ | Investment incomes / premiums earned |
| Liquidity | $LIQ$ | Ratio of cash and cash-equivalent marketable securities to total reserves |
| Size | $SIZE$ | Natural logarithm of total assets |

This table lists all the variables used in the regressions. $LN(CAP)$ and $LN(STOCK)$ represents two risk measures as the dependent variable in the OLS and the 2SLS regressions. $ITEM$ is the key-interest explanatory variable, and $PITEM$ is one of the instrumental variables applied in the 2SLS estimation. $GPREM$, $INV$, $LIQ$ and $SIZE$ are control variables for the insurers' risk. In the 2SLS first-stage regression, $INV$ and $SIZE$ are control variables for the disclosure level.

[21] See Kim et al. (1995).

[22] See, for example, BarNiv and Hershbarger (1990, p. 119); Cummins et al. (1995).

Therefore, the regression model for the OLS estimation is thus

$$RISK_{it} = \alpha ITEM_{it} + \beta_0 + \beta_1 GPREM_{it} + \beta_2 INV_{it} + \beta_3 LIQ_{it} + \beta_4 SIZE_{it} + u_{it}. \quad (1)$$

In the model, $RISK_{it}$ is captured by variables such as the insurers' capitalization ($CAP_{it}$) or the portion of stock investments ($STOCK_{it}$). Since these variables are percentage variables, in order to conduct a linear estimation, I reformulate the dependent variable ($RISK_{it}$) as the natural logarithm of the two risk indicators, denoted as $LN(CAP_{it})$ and $LN(STOCK_{it})$ respectively. Furthermore, although the disclosure level $ITEM_{it}$ is a variable at $T = t$, most of the financial items, particularly through the format of annual reports, are disclosed at the beginning of the following period. In other words, $ITEM_{it}$ reflects an ex post indicator, whereas $RISK_{it}$ is an ex ante variable.

Apart from the regression of the complete sample, I separate the sample into three sub-samples according to the different business types of insurers: pure life insurers, pure non-life insurers and multi-line insurers. The regressions by using different sub-samples provide results for identifying the influence of business types on the results. For example, I expect different results for the pure life insurance sub-sample compared to pure non-life insurance, since life insurers underwrite contracts with longer maturities and hold relatively more reserves. In addition, multi-line insurers have more complex asset and liability portfolios compared to solo insurers. I thus expect multi-line insurers to exhibit different risk profiles compared to solo insurance companies.

### 4.4 2SLS Estimation and Control Variables for Disclosure

Based on theoretical arguments and previous empirical studies, the risk level of an insurer can affect its disclosure strategy. In other word, an insurer can decide on its shareholder-value-maximizing risk policy, and then choose the optimal level of disclosure subsequently. In this case, the key-interest explanatory variable (disclosure level) that can be simultaneously determined with the dependent variable (insurer risk) is generally correlated with the error term. Consequently, the OLS estimation can be biased and inconsistent. In order to solve this endogeneity issue, this article applies the simultaneous equations model (SEM) with the Two Stage Least Squares (2SLS) estimation as the robustness check.

The instrument of the 2SLS estimation used for the endogenous variable – the disclosure level of the insurer $X$ – is the linear combination of all the included exogenous variables. One of the instrumental variables is the average disclosure level of the insurer $X$'s peers. In specific, I calculate the average disclosure level of its top three competitive companies of each insurer[23] (denoted as $PITEM$). The reasons for choosing the $PITEM$ as the instrumental variables are that ($i$) each individual insurer decides on its shareholder-value-maximizing risk policy, and the risk of insurer $X$ is thus uncorrelated with the average disclosure level of insurer $X$'s peers. ($ii$) the disclosure

[23] The information of an insurer's top competitors is offered by Hoover's Inc., a subsidiary of the Dun and Bradstreet Corporation (D&B) which provides corporate and industry data and analyses.

level of the insurer $X$ is correlated with its peers' disclosure activities due to the competition for market share based on the game-theoretical argument explained in Section 3.

Furthermore, the results of Höring and Gründl (2011) show that firm size and risk have significant positive impacts on the risk disclosure activities of insurers. In addition, the insurers' profitability has a significant negative relationship with the disclosure level. Therefore, I incorporate the insurers' investment performance ($INV$) and size ($SIZE$) into the first-stage regression (eq. (2)). Finally, the simultaneous equations model (SEM) can be written as

$$ITEM_{it} = \alpha_1 RISK_{it} + \beta_{10} + \beta_{11} PITEM_{it} + \beta_{12} INV_{it} + \beta_{13} SIZE_{it} + u_{1it}, \tag{2}$$

$$RISK_{it} = \alpha_2 ITEM_{it} + \beta_{20} + \beta_{21} GPREM_{it} + \beta_{22} INV_{it} + \beta_{23} LIQ_{it} + \beta_{24} SIZE_{it} + u_{2it}. \tag{3}$$

### 4.5 Data

The testing sample of this article is an unbalanced panel from 2005 to 2012 for 52 European stock insurance companies from the Thomson One database. The original sample covers listed insurance companies from all European Union member states plus Norway and Switzerland. Specifically, the sample consists of around 27% insurance companies from the United Kingdom, 12% from Switzerland, 10% from Germany, 10% from Italy, 8% from France, 6% from the Netherlands, with the rest being from Austria, Belgium, Denmark, Finland, Ireland, Luxembourg, Norway, Poland, Slovenia and Spain. The companies in the sample have diversified business profiles which include life insurance, non-life insurance and multi-line insurance. Life insurance companies account for around 12% of the sample, 19% are non-life insurers and the remaining 69% are multi-line insurers. I obtain the firm-specific data such as capitalization ratio, the portion of stock investment, the growth rate of insurance premiums, investment income, liquidity and firm size from the Worldscope fundamentals database provided by Thomson Reuters. Table 2 displays the summary statistics for the two risk measures, insurers' disclosure levels and other firm specific variables in the complete sample. The sub-tables (a), (b) and (c) summarize variable statistics of three sub-samples according to the different business types of insurers.

Regarding the risk of insurers, the statistics show the following two features: Firstly, the average equity capital-to-asset ratio ($CAP$) of pure non-life insurance companies is higher than that of pure life and multi-line insurance companies. However, non-life insurers also have larger variance in their decisions on capital-holding compared to the other two groups. Pure life insurers tend to hold constantly less equity capital. This might be due to the fact that the liabilities of life insurance companies are long-term and tend to be more stable and predictable. Consequently, the underwriting risk of life insurers is lower compared to insurers which have non-life undertakings. Secondly, pure life insurers have the highest average portion of risky investment in the sample, and the high volatility of the $STOCK$ indicates that pure life insurers adjust their asset portfolios more actively, compared to the other two groups. One incentive for life insurers to invest more riskily is that the investment risk can be shared with policyholders, for example through the unit-linked type of insurance contracts.

Table 2: Summary Descriptive Statistics of Firm-specific Variables (2005-2012)

| Complete (52) | Mean | Std. Dev. | Min. | Max. | Obs.(n×T) |
|---|---|---|---|---|---|
| *CAP* | 0.14 | 0.14 | 0 | 0.80 | 409 |
| *STOCK* | 0.10 | 0.09 | 0 | 0.43 | 389 |
| *ITEM* | 137.33 | 12.673 | 62 | 152 | 410 |
| *PITEM* | 129.18 | 15.291 | 46.67 | 149.67 | 408 |
| *GPREM* | 0.09 | 0.374 | -0.62 | 4.49 | 400 |
| *INV* | 0.32 | 0.84 | -1.59 | 7.70 | 395 |
| *LIQ* | 0.21 | 0.82 | 0 | 7.34 | 402 |
| *SIZE* | 10.11 | 2.16 | 3.307 | 14.09 | 409 |
| Life (6) | | | | | |
| *CAP* | 0.04 | 0.01 | 0 | 0.06 | 48 |
| *STOCK* | 0.15 | 0.16 | 0.01 | 0.43 | 48 |
| *ITEM* | 142.60 | 7.49 | 105 | 152 | 48 |
| *PITEM* | 135.60 | 10.08 | 110 | 146.2 | 48 |
| *GPREM* | 0.002 | 0.26 | -0.52 | 1.17 | 44 |
| *INV* | 0.35 | 0.46 | -1.59 | 1.60 | 48 |
| *LIQ* | 0.05 | 0.05 | 0.003 | 0.19 | 48 |
| *SIZE* | 12.59 | 0.75 | 11.41 | 14.09 | 48 |
| Non-life (10) | | | | | |
| *CAP* | 0.33 | 0.18 | 0.1 | 0.80 | 77 |
| *STOCK* | 0.06 | 0.06 | 0 | 0.28 | 69 |
| *ITEM* | 139.88 | 9.10 | 87 | 149 | 77 |
| *PITEM* | 125.03 | 20.03 | 46.67 | 148.67 | 72 |
| *GPREM* | 0.09 | 0.20 | -0.32 | 1.33 | 76 |
| *INV* | 0.06 | 0.071 | -0.2 | 0.23 | 76 |
| *LIQ* | 0.76 | 1.75 | 0.01 | 7.34 | 77 |
| *SIZE* | 7.66 | 1.70 | 3.31 | 10.34 | 77 |
| Multi-line (36) | | | | | |
| *CAP* | 0.10 | 0.08 | 0.005 | 0.39 | 284 |
| *STOCK* | 0.10 | 0.07 | 0 | 0.31 | 272 |
| *ITEM* | 135.75 | 13.816 | 62 | 152 | 285 |
| *PITEM* | 129.14 | 14.302 | 88.25 | 149.67 | 288 |
| *GPREM* | 0.10 | 0.422 | -0.62 | 4.49 | 280 |
| *INV* | 0.39 | 0.98 | -1.16 | 7.70 | 271 |
| *LIQ* | 0.08 | 0.15 | 0 | 1.82 | 277 |
| *SIZE* | 10.35 | 1.77 | 6.14 | 13.86 | 284 |

This table summarizes the statistics of the firm-specific characteristics of the sample insurers. The complete sample consists of 52 insurers, of which 6 are pure life insurers, 10 are pure non-life insurers and the remaining 36 are multi-line insurers. Firm-specific characteristics include capitalization ratio ($CAP$), the portion of stock investment ($STOCK$), the number of financial items disclosed ($ITEM$), the number of items disclosed by an insurer's peer insurers ($PITEM$), the growth rate of insurance premiums ($GPREM$), investment performance ($INV$), liquidity ($LIQ$) and firm size ($SIZE$). The descriptive statistics focus on the mean values (Mean), the standard deviations (Std. Dev.), the minimum value (Min.), the maximum value (Max.) and the number of observations (Obs.(n×T)) of the firm-specific variables.

Regarding the transparency level of different types of insurers, the average disclosure level ($ITEM$) of pure life insurers is higher and more stable than that of pure non-life and multi-line insurers. The average disclosure level of multi-line insurers is the lowest in the sample, and multi-line insurers tend to vary largely in their decisions on disclosing. The statistics also summarize the disclosure levels of insurers' top 3 competitors ($PITEM$). The peer insurers of pure life insurers tend to have constantly high disclosure levels, whereas the peer insurers of pure non-life insurers exhibit the opposite.

Regarding the firm-specific characteristics of insurers, the statistics indicate the following four features: Firstly, multi-line insurers have higher and more volatile premium growth rates in comparison to solo insurers. Secondly, multi-line insurers generate the highest average investment income in comparison to solo insurers. However, the high average investment return is associated with high volatility. Thirdly, pure non-life insurers are inclined to hold relatively more liquid assets. This may be due to the fact that pure non-life insurers underwrite short-term insurance contracts, and adequate liquid assets are necessary to fulfill more frequent claims payments. In contrast, pure life insurers have the incentive to hold more illiquid assets. This is because, on the one hand, the liabilities of pure life insurers are long-term, and claims payments are more predictable. On the other hand, illiquid assets can generate higher returns which are favored by pure life insurers, particularly for life insurers which offer insurance products with interest rate guarantees[24]. Last but not least, the pure life insurers and the multi-line insurers in the sample consist of mainly large- and medium-sized companies (with their market capitalizations more than €2 billion), whereas the pure non-life insurers in the sample are mostly small companies (with their market capitalizations below €2 billion).

## 5 Empirical Results of the OLS Estimation

This section provides the empirical results of the relationship between firm-level transparency and the insurers' risk based on the OLS regression. Tables 5 and 6 report the regression outcomes for the effect of transparency on the insurers' capitalization and investment risk, respectively. Specifically, Table 3 shows that the insurers' disclosure level has a positive impact on its capitalization at the 1% significance level for the complete sample. Particularly, one more number of financial items disclosed by an insurer leads to an approximately 1.63% higher equity capital-to-asset ratio of the insurer. In other words, greater firm-level transparency induces insurers to hold more equity capital, and insurers are thus less risky. Therefore, a higher disclosure level can limit the incentive of an insurer in risk-taking, and market discipline takes place. For the sub-samples, only the multi-line insurers sub-sample shows a significant positive relationship between transparency and the insurers' capitalization at the 5% significance level.

[24] See, for example, Cummins et al.(2004).

Table 3: OLS Estimate on the Relationship between the Insurers' Transparency and Capitalization

| LN(Capitalization) | Complete | Life | Non-life | Multi-line |
|---|---|---|---|---|
| Disclosure level | 0.0163*** | 0.00610 | 0.0105 | 0.0112** |
| | (0.00428) | (0.00917) | (0.00630) | (0.00521) |
| Growth rate of insurance premium | 0.0648 | 0.0408 | 0.200 | 0.0277 |
| | (0.113) | (0.167) | (0.201) | (0.132) |
| Investment performance | -0.189*** | -0.339* | 1.637*** | -0.190*** |
| | (0.0418) | (0.175) | (0.604) | (0.0465) |
| Liquidity | 0.0365 | 2.046* | 0.0425 | 0.356 |
| | (0.0457) | (1.021) | (0.0353) | (0.348) |
| Size | -0.298*** | -0.228*** | -0.167*** | -0.209*** |
| | (0.0185) | (0.0656) | (0.0373) | (0.0268) |
| Constant | -1.652*** | -1.300 | -1.583* | -1.972*** |
| | (0.590) | (1.275) | (0.888) | (0.713) |
| Obs. $(n \times T)$ | 382 | 43 | 75 | 264 |
| R-sq. | 0.531 | 0.299 | 0.533 | 0.274 |

This table presents the results of the OLS regression of the insurers' capitalization on its disclosure level. The dependent variable is the natural logarithm of capitalization ($LN(CAP)$), the key-interest explanatory variable is the disclosure level ($ITEM$), and the remaining four variables serve as control variables. The results are separated into four groups: the complete sample ("Complete"), the pure life insurers ("Life"), the pure non-life insurers ("Non-life") and the multi-life insurers ("Multi-line") sub-sample. Statistical significance is indicated by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: OLS Estimate on the Relationship between the Insurers' Transparency and Investment Risk

| LN(Portion of Stock Investment) | Complete | Life | Non-life | Multi-line |
|---|---|---|---|---|
| Disclosure level | 0.00485 | -0.0101 | 0.0983*** | -0.00165 |
| | (0.00789) | (0.0239) | (0.0264) | (0.00821) |
| Growth rate of insurance premium | -0.222 | 0.463 | 1.195 | -0.478** |
| | (0.209) | (0.671) | (0.833) | (0.203) |
| Investment performance | -0.275*** | 2.194*** | -0.526 | -0.247*** |
| | (0.0767) | (0.707) | (2.525) | (0.0713) |
| Liquidity | -0.0695 | -5.572 | 0.237 | -1.842*** |
| | (0.131) | (4.212) | (0.218) | (0.533) |
| Size | 0.0619* | 0.243 | 0.399* | 0.0106 |
| | (0.0369) | (0.265) | (0.212) | (0.0420) |
| Constant | -3.972*** | -4.906 | -20.57*** | -2.313** |
| | (1.077) | (3.966) | (3.609) | (1.105) |
| Obs. $(n \times T)$ | 356 | 44 | 52 | 260 |
| R-sq. | 0.046 | 0.313 | 0.371 | 0.134 |

This table presents the results of the OLS regression of the insurers' investment risk on its disclosure level. The dependent variable is the natural logarithm of the portion of stock investment ($LN(STOCK)$), the key-interest explanatory variable is the disclosure level ($ITEM$), and the remaining four variables serve as control variables. The results are separated into four groups: the complete sample ("Complete"), the pure life insurers ("Life"), the pure non-life insurers ("Non-life") and the multi-life insurers ("Multi-line") sub-sample. Statistical significance is indicated by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In terms of control variables, the regression delivers mixed results for the relationship between the investment performance and the capitalization ratio of insurers. Specifically, a higher investment return leads to a lower risk level of insurers for the complete sample, which is also confirmed by the results for the pure life and multi-line insurers sub-samples. However, the investment performance is positively related to the capitalization ratio of insurers for the pure non-life insurers sub-sample. One explanation for these mixed findings is: When insurers are seeking abnormal returns through investing in high-risk assets, investments with high volatilities can reduce the safety levels of insurers. In contrast, increasing returns through more effective investments can generate the less risky profiles of insurers. Furthermore, liquidity has a weakly positive relationship with the insurers' capitalization for the pure life sub-sample. This result is consistent with Lee and Urrutia (1996), who show that lower liquidity leads to a higher insolvency risk of an insurer. In addition, size has a negative influence on insurers' capitalization. Hence, larger insurers tend to be more risky. This result is consistent with Bhagat et al. (2012), who find that large firms are inclined to take more risks due to the risk incentive distortion by the "too big to fail" policy. Besides, the OLS results in Table 3 do not demonstrate any significant relationship between the insurance premium growth rate and the insurers' capitalization.

Table 4 shows that there is no statistically significant link between the disclosure level and the asset allocation strategies of insurers for the complete sample. However, the result for the pure non-life insurers sub-sample indicates a positive relationship between the disclosure level and the investment risk, meaning that greater transparency leads to more risky investments. This result confirms the another alternative hypothesis which indicates that outside stakeholders place bind trust on insurers under greater firm-level transparency. In this case, risk-taking is less costly and thus more beneficial for insurers.

In terms of control variables, the growth rate of insurance premiums for the multi-life insurers sub-sample have a negative correlation with the investment risk of insurers. A higher growth rate of insurance premiums can generate more liabilities to insurers, and consequently the insurance reserves of insurers increase. When considering the regulation on the investment of insurance reserves,[25] the total investment risk is limited. Furthermore, liquidity has a negative impact on the investment risk of insurers, meaning more holdings in cash diminish the available assets invested riskily. In addition, the investment performance presents mixed influences on the insurers' risk, and size has a negative impact on the investment risk, which are both consistent with the previous findings in Table 3.

[25] For example, in Germany, the direct and indirect investments of an insurer may not exceed 7.5% of guarantee assets and of the other restricted assets. See §3(2) no.1. AnlV.

## 6 Robustness Check

The results of the robustness check not only confirm the main outcomes of the OLS benchmark regressions, but also demonstrate more significant and interesting findings. Tables 7 and 8 present the results of the second-stage regressions under the 2SLS estimation. Specifically, Table 5 shows that the disclosure level has a positive impact on the insurers' capitalization at the 5% significance level for the complete sample. One more number of financial items disclosed by an insurer leads to an approximately 4.14% higher equity capital-to-asset ratio of the insurer. This positive effect of improved transparency on the insurers' capital-holding is confirmed by the results of testing different sub-samples, particularly for the pure non-life sub-sample (at the 1% significance level). To sum up, consistent with the main findings in the OLS estimations, the results of the 2SLS estimations imply that a higher disclosure level can limit the insurers' risk-taking behavior based on the principle of market discipline.

In terms of control variables, liquidity is positively correlated to the insurers' capitalization for the complete sample, and for the pure life and pure non-life insurers sub-samples. This result is consistent with the OLS outcome: lower liquidity generates a higher insolvency risk of insurers. The positive relation between the insurers' capitalization and liquidity is particularly significant for pure non-life insurers. Compared to pure life insurers, non-life insurers offer insurance contracts with shorter maturities, which requires high liquidity to fulfill relatively more frequent claim payments. Furthermore, both the investment performance and the size of insurers are negatively related to the their capitalization.

Table 6 presents the final 2SLS estimates of the relationship between transparency and the investment risk of insurers. The results indicate no statistically significant link between the disclosure levels and the asset allocation strategies of insurers for the complete sample. However, the result for the pure life insurers sub-sample demonstrates that a higher disclosure level leads to a lower portion of stock investment. Specifically, one more financial item disclosed by an insurer results in an approximately 8.94% decline in the portion of stock investment. Furthermore, the disclosure level is positively related to the investment risk for the non-life insurers sub-sample, which is consistent with the finding in the OLS regression. The different results of pure life and pure non-life insurers come from the varied contract design of each type. The short-term feature of non-life insurance contracts enables non-life insurers to deviate from the promised risk level more easily compared to life insurers, whose consumers can lapse on policies when life insurers invest at high risks.

In terms of control variables, the growth rate of insurance premiums and liquidity are negatively correlated to the investment risk, and the investment performance has mixed influences on the investment risk. All results are consistent with the OLS findings. However, the 2SLS estimation shows no significant impact of firm size on the investment risk of insurers.

Table 5: 2SLS Estimate on the Relationship between the Insurers' Transparency and Capitalization

| LN(Capitalization) | Complete | Life | Non-life | Multi-line |
|---|---|---|---|---|
| Disclosure level | 0.0414** | 0.0368** | 0.0520*** | 0.0502* |
| | (0.0169) | (0.0164) | (0.0180) | (0.0290) |
| Growth rate of insurance premium | 0.0527 | -0.127 | -0.286 | 0.0768 |
| | (0.119) | (0.191) | (0.322) | (0.149) |
| Investment performance | -0.230*** | -0.558*** | 1.046 | -0.211*** |
| | (0.0444) | (0.208) | (0.804) | (0.0529) |
| Liquidity | 0.773*** | 2.045* | 0.936*** | 0.00767 |
| | (0.248) | (1.080) | (0.328) | (0.456) |
| Size | -0.305*** | -0.302*** | -0.109* | -0.251*** |
| | (0.0251) | (0.0765) | (0.0603) | (0.0423) |
| Constant | -5.131** | -4.676** | -8.035*** | -6.892* |
| | (2.186) | (1.986) | (2.462) | (3.675) |
| Obs. $(n \times T)$ | 374 | 43 | 67 | 264 |
| R-sq. | 0.447 | 0.087 | 0.207 | 0.116 |

This table presents the results of the 2SLS second-stage regression of the insurers' capitalization on its disclosure level. The dependent variable is the natural logarithm of capitalization ($LN(CAP)$), and the key-interest explanatory variable is the disclosure level ($ITEM$). The results are separated into four groups: the complete sample ("Complete"), the pure life insurers ("Life"), the pure non-life insurers ("Non-life") and the multi-life insurers ("Multi-line") sub-sample. Statistical significance is indicated by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6: 2SLS Estimate on the Relationship between the Insurers' Transparency and Investment Risk

| LN(Portion of Stock Investment) | Complete | Life | Non-life | Multi-line |
|---|---|---|---|---|
| Disclosure level | -0.00840 | -0.0894** | 0.125** | -0.0663 |
| | (0.0287) | (0.0445) | (0.0535) | (0.0499) |
| Growth rate of insurance premium | -0.178 | 0.873 | 1.831 | -0.558** |
| | (0.207) | (0.733) | (1.193) | (0.232) |
| Investment performance | -0.211*** | 2.973*** | 1.383 | -0.211** |
| | (0.0775) | (0.828) | (2.730) | (0.0831) |
| Liquidity | -1.809*** | -4.546 | -0.945 | -1.278* |
| | (0.469) | (4.468) | (1.376) | (0.727) |
| Size | 0.0639 | 0.495 | 0.280 | 0.0917 |
| | (0.0466) | (0.303) | (0.225) | (0.0771) |
| Constant | -2.036 | 2.874 | -23.34*** | 5.715 |
| | (3.672) | (5.515) | (7.047) | (6.218) |
| Obs. $(n \times T)$ | 354 | 44 | 50 | 260 |
| R-sq. | 0.083 | 0.116 | 0.363 | 0.112 |

This table presents the results of the 2SLS second-stage regression of the insurers' investment risk on its disclosure level. The dependent variable is the natural logarithm of the portion of stock investment ($LN(STOCK)$), and the key-interest explanatory variable is the disclosure level ($ITEM$). The results are separated into four groups: the complete sample ("Complete"), the pure life insurers ("Life"), the pure non-life insurers ("Non-life") and the multi-life insurers ("Multi-line") sub-sample. Statistical significance is indicated by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

## 7 Conclusions and Policy Implication

This article aims to investigate the influence of firm-level transparency on the risk decisions of insurers. The analysis is based on the "market discipline" theory that outside stakeholders have incentives to monitor and consequently influence inside shareholders' risk decisions in the absence of information asymmetry. Enhanced disclosure, which reduces the information asymmetry problem, can enable outside stakeholders to monitor the risk behavior of inside shareholders. Insurers, which are concerned about the adverse effects on external financing due to the disclosure of their risk profiles, should have the incentive to limit their risks. In other words, greater transparency provides necessary conditions for market discipline to take place.

The motivation of this article is to understand the impact of the enhanced disclosure level on insurers' risk incentives in both capitalization and investment decisions. I analyze a sample that consists of 52 European insurance companies based on a database from 2005 to 2012. The sample selection is particularly relevant to the envisaged Solvency II which aims to improve market transparency through higher disclosure requirements. The results of this article present a negative impact of extended disclosure on the risk-taking of insurance companies. In general, greater firm-level transparency results in higher capital-holding and lower investment risk of insurers . An intuitive conclusion is that insurers that are more transparent tend to be safer due to public or regulatory pressure. The results for insurers' capitalization decisions are statistically significant for the complete sample and all sub-samples based on the different business types of insurers. The results for the investment strategy of insurers are only significant for solo-insurers.

From a regulator's perspective, enhancing market transparency is essential for insurance supervision and consumer protection. The implementation of Solvency II will not only change the risk management strategies of insurers in Europe, but also shape insurers' reporting systems and increase their communications with the public, which is fundamental for market discipline. However, the influence of improved transparency on insurers' risk-taking behavior may not be significant or consistent for different types of insurers. This is due to the fact that consumers, as the party with less information/knowledge, can still be exploited by insurers even under greater transparency. Hence, relying only on the monitoring from the consumer side is inadequate, and regulatory attention is thus necessary.

There are several limitations of this article that I have to point out: Firstly, the major data limitation is that I test a small data sample which only consists of listed European insurance companies. The voluntary disclosure levels of the sample insurers do not vary largely year by year, since listed insurers are subject to the high mandatory disclosure requirements of the exchange market. The results would have been more persuasive if the sample included private and mutual insurers. In this case, the space of insurers' voluntary disclosure choice would have been larger. The second concern lies on the robustness of the empirical method, and particularly, on the question whether $PITEM$ is an efficient IV. Therefore, I also test the null hypothesis by using another instrument variable, i.e. the distance (in kilometers) from an insurer's top 10 largest investors to the insurer. The fundamental idea of this distance IV is that investors demand greater transparency

when it is more costly for them to acquire information about the financial strength of the insurer, the insurer-related market conditions and regulatory changes. Therefore, one can think that the distance of investors to an insurer correlates to the disclosure level of the insurer but does not affect the risk decision of the insurer. The results of applying the distance IV are consistent with the previous findings for the complete sample, but fail to show any statistical significance for the sub-samples. In addition, the major limitation of the distance IV is that I only have the cross-sectional data for the distance information of insurers in 2014, despite the fact that the distance IV is considered to be more exogenous than $PITEM$. Furthermore, there are other possible IV options such as the number of overseas branches of an insurer, and the diversity of the business types of an insurer's large investors. Theoretically speaking, an insurer usually faces higher reporting demand when expanding its business abroad or attempting to attract different types of investors. Therefore, these two IVs are considered to correlate with the firm-level transparency of the insurer but are exogenous to its risk policy. However, it is either difficult to obtain panel data for the information of overseas branches and investors' business types, or the data do not exhibit obvious variations in years. To sum up, by considering both the limitations of data and the effectiveness of testings, I select $PITEM$ as the final IV of this article.

Finally, one possible extension of this article would be to analyze how market discipline functions, i.e. who are the outside stakeholders consuming information and monitoring the risk behavior of insurers and through what kinds of methods. A further interesting topic in this area would be to investigate the implications of certain regulations (for example, the various forms of insurance guarantee schemes in Europe) or product designs (for example, life insurance products with guaranteed interest rates) on market discipline.

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## Appendix

Appendix 1: Disclosing Items in the Thomson One Database (Number of items in total: 163)

(a) Annual Balance Sheet (Number of items: 48)

| Assets | Liabilities | Shareholders' Equity |
|---|---|---|
| Cash | Insurance Reserves - Total | Non-Equity Reserves |
| **Investments - Total** | Benefit & Loss Reserves | Minority Interest |
| Fixed Income Securities Investment - Total | Unearned Premiums | Preferred Stock |
| Bonds | Policy & Contract Claims | Common Equity |
| Redeemable Preferred Stock | Other Insurance Reserves | Common Stock |
| Equity Securities Investment - Total | **Total Debt** | Capital Surplus |
| Common Stocks | ST Debt & Current Portion of LT Debt | Revaluation Reserves |
| Non-Redeemable Preferred Stock | Long Term Debt | Other Appropriated Reserves |
| Real Estate Assets | LT Debt Excl Capital Leases | Inappropriate Reserves |
| Mortgage, Policy & Other Loans | Non-Convertible Debt | Retained Earnings |
| Other Investments | Convertible Debt | Equity In Untaxed Reserves |
| Investments In Unconsolidated Subsidiaries | Capitalized Lease Obligations | ESOP Guarantees |
| Premium Balance Receivables | Provision for Risks & Charges | Unrealized Foreign Exchange Gain/Loss |
| Property, Plant & Equipment – Net | Deferred Income | (Less) Treasury Stock |
| Other Assets | Deferred Taxes | **Total Shareholders Equity** |
| **Total Assets** | Deferred Taxes – Credit | Policyholders' Equity |
| | Deferred Taxes – Debit | **Total Liabilities and Shareholders Equity** |
| | Deferred Tax Liability In Untaxed Reserves | Common Shares Outstanding |
| | Other Liabilities | |
| | **Total Liabilities** | |

Appendix 1: Disclosing Items in the Thomson One Database (Number of items in total: 163)

(b) Annual Income Statement (Number of items: 34)

| |
|---|
| **Net Sales or Revenues** |
| Premiums Earned |
| Investment Income |
| Gains/Losses on Sale of Securities - Pretax |
| Other Operating Income |
| Claim & Loss Expense – Total |
| Long Term Insurance Reserves |
| General & Admin Expenses |
| Other Operating Expenses |
| **Operating Expenses – Total** |
| **Operating Income** |
| Extraordinary Credit Pretax |
| Extraordinary Charge Pretax |
| Interest Expense on Debt |
| Interest Capitalized |
| Non-Operating Interest Income |
| Other Income/Expenses Net |
| Pretax Equity In Earnings |
| Reserves – Increase(Decrease) |
| **Pretax Income** |
| Income Taxes |
| Current Domestic Income Tax |
| Current Foreign Income Tax |
| Deferred Domestic Income Tax |
| Deferred Foreign Income Tax |
| Income Tax Credits |
| Minority Interest |
| Equity In Earnings |
| After Tax Other Income or Expenses |
| Discontinued Operations |
| Realized Investment Gain(Loss) |
| Policyholders' Surplus |
| **Net Income Before Extra Items/Pfd Dividends** |
| Extra Items & Gain(Loss) Sale of Assets |
| **Net Income Before Preferred Dividends** |
| Preferred Dividend Require |
| **Net Income to Common Shareholders** |
| EPS Incl. Extraordinary Items |
| EPS – Continuing Operations |
| Dividend Per Share |
| Common Shares Used to Calc Diluted EPS |

Appendix 1: Disclosing Items in the Thomson One Database (Number of items in total: 163)

(c) Annual Cash Flow Statement (Number of items: 26)

| Operations | Investing | Financing |
|---|---|---|
| Funds From Operations | Capital Expenditures Additions to Fixed Assets | Net Proceeds From Sale/Issue of Com & Pfd |
| Extraordinary Items | Additions To Other Assets | Proceeds From Stock Options |
| Funds From/For Other Operating Activities | Net Assets From Acquisitions | Other Proceeds From Sale/Issuance of Stock |
| **Net Cash Flow – Operating Activities** | Increase In Investments | Com/Pfd Purchased |
| | Decrease In Investments | Inc(Dec) In Short Term Borrowings |
| | Disposal of Fixed Assets | Long Term Borrowings |
| | Other Use/(Source) – Investing | Reduction In Long Term Debt |
| | Other Uses - Investing | Cash Dividend Paid – Total |
| | Other Sources – Investing | Common Dividends (Cash) |
| | **Net Cash Flow – Investing** | Preferred Dividends (Cash) |
| | | Other Source/(Use) – Financing |
| | | Other Sources – Financing |
| | | Other Uses – Financing |
| | | **Net Cash Flow – Financing** |
| | | Effect Of Exchange Rate On Cash |
| | | **Inc(Dec) In Cash & Short Term Investments** |

Appendix 1: Disclosing Items in the Thomson One Database (Number of items in total: 163)

(d) Annual Ratios (Number of items: 55)

| | | |
|---|---|---|
| Valuation Measures | Market Cap | Enterprise Value |
| | Net Sales or Revenues | EBITDA |
| | Total Debt | EBIT |
| | Net Assets | Capital Expenditure |
| Valuation | Price/Earnings | Price/Book Value |
| | Price/Sales | Price/Tangible Book Value |
| | Price/Cash Flow | |
| Liquidity Leverage | Long Term Debt/Equity | Long Term Debt / Total Capital |
| | Total Debt/Equity | Total Debt / Total Capital |
| Profitability Ratios | Loss Ratio | Operating Margin |
| | Loss Ratio – 5Y Average | Operating Margin – 5Y Average |
| | Expense Ratio | Pre-tax Margin |
| | Expense Ratio – 5Y Average | Pre-tax Margin – 5Y Average |
| | Combined Ratio | Net Margin |
| | Combined Ratio – 5Y Average | Net Margin – 5Y Average |
| Efficiency Ratios | Sales Per Employee | Net Income Per Employee |
| | Operating Profit Per Employee | Assets Per Employee |
| Management Effectiveness | Return on Equity | Return On Assets – 5Y Average |
| | Return on Equity – 5Y Average | Return On Invested Capital |
| | Return On Assets | Return On Invested Capital – 5Y Average |
| Dividend Ratios | Dividend Per Share | |
| | Dividend Yield | |
| | Dividend Payout Ratio | |
| Growth Rates | Sales | Net Income |
| | Sales – 5Y Average | Net Income – 5Y Average |
| | Operating Income | EPS |
| | Operating Income – 5Y Average | EPS – 5Y Average |
| | EBITDA | |
| | EBITDA – 5Y Average | |
| Stock Performance | Price Close | |
| | % Change | |
| | Total Return | |