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

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April 11, 2014

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, improved firm-level 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 under the anticipation of greater transparency, and this strategy on capital-holding is consistent for different types of insurance businesses. When considering the influence of improved transparency on the investment policy of insurers, the results are mixed for different types of insurers.

Keywords: Transparency, risk-taking, market discipline

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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 on 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 from outside stakeholders, which is detrimental to outside stakeholders, and particularly when acquiring information for the monitoring purpose is costly. One approach to resolve this issue is through timely disclosures 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 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. In other words, improved firm-level transparency can induce less risk-taking incentive of insurers.

[1]See, e.g., 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 that 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 that market participants have enough market power to influence the managerial decisions of insurers. See Eling (2012, p. 186).

[3]See, e.g., 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.

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 a higher transparency level (ex post) can lead to the less risky profile of insurers (ex ante) due to market discipline. I measure firm-level transparency by the disclosure level of the insurers. 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 my best 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 lead to a substantial increase in information to the public. This new challenge to European insurers requires them to achieve a better understanding of the consequences of enhanced disclosure.

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 pure life insurance, pure non-life insurance and multi-line insurance. By investigating a data sample with the time horizon 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 disclosure level and the risk of an insurer can be determined simultaneously. Particularly, the risk of an insurer can

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

[6] The implementation of the International Financial Reporting Standards (IFRS) at the beginning of 2005 requires all listed European insurance 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.

affect its voluntary disclosure activities.[7] Therefore, in addition to the benchmark regression which applies the ordinary least squares (OLS) method, the robustness check utilizes the simultaneous equations model (SEM) with the Two Stage Least Squares (2SLS) estimation in order to resolve this simultaneity issue. In the 2SLS regression, I use the average disclosure level of an insurer's top 3 competitors, together with other exogenous variables, as the instrument for the endogenous explanatory variable – the disclosure level of this insurer.

The results of both the OLS and the 2SLS estimations are consistent and show significant negative relationships between transparency and insurers' risk. Particularly, 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 improved 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 leads to improved transparency, may have different influence on the risk-taking behavior of insurers with different types of businesses; (*ii*) market discipline may still fail, despite greater firm-level transparency, in which case regulation on risk-taking is necessary.

The organizational structure of the article is as follows. Section 2 reviews two related streams of literature that provide background and motivation for this study. Section 3 explains the theoretical foundations and develops the testing hypothesis. Section 4 specifies the research design with methodologies and describes the data sample. Section 5 presents the empirical results from the benchmark OLS regression. Section 6 conduct the robustness check and discuss the results from the 2SLS regression. Section 7 concludes and provides relevant policy implications.

[7] Höring and Gründl (2011) consider the risk level of an insurer as one of the factors for the disclosure activities of the insurer. They find that the insurers' risk has a significant positive impact on their risk disclosure level.

2 Related Literature

The primary interest of this article lies on the impact of firm-level transparency on the risk-taking behavior of insurers. There has been, to my best knowledge, no direct research which identifies this relation. However, there are two streams of literature that provide the background and motivation for the investigated question. The first stream of literature focuses on the economic consequences of the change in disclosure activities. The second stream of literature relates to market discipline. In the following, I review the two related streams of literature.

Firstly, the disclosure activities of companies can either be voluntary or due to disclosure regulation. As to 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 measure 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.

[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.

As to mandatory disclosure, previous empirical studies find that companies under higher mandatory disclosure standards obtain higher liquidity and abnormal returns in their stocks. For example, Leuz and Verrecchia (2000) show that the increased mandatory disclosure level through changing to the international accounting standards leads to higher stock liquidity for the listed companies. Greenstone et al. (2006) investigate the influence of the 1934 Securities Exchange Act on companies' stock returns. Their results suggest that increased mandatory disclosure requirements allow firms to gain abnormal excess stock returns. However, enforced extended disclosure by regulation can also be detrimental, particularly to small companies without relevant reporting experience. For example, Bushee and Leuz (2005) examine the impact of the increased mandatory disclosure due to the 1934 Securities Exchange Act on companies. They find that enhanced mandatory disclosure can be extremely costly for small companies according to these companies' return outcomes, in which case small companies would prefer to leave the OTC Bulletin Board. However, companies that previously had experience in reporting under the SEC requirements obtain positive stock returns and a permanent increase in their stock liquidity.

The second stream of literature lies in the area of market discipline. Previous studies in the insurance field show that policyholders and stock investors have incentives to monitor the risks of insurers. 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 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. In specific, 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, 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. In specific, both Fenn and Cole (1994) and Brewer and Jackson (2002) show that insurers, which hold risky asset portfolios, face relatively 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 does 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. Furthermore, 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 disclose less information or fake reported

[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. Particularly, regulators have an incentive to limit excess risk-taking for consumer protection.

contents. This misbehave 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.

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] In specific, the manager of an insurance company (the agent) cannot commit to a low-risk investment strategy, and can thus benefit from risk-taking, when hiding information about its risk from outside stakeholders (the principal), such as stock investors or policyholders, is feasible. Improved transparency, which may resolve this information asymmetry issue, can thus be detrimental for high-risk insurers, since they may suffer from potential adverse effects on their stock performance or insurance demand. Therefore, before developing the hypothesis to test the impact of enhanced disclosure on the risk of insurers, one needs to understand the reasons for insurers to increase their transparency levels. In the following, I provide two possible theoretical arguments.

The first simple explanation for insurers' behavior of increasing their disclosure activities is due to the change of mandatory disclosure requirements. For example, the implementation of International Financial Reporting Standards (IFRS) in 2005 requires all listed European Union insurance companies to disclose in accordance with the IFRS. A higher standard for reporting forces companies with low transparency levels to enhance their disclosure. The second reason why insurers improve their

[10] See, e.g., 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.

transparency results from a game-theoretical argument. Consider a competitive insurance market where insurers are ranked according to their different levels of risks (i.e., Rank 1 – low-risk insurer, Rank 2 – medium-risk insurer and Rank 3 – high-risk insurer). In order to gain larger market share, the low-risk insurer discloses more in order to distinguish itself from its competitors.[12] This disclosure strategy of the low-risk insurer induces the medium-risk insurer to improve its transparency as well, since the medium-risk insurer cannot separate itself from the high-risk insurer otherwise. Therefore, this mechanism driven by the competition for market share induces companies, except for the ones that have the highest risk level, to improve their transparency. Furthermore, companies that are identified in the high-risk group also have incentives to disclose more. Helbok and Wagner (2006) show that banks with higher levels of debt increase their transparency in order to avoid regulatory attention. Therefore, regulatory attention or even public pressure may force the high-risk insurer to improve its transparency.

According to the principle of market discipline, enhanced disclosure enables outside stakeholders to monitor and respond to the risk-taking behavior of insurers. By considering the potential ex post adverse effects of risk-taking on external financing, insurers are inclined to control risks ex ante. However, greater firm-level transparency can also have a positive influence on risk-taking. 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, outside stakeholders react to the vague information as if they were facing the worst scenario.[13] This implies that ambiguous-averse outside stakeholders overestimate the risk of insurers when insurance companies are opaque. In contrast, outside stakeholders might perceive greater

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

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

transparency as a sign of the robust financial conditions of an insurer and perform blind trust on the insurer. In this case, market discipline loses effect, and the insurer can thus deviate even more easily from the risk perceived by outside stakeholders.[14] Therefore, based on the these two theoretical arguments, this article tests the null hypothesis (H_0) that the disclosure level has no effect on the risk decision of insurers against the alternative (H_A) that the disclosure level has either a negative or a positive effect.

$\boldsymbol{H_0}$ *The disclosure level of an insurance company has no effect on its risk-taking.*

4 Research Design and Data

4.1 Research Design

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

[14]Epermanis and Harrington (2006) state a situation when insurance demand is risk insensitive. In this case, policyholders do not react to the insolvency risk of insurers, and insurers are more likely to conduct risk-taking ("i.e. gambling for resurrection").

[15]See Harrington and Nelson (1986).

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

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.

Disclosure Level

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 to use 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 qualitative rather than quantitative assessments of insurers' risk profiles, which is an advantage of their disclosure index. However, to replicate this index requires consistent assess-

[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.

ments 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 that, firstly, 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 is 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. In specific, 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 Table 1. The graph reveals a general increase in the average disclosure level during the analyzed period. 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). In specific, 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 simply due to the fact that large insurers have more financial resources spent in 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. Figure 4 demonstrates that insurers with lower investment incomes exhibit higher transparency levels. The reason is similar to the explanation for the disclosure incentive of the high-risk insurer. Greater transparency may help reduce the adverse effects on consumers' or investors' trust, particularly for insurers with bad investment outcomes.

OLS Estimation and Control Variables for Insurer Risk

To test the null hypothesis, I first perform the ordinary least squares (OLS) regression as the benchmark estimation, assuming that the disclosure level of an insurer is exogenously given. This assumption holds under the following line of reasoning: The disclosure level of an insurer is mainly determined or influenced by its shareholders or outside stakeholders such as regulators and competitors. The manager of the insurance company thus only decides on risk policy. Therefore, 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 2. 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 is positively affecting its financial solidity.[20] In other words, a bad investment income can be the sign for 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 is, the higher is the insolvency risk of the insurer. In this article, firm liquidity (denoted as LIQ) is measured by the ratio of cash and cash-equivalent assets

[18]See Harrington and Danzon (1994).

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

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

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 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 the 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 "too big to fail" can be exactly the reason for the managers of large firms to conduct 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 incline 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 $SIZE$).

Threrefore, the regression model for the OLS estimation is thus

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

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 depen-

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

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

dent 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.

2SLS Estimation and Control Variables for Disclosure Level

Based on theoretical arguments and previous empirical studies, the risk level of an insurer can affect its disclosure strategy. 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. Therefore, the OLS estimation can be biased and inconsistent. In order to solve this endogeneity issue, this article applies a 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 an insurer X – is the linear combination of all the included exogenous

variables. One of the instrumental variables is the average disclosure level of insurer X's peers. For the insurer X, I calculate the average disclosure level of its three competitive companies[23] (denoted as $PITEM$). The reasons for choosing the $PITEM$ as one of the instrumental variables are that (i) the risk of insurer X is uncorrelated with the average disclosure level of insurer X's peers; (ii) the $PITEM$ is correlated with the explanatory variable $ITEM$ 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, in the first-stage regression of the 2SLS estimation (eq. (2)), I regress the disclosure level on the insurers' risk, controlling for the average disclosure level of insurer peers ($PITEM$), the investment performance (INV) and the size ($SIZE$) of insurers.[24] The 2SLS regression model is thus expressed as

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

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

In principle, by regressing the $ITEM$ on the chosen exogenous variables, the first-stage regression provides an estimated $\widehat{ITEM}$ which is uncorrelated with the error term u_2. The second-stage regression (eq. (3)) of $RISK$ on $\widehat{ITEM}$ with other control variables generates the final unbiased estimation.

[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.

[24]Höring and Gründl (2011) find that cross-listing status has a positive influence on the risk disclosure activities of insurers. In specific, companies that are listed on a U.S. stock exchange exhibit higher risk disclosure levels. This is due to the fact that cross-listing companies face higher regulatory disclosure requirements and higher agency costs related to foreign listing. Nevertheless, I exclude cross-listing as a factor of disclosure level in this article, since this article focuses on the voluntary disclosure activities of insurers.

4.2 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 pulsing Norway and Switzerland. Table 3 lists the insurance companies in the testing sample with their home countries. In specific, 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 and the rest are from Austria, Belgium, Denmark, Finland, Ireland, Luxembourg, Norway, Poland, Slovenia and Spain. The companies in the sample have diversified business profiles which include pure life insurance, pure non-life insurance and multi-line insurance. Pure life insurance companies account for around 12% of the sample, 19% are pure non-life insurers and the rest 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. Furthermore, the Thomson One database records the firm-specific data (e.g. total assets) in company home-country currencies. In order to be consistent, I thus convert the data in other currencies into Euro using the annual bilateral exchange rates of other currencies against the Euro each year, based on the Eurostat database.[25]

Table 4 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 insurers' risk, the statistics show that firstly, the average equity capital-

[25]Five annual bilateral exchange rates are applied for the sample data: Danish Krone – Euro, Norwegian Krone – Euro, Polish Zloty – Euro, Pound Sterling – Euro and Swiss Franc – Euro.

to-asset ratio (CAP) of pure non-life insurance companies is higher than the ones 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 constantly hold less equity capital. This is 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 relatively less 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, for example through the unit-linked type of insurance contracts, shared with policyholders.

Regarding the disclosure levels, the average disclosure level ($ITEM$) of pure life insurers is higher and more stable than the ones 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. Besides, the statistics also summarize the disclosure levels of insurers' peers ($PITEM$). The peer insurers of pure life insurers tend to have constant high disclosure level, whereas the peer insurers of pure non-life insurers exhibit the opposite.

Regarding firm-specific characteristics, the statistics indicate four features: Firstly, multi-line insurers have higher and more volatile premium growth rates in comparison with solo insurers. Secondly, multi-line insurers generate the highest average investment income in comparison with solo insurers. However, the high average investment return associates 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[26]. Last but not the least, the pure life insurers and the multi-line insurers in the sample consist of mainly large- and medium-size 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

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. In specific, Table 5 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.

In terms of control variables, the regression delivers mixed results for the relationship between the investment performance and the insurers' capitalization. Specifically, a

[26]See, e.g., Cummins et al.(2004).

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 insurers' capitalization for the pure non-life insurers sub-sample. When insurers 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 5 do not demonstrate any significant relationship between the insurance premiums growth rate and the insurers' capitalization.

Table 6 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. One possible explanation is that consumers behave blind trust on insurers under greater transparency. In this case, insurers can conduct risk-shifting more easily by taking riskier investments to maximize their shareholder value.

In terms of control variables, the growth rate of insurance premiums for the multi-life insurers sub-sample is negatively correlated to the investment risk of insurers. A higher growth rate of insurance premiums can bring more liabilities to insurers, and

consequently the insurance reserves of insurers increase. Due to the regulation on the investment of insurance reserves,[27] 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 consistent with the previous findings in Table 5.

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 2SLS second-stage regressions. In specific, Table 7 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). Therefore, similar to the main findings in the OLS estimations, a higher disclosure level can limit the insurers' risk-taking behavior due to the effect of market discipline.

In terms of control variables, liquidity is positively correlated to the insurers' capitalization for the complete sample, pure life and pure non-life insurers sub-samples. This result is consistent with the OLS outcome: lower liquidity generates the higher insolvency risk of insurers. The positive relation between the insurers' capitalization

[27] 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.

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 8 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 comes 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 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.

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, only relying on the monitoring from the consumer side is inadequate, and regulatory attention is thus necessary.

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 (e.g. the various forms of insurance guarantee schemes in Europe) or product designs (e.g. life insurance products with guaranteed interest rates) on market discipline.

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Figures and Tables

Figure 1: Development of the Average Disclosure Levels from 2005 to 2012

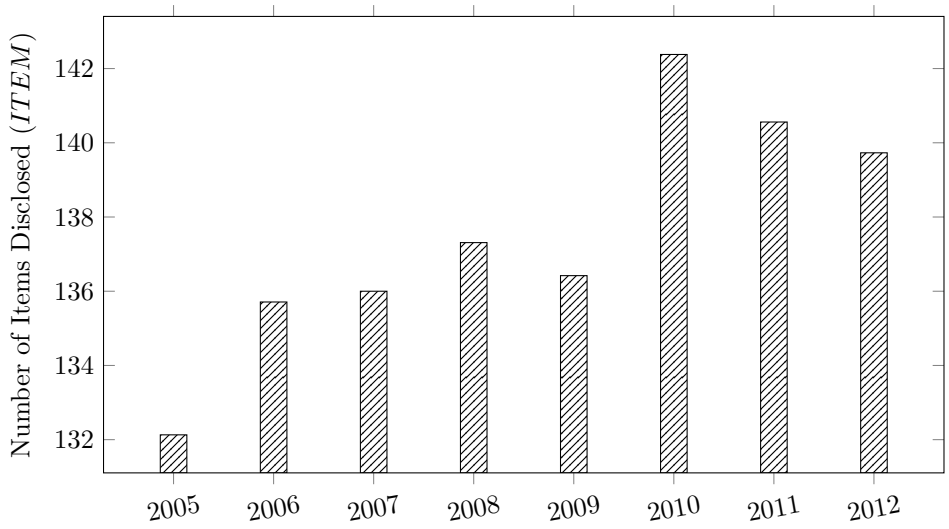

Table 1: Growth Rates of the Average Disclosure Level from 2005 to 2012

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%

Figure 1 plots the average number of disclosure items ($ITEM$) of all companies in the sample from 2005 to 2012. Table 1 presents the growth rate of the average disclosure level each year (% *Change*).

Figure 2: Development of the Average Disclosure Levels for Companies with Different Sizes from 2005 to 2012

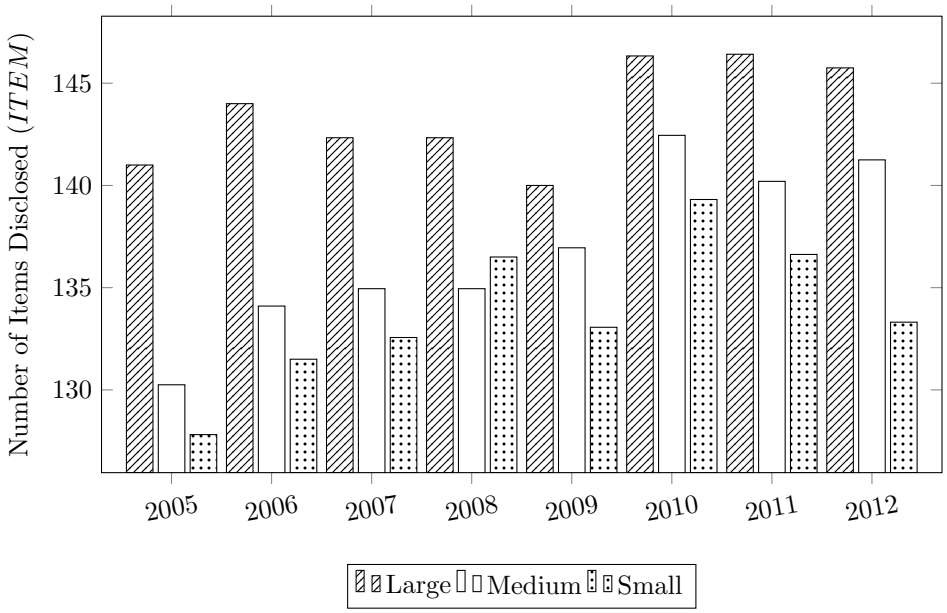

Figure 2 separates companies into three categories according to their market capitalizations and shows the changes of disclosure activities in each category. "Large" represents companies with their market capitalizations above €10 billion; "Medium" are companies that have their market capitalizations 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 3: Development of the Average Disclosure Levels for Companies with Different Risk Levels from 2005 to 2012

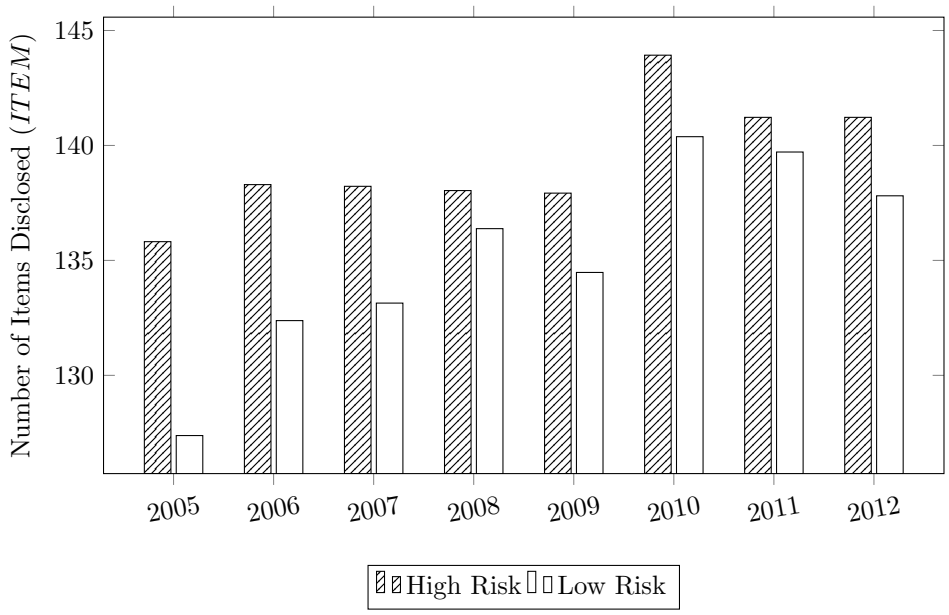

Figure 3 distinguishes companies by their risk levels and illustrates the development of the average disclosure levels for companies with different levels of risks. The risk levels of insurers are captured by their equity-capital-to-asset ratios (CAPs). Higher CAPs, lower insurers' risks. The "High Risk" group denotes insurers with their CAPs lower than 10%, whereas insures who belong to the "Low Risk" group have CAPs above 10%.

Figure 4: Development of the Average Disclosure Levels for Companies with Different Investment Incomes from 2005 to 2012

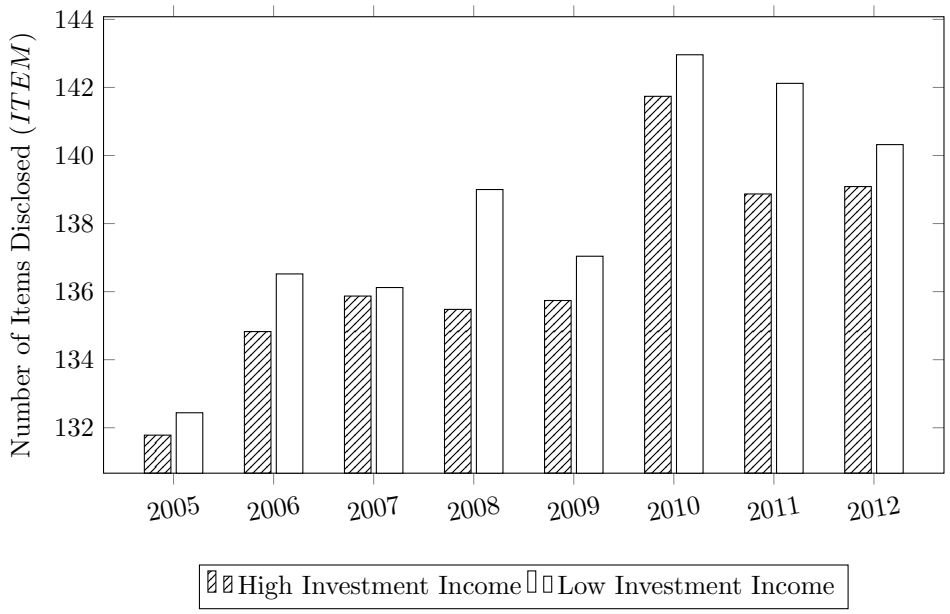

Figure 4 demonstrates the average disclosure levels for companies with high/low investment incomes from 2005 to 2012. The investment performance of insurers are calculated as the investment income divided by premiums earned (INV). The higher INVs, the better insurers perform in investment. The "High Investment Income" group stands for insurers whose INVs are above 15%, whereas the "Low Investment Income" group includes insurers whose INVs are lower than 15%.

Table 2: Variable Definitions

Variable	Notation	Definition
Capitalization	$LN(CAP)$	Natural logarithm of the equity capital-to-asset ratio
Disclosure Level	$ITEM$	Number of information available in the Thomson One database for each company
Disclosure Level of Peer Insurers	$PITEM$	Number of information available in the Thomson One database for peer companies
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

Table 2 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.

Table 3: List of Insurance Companies

Nr.	Company	Country	Nr.	Company	Country
1	Admiral Group	United Kingdom	27	Nuernberger Beteiligungs	Germany
2	Aegon	Netherlands	28	Old Mutual	United Kingdom
3	Ageas	Belgium	29	Permanent TSB Group Holdings	Ireland
4	Allianz	Germany	30	Personal Group Holdings	United Kingdom
5	Amlin	United Kingdom	31	Powszechny Zaklad Ubezpieczen	Poland
6	Assicurazioni Generali	Italy	32	Protector Forsikring	Norway
7	Aviva	United Kingdom	33	Prudential	United Kingdom
8	Axa	France	34	RheinLand Holding	Germany
9	Baloise Holding	Switzerland	35	RSA Insurance Group	United Kingdom
10	Beazley	Ireland	36	Sampo	Finland
11	Brit	United Kingdom	37	Scor	France
12	Catlin Group	United Kingdom	38	Societa Cattolica di Assicurazione	Italy
13	CNP Assurances	France	39	Standard Life	United Kingdom
14	Delta Lloyd	Netherlands	40	Storebrand	Norway
15	Euler Hermes	France	41	Swiss Life Holding	Switzerland
16	FBD Holdings	Ireland	42	Talanx	Germany
17	Foyer	Luxembourg	43	Topdanmark	Denmark
18	Grupo Catalana Occidente	Spain	44	Tryg	Denmark
19	Helvetia Holding	Switzerland	45	Unipol Gruppo Finanziario	Italy
20	ING Groep	Netherlands	46	Uniqa Insurance Group	Austria
21	Lancashire Holdings	United Kingdom	47	Vaudoise Assurances Holding	Switzerland
22	Legal and Gernal Group	United Kingdom	48	Vienna Insurance Group	Austria
23	Mapfre	Spain	49	Vittoria Assicurazioni	Italy
24	Mediolanum	Italy	50	Wuestenrot & Wuerttembergische	Germany
25	Nationale Suisse	Switzerland	51	Zavarovalnica Triglav	Slovenia
26	Navae Group	United Kingdom	52	Zurich Insurance Group	Switzerland

Table 3 lists all insurance companies included in the sample. The sample selection process is as follows: Originally, 100 listed insurance companies from the European Union member states, Norway and Switzerland in the Thomson One data are flagged in their business type as "insurance". However, 22 companies among them are either insurance brokers or non-insurance companies (i.e. specialized investors in the insurance industry or wealth management companies). Furthermore, I exclude 7 reinsurance companies due to their different business operations, compared to primary insurers. In addition, 14 insurance companies have incomplete data profiles for more than three years, and the peers information of other 5 other insurers is unobservable. *Source for company names and home countries:* Financial Times – Markets Data.

Table 4: Summary Descriptive Statistics of Firm-specific Variables (2005-2012)

Complete (52)	Mean	Std. Dev.	Min.	Max.	Obs.
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

Table 4 summarizes the statistics of the firm-specific characteristics of the sample insurers. The complete sample consists 52 insurers, in which 6 are pure life insurers, 10 are pure non-life insurers and the rest 36 are the 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.) of the firm-specific variables.

Table 5: 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)
Observations	382	43	75	264
R-squared	0.531	0.299	0.533	0.274

Table 5 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 rest 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 *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (two-sided).

Table 6: 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)
Observations	356	44	52	260
R-squared	0.046	0.313	0.371	0.134

Table 6 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 rest 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 *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (two-sided).

Table 7: 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)
Observations	374	43	67	264
R-squared	0.447	0.087	0.207	0.116

Table 7 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 *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (two-sided).

Table 8: 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)
Observations	354	44	50	260
R-squared	0.083	0.116	0.363	0.112

Table 8 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 *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (two-sided).

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