Accounting Department

Debt Composition in the Solvency II Era:

Evidence from European Insurance Companies

Thesis Equivalent

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Abstract

In this study I examine the changes in the debt composition of European insurance companies during the years surrounding the effective date of the Solvency II directive. I focus on changes in the absolute and relative subordinated debt levels. The motivation lies in the Solvency II directive, under which, given certain conditions, subordinated debts meet the requirements to be classified as own funds. These own funds are eligible to cover the Solvency II capital requirements (SCR). My analysis reveals that the companies' absolute levels of subordinated debt increased from 2013 to 2018. In addition, the proportion of subordinated debt in the companies' capital structure increased at the expense of the senior debt proportion. These results suggest that from a capital structure perspective, the policyholders' position has improved – as initially intended by the Solvency II directive. Further analysis reveals that the stagnation in equity proportion observed in the overall sample from 2013 to 2018 breaks down into a decrease (increase) presented by the top 20% highest (bottom 80% lowest) dividend yield companies. In addition, further analysis reveals that the phenomena observed in the overall sample are attributed to multiline and life and health insurers, and to both large and small companies.

Keywords: Solvency II, Insurance, Debt, Subordinated Debt, Capital Structure.

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1. Introduction

This study describes the changes in the debt composition of European insurance companies before and after the effective date of the Solvency II directive. I focus on a time period of 6 years surrounding the effective date of the Solvency II directive – January 1, 2016. The Solvency II directive sets regulatory requirements for how an insurance company should calculate its capital requirements and how to identify eligible own funds to meet those requirements. These capital requirements are known as Solvency II Capital Requirements, and the eligible funds are known as Solvency II *own funds* (see further discussion with regard to the Solvency II directive in section 2).

Under certain conditions, the Solvency II directive allows subordinated debts to be included in the own funds. This means that insurance companies are not confined solely to raising equity in order to meet the Solvency II capital requirements, as they are also able to raise subordinated debt for this purpose.

In this study I examine the absolute and relative levels of senior debt and subordinated debt from 2013 to 2018, in order to find whether these levels have changed (i.e., a debt tradeoff). In addition, I also examine the absolute and relative level of equity during these years in order to find whether the financial leverage (i.e., the ratio between debt to equity) of these companies has changed.

These questions are of interest, as the capital structure (i.e., the debt and equity composition) of a company affects many of its stakeholders. In this specific case, the immediate group of stakeholders that comes to mind is the policyholders – as Solvency II's main objective is to ensure they are adequately protected.[1] A debt tradeoff which results in a higher proportion of subordinated debt out of the overall debt financing improves the policyholders' position (i.e., they are better protected and less exposed to a potential insolvency), as these debts are subordinated to their claims – unlike the senior debts. Moreover, a decrease in the financial

[1] Sections (16) and (17) in the Solvency II directive preview.

leverage (i.e., an increase in the proportion of equity in the ratio between debt to equity) may furthermore improve their position, as a larger portion of the company's financing sources is subordinated to their claims. Another group of stakeholders that might be affected by these potential capital structure changes are the shareholders, as the risk they bear (together with the expected return they earn) is a function of the firm's financial leverage [Modigliani and Miller (1958)].

Several previous papers have investigated the connection between regulatory change and the affected companies' capital structure. In their review paper, Leuz and Wysocki (2016) use a broad definition for financial regulation, and define it as a setting in which "a central authority formally creating and interpreting disclosure and reporting rules, monitoring compliance with these rules, and enforcing and imposing penalties for deviations from the rules". Givoly et al. (1992) found a positive association between changes in financial leverage and changes in corporate tax rates in relation to the 1986 Tax Reform Act. The 1986 Tax Reform Act was an exogenous shock, and as such allowed assessing the interaction between taxes and financial leverage decisions. They found a substitution effect between debt and nondebt tax shields, and that both corporate and personal tax rates affect financial leverage decisions. The empirical results presented by Givoly et al. (1992) support the tax-based theories of capital structure, the most prominent of which relates to debt level being related to the tax rate [Modigliani and Miller (1963)]. Tax reforms were not the only regulatory change investigated. Petacchi (2015) uses the Reg FD setting in order to examine if it changed the capital structure of companies. She finds that firms with a high level of information asymmetry increase debt more than firms with a low level of information asymmetry, in the post-Reg FD period. The effect of *price regulation* on capital structure was also explored by Taggart (1981), Klein, Phillips and Shiu (2002), Dasgupta and Nanda (1993) and Rao and Moyer (1994). These studies found that price-regulated firms tend to

undertake more debt for various reasons.[2] Overall, previous literature has established that regulation can affect the capital structure of regulated companies, yet it seems that the causal relation in these papers was assumed rather than proven. Moreover, it appears that regulation may affect capital structure even when it does not directly address the capital structure of regulated companies. Since Solvency II *does* address the capital structure of the regulated companies, a change in the companies' capital structure is expected.

I find that European insurance companies increased their absolute level of subordinated debt and equity, and that subordinated debt *proportion* in the capital structure increased while the senior debt *proportion* decreased. However, the *proportion* of equity in the capital structure remained unchanged (this means that the proportion of overall debt, senior and subordinated, also remained unchanged). These findings suggest that the position of policyholders has improved. While there was no change in the overall debt proportion, the proportion of subordinated debt within the overall debt financing has increased – and these debts are subordinated to their claims.

[2] Taggart (1981) presents one of the earliest theoretical discussions of the interaction between capital structure and the rate regulatory process. He presents a stylized model and introduces the concept of a price-influence effect whereby the use of debt can provide an incentive for regulators to choose higher prices in the output market. Regulators allow regulated entities higher output prices to ensure their survival and avoid firm failures under their supervision. Klein, Phillips and Shiu (2002) investigate how price regulation affects the capital structure decisions of profit-maximizing insurers that sell in both competitive and/or regulated markets. They find that insurers that are subject to price regulation will choose to hold less capital. In addition, insurers with more stringent regulatory pricing constraints will choose even higher degrees of leverage because the benefits from holding additional amounts of capital are suppressed. Dasgupta and Nanda (1993) developed a model in which firms use debt as a strategic instrument to enhance their bargaining position with consumers in the rate setting process. In their model, increasing levels of debt decrease the divisible surplus between consumers and producers (insurers). In cases where the regulators favor consumers over producers, the producers have an incentive to use additional levels of debt financing in order to reduce the ability of the regulator to divert more of the gross surplus to consumers. Finally, Rao and Moyer (1994) present a theoretical model of the rule of regulatory climate in the capital structure decisions of regulated electric utilities. The model indicates that managers can mitigate the consequences of unfavorable regulation by increasing the proportion of debt in their capital structure.

In addition, I find that the stagnation in the equity proportion observed in the overall sample breaks into two: the top 20% dividend yield companies present a *decrease* in their equity proportion, suggesting that these companies *increased* their financial leverage, while the bottom 80% companies present an increase in their equity proportion. These results may suggest that dividend paying companies exploited the Solvency II relief with regard to capital requirements (i.e., the inclusion of subordinated debts in the own funds, which are eligible to meet the capital requirements), by distributing dividends (equity) and replacing equity financing with subordinated debt financing. Finally, I also find that the trends observed in the overall sample are attributed mainly to multiline and life and health insurers, and that they are not specifically attributed to either large or small companies. These results are somewhat expected, as the insurance liabilities of property and casualty insurers bear less uncertainty compared to life and health insurers (life and health insurers' liabilities have a significantly longer duration than those of property and casualty insurers). Therefore, property and casualty insurers are expected to face lower capital requirements, as they are not exposed to life and health insurance underwriting risks.

The study makes the following contributions: First, the findings extend the empirical evidence on the relation between regulation and capital structure changes [Givoly et al. (1992); Petacchi (2015); Taggart (1981); Klein, Phillips and Shiu (2002); Dasgupta and Nanda (1993); and Rao and Moyer (1994)]. Documenting capital structure changes around the effective date of the Solvency II directive extends our knowledge by shedding light on several trivial and non-trivial phenomena. For instance, the overall sample increase in subordinated debt level and proportion, which resulted in an improvement in the policyholders' position (as intended by the Solvency II directive), is relatively trivial. Nevertheless, the fact that high dividend yield insurers exchanged equity financing with subordinated debt financing, which caused an *increase* in the financial leverage and in the risk imposed on their shareholders [Modigliani and Miller (1958)], is less trivial. Second, the results suggest that the position of policyholders has improved after the Solvency II

directive. While this study does not claim for causality, I do note that improving policyholders' position was a primary objective of the Solvency II directive (see sections (16) and (17) in the directive preview). Finally, this study presents the foundations for future research, which are detailed in chapter 8.

The rest of this paper is organized as follows: section 2 describes the Solvency II directive. Section 3 discusses capital structure and the debt-to-equity range from different perspectives. Section 4 presents the research questions and motivation. Section 5 describes the data and the methodology. Section 6 presents the main results, while section 7 presents the sub-sample analysis results. Section 8 briefly summarizes the study and discusses future research.

2. The Solvency II Directive

2.1. The Directive

The Solvency II directive is a harmonized framework for European insurance companies, introduced in 2009 to replace a patchwork of rules in the areas of life insurance, non-life insurance and reinsurance. Solvency II rules introduced prudential requirements tailored to the specific risks that each insurer bears. Their objective is to promote transparency, comparability and competitiveness in the insurance sector. Solvency II applies to medium-size and large insurance European companies (these are insurance companies whose gross premium income exceeds €5 million, and/or whose technical provisions exceed €25 million and/or whose reinsurance activities and/or activities abroad are non-negligible).

The effective date of the Solvency II directive was January 1, 2016. It addresses 3 main areas (3 pillars), related to (1) capital requirements, (2) risk management and (3) supervisory rules, as detailed below:

- Pillar 1 sets out quantitative requirements, including the rules for how to value assets and liabilities (in particular, technical provisions), how to calculate capital requirements and how to identify eligible own funds to cover those requirements
- Pillar 2 sets out the requirements for risk management and governance, as well as the details of the supervisory process with competent authorities; this will ensure that the regulatory framework is combined with each undertaking's own risk-management system and informs business decisions
- Pillar 3 addresses transparency, reporting to supervisory authorities and disclosure to the public, thereby enhancing market discipline and increasing comparability, leading to more competition

Capital requirements under Solvency II are forward-looking and economic, i.e., they are tailored to the specific risks borne by each insurer. The objective is to allow an optimal allocation of capital across the EU. They are defined along a two-step ladder, including the

Solvency II Capital Requirements (SCR) and the Minimum Capital Requirements (MCR),[3] in order to trigger proportionate and timely supervisory intervention.

2.2. Solvency II Objectives

According to section (16) in the directive preview, "*The main objective of insurance and reinsurance regulation and supervision is the adequate protection of policy holders and beneficiaries…*". The section continues with a secondary objective, and states that "*Financial stability and fair and stable markets are other objectives of insurance and reinsurance regulation and supervision which should also be taken into account but should not undermine the main objective*".

Section (17) in the directive preview states that "*The solvency regime laid down in this directive is expected to result in even better protection for policy holders…*".

2.3. Solvency II Capital Requirements and Own Funds

2.3.1. Solvency II Capital Requirement Ratio

The Solvency II directive requires an insurer to hold an SCR ratio of above 100%. The SCR ratio is defined as follows (own funds and the SCR are discussed below):

$$SCR\ Ratio = \frac{Own\ Funds}{Solvency\ II\ Capital\ Requirement\ (SCR)}$$

An SCR Ratio of 100% means that an insurer's capital is such that it will be able to meet its obligations in the event of a severe shock, which is an event that is expected to occur once

[3] The Solvency Capital Requirement (SCR) is a level of financial resources that enables insurers to absorb significant losses and that gives reasonable assurance to policyholders and beneficiaries that payments will be made when they are due. The Minimum Capital Requirement is a lower, minimum level of security, below which the amount of insurers' financial resources should not fall, otherwise supervisory authorities may withdraw authorization.

in every 200 years. The target confidence level for insurers has been set at 99.5% over a one-year horizon.

2.3.2. Solvency II Own Funds

The Solvency II own funds are calculated based on the accounting equity, with some adjustments. According to article 87, the own funds should comprise the sum of (1) *basic own funds* and (2) *ancillary own funds*. The basic own funds are on-balance-sheet amounts, while the ancillary own funds shall consist of items other than basic own funds, which can be called up to absorb losses (such as letters of credit and guaranties).

Article 88 states that the *basic own funds* should consist of the following two items:

1. Excess of assets over liabilities, valued according to their fair value; [4] and
2. Subordinated liabilities.

The own fund items must be loss absorbing on both an ongoing and winding-up basis. In addition, all own funds instruments shall not (1) rank on insolvency before policyholder or non-subordinated creditors and (2) be redeemed without supervisory approval.

Article 93 states that own funds items should be classified into three tiers. The classification of those items should depend upon whether they are basic own fund or ancillary own fund items and to the extent to which they possess the following characteristics:

1. The item is available, or can be called up on demand, to fully absorb losses on a going-concern basis, as well as in the case of winding-up (permanent availability);

[4] Article 75 states that assets (liabilities) shall be valued at the amount for which they could be exchanged (transferred, or settled) between knowledgeable willing parties in an arm's length transaction. When valuing liabilities, no adjustment to the specific insurer/reinsurer credit standing shall be made. Although the accounting term "fair value" is not mentioned explicitly, the instructions are almost identical to those listed in IFRS 13. In addition, article 303 states that any intangible item shall be reduced from the excess of assets over liabilities.

2. In case of winding-up, the total amount of the item is available to absorb losses, and the repayment of the item is refused to its holder until all other obligations, including insurance and reinsurance obligations towards policyholders and beneficiaries of insurance and reinsurance contracts, have been met (subordination).

Finally, article 94 sets the main criteria for the classification of the own funds items into the three tiers. Tier 1 includes ordinary share capital, non-cumulative preferred shares and relevant subordinated liabilities. Preferred shares and subordinated debt are subject to the loss absorption requirement. Tier 2 is likely to include cumulative preferred shares and subordinated liabilities with relatively short duration (i.e., liabilities with a permanence which is not sufficient for a tier 1 classification). Tier 3 is intended to comprise own funds which do not satisfy the tier 1 or tier 2 requirement. It appears that for the own funds' classification, the Solvency II directive puts the greatest emphasis on *permanence* and *loss absorbency* of financial items.

2.3.3. Solvency Capital Requirement (SCR)

The SCR constitutes a risk-based buffer, based on the actual risks on the balance sheet. This means that insurers with higher-risk investments, such as equities, must maintain a higher buffer than those investing in lower-risk assets, such as government bonds. Article 101 states that the SCR shall correspond to the Value-at-Risk of the basic own funds of an insurance or reinsurance undertaking, subject to a confidence level of 99.5% over a one-year period.

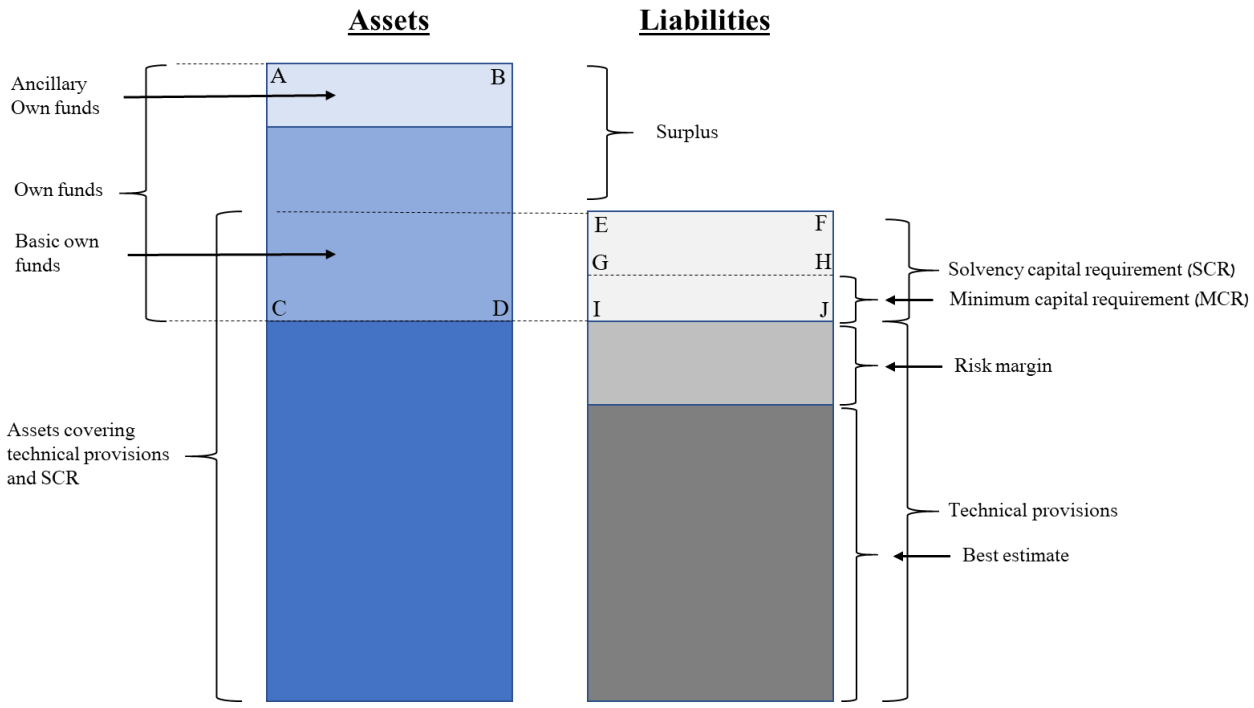
The SCR calculation shall cover at least the following risks: non-life underwriting risk, life underwriting risk, health underwriting risk, market risk, credit risk and operational risk. The SCR will be reduced according to the risk diversification between the different components of the insurer's portfolio.

Article 77 states that the value of technical provisions will be equal to the sum of (1) a best estimate and (2) a risk margin. The best estimate shall correspond to the probability-weighted average of future cash-flows, discounted by using the relevant risk-free interest

rate term structure. The risk margin should be such as to ensure that the value of the technical provisions is equivalent to the amount that insurance and reinsurance undertakings would be expected to require in order to take over and meet the insurance or reinsurance obligations.

The following figure summarizes the relations between the SCR (derived from the technical provisions) and the own funds:

Figure 1 – Solvency II Balance Sheet



As explained previously, The SCR ratio is the ratio between the own fund (rectangle ABCD) and the SCR (rectangle EFIJ). The MCR ratio is the ratio between own funds and the MCR (rectangle GHIJ).

3. Capital Structure and Solvency II

3.1. Capital Structure Theory

The capital structure of a firm constitutes the relative proportions of the firm's debt, equity, and other securities (such as hybrid securities) that are outstanding.[5] Firms must choose which type of security to issue when they raise funds. Firms' financing can rely completely on equity, or on some combination of debt and equity, including combinations of debt, equity and other hybrid securities (In order to simplify the discussion at this stage, I will not discuss any hybrid securities).

After introducing different financing alternatives, one may wonder: which capital structure is the best for shareholders? In their seminal paper, Modigliani and Miller (1958) argued that under the assumption of perfect capital markets, the total value of a firm is independent of its capital structure. However, once the assumption of perfect capital markets is relaxed, it appears that capital structure does affect the firm's value. Focusing on taxes (which are a market imperfection), one can show that a firm can enhance its value by issuing debt and minimizing the taxes it pays [Modigliani and Miller (1963)]. This additional value is referred to as the *interest tax shield*, and it is the *positive* influence of financial leverage (i.e., financing a firm with a positive amount of debt) on a firm's value.

Keeping the assumption of perfect capital markets relaxed, capital structure also has some *negative* influences on a firm's value, such as costs of financial distress [Kraus and Litzenberger (1973); Scott (1977); Titman and Wessels (1988)], costs of asymmetric information and different kinds of agency costs [Jensen and Meckling (1976); Myers (1984)].

Therefore, prior studies assumed that companies select a capital structure that maximizes their value by balancing the advantages and disadvantages of leverage. This theory is known

[5] The following discussion is based on "Corporate Finance", 4th edition, by Berk and DeMarzo (2017).

as the Balancing Theory [Bradley, Jarrel and Kim (1984)]. In other words, the capital structure chosen by a firm is such that maximizes its value.

3.2. Debt-Equity Range

Capital can be obtained through many different media, ranging from pure debt instruments to pure equity issues [Modigliani and Miller (1958)]. In this range one can find different types of senior debt, subordinated debt, all kinds of hybrid and convertible instruments, and different kinds of equity instruments.

In the following sections, I will quote and discuss debt and equity definitions from three different disciplines:

1. Modigliani and Miller's seminal paper "The cost of capital, corporation finance and the theory of investment" (1958);
2. IFRS (specifically – IAS 32); and
3. The Solvency II directive.

3.2.1. Finance Approach

3.2.1.1. Modigliani and Miller (1958)

In their seminal paper, Modigliani and Miller (hereafter: "**MM**") mention debt and equity instruments: "…capital can be obtained by many different media, ranging from pure debt instruments, representing money fixed claims, to pure equity issues, giving holders only the right to a pro-rata share in the uncertain venture…"

Although a range is mentioned, when introducing debt to their model, MM deal with bonds, which represent a pure debt instrument on the debt-equity range mentioned above. They further state "…that all bonds… are assumed to yield a constant income per unit of time, and this income is regarded as certain by all traders…"

It seems that the distinction made by MM between debt and equity focuses on the debt being a certain (risk-free) instrument that yields a constant return, while equity grants its holders a pro-rata right to share in the company's venture.[6]

3.2.1.2. Valuation Practices

The debt-equity range is relevant to valuation practices in two main aspects: the transition from enterprise value to equity value, and the WACC calculation.

As an example, in a discussion about the transition from enterprise to equity value, McKinsey[7] treats preferred stocks as a nonequity instrument which is excluded from the company's equity. In chapter 6, "Frameworks for Valuation", the authors discuss the identification and valuation of nonequity claims. The authors explain that in order to convert enterprise value into equity value, one needs to "…subtract any nonequity claims…" and that "…common equity is a residual claimant, receiving cashflows only after the company has fulfilled all of its other contractual claims". A list of the most common nonequity claims is provided, including preferred stocks. The authors explain that "…although the name denotes equity, preferred stock in well-established companies more closely resembles unsecured debt."

When analyzing financial statements for calculating the debt-to-equity ratio, Damodaran[8] addresses preferred stocks: "while these ratios presume that the capital is raised from only debt and equity, they can include… other sources of financing, such as preferred stocks. Although preferred stock is sometimes combined with common stock under the equity

[6] In addition, MM discuss in footnote 37 two other articles. They mention that these two articles properly classified preferred stocks as debt (together with bonds). Once again, it seems that the important characteristic of debt, according to MM, is its constancy (in terms of return).

[7] "Valuation – Measuring and Managing the Value of Companies". McKinsey and Company. 5th edition.

[8] "Investment Valuation – Tools and Techniques for Determining the Value of any Asset". Aswath Damodaran. 3rd edition, 2012. p.51.

label, it is better to keep the two sources of financing separate and to compute the ratio of preferred stock to capital…". In addition, in one of his class presentations[9] about "Dealing with Hybrids and Preferred Stocks", Damodaran discusses preferred stocks and recommends to "…keep it as a separate component". It seems that from a capital structure perspective, Damodaran treats preferred stocks as a non-equity (and a non-debt) instrument.

To summarize the two valuation approaches mentioned above, one can claim that while it is unclear whether a preferred stock should be classified as debt, it is definitely clear that it should not be classified as equity. In addition, equity is a *residual* claimant, receiving cashflows only after the company has fulfilled *all* of its other contractual claims.

3.2.2. Accounting (IFRS) Approach

The accounting standard that sets the principles for classifying financial instruments as liabilities (debt) or equity is International Accounting Standard No. 32 (hereafter: "**IAS 32**" or the "**Standard**").

IAS 32 defines an *equity instrument* as any contract that evidences a residual interest in the assets of an entity after deducting all of its liabilities.

A financial instrument will be classified as an equity instrument if:

1. The instrument includes *no* contractual obligation to deliver cash or another financial asset to another entity or to exchange financial assets or financial liabilities with another entity under conditions that are potentially unfavorable to the issuer; and
2. In case that the instrument will or may be settled in the issuer's own equity instruments, it will be in a Fix-for-Fix settlement.[10]

[9] http://people.stern.nyu.edu/adamodar/podcasts/valspr15/valsession7.pdf

[10] This means that the entity will issue a fixed amount of equity instruments for a fixed amount of cash or another financial asset.

The Standard defines a *financial liability* as any liability that is:

1. A contractual obligation to deliver cash or another financial asset to another entity, or to exchange financial assets or financial liabilities with another entity under conditions that are potentially unfavorable to the entity; or
2. A contract that will or may be settled in the entity's own equity instrument, where the settlement will *not* be a Fix-for-Fix settlement.

In addition, paragraph 16 of the Standard sets some exceptions under which a financial liability will be classified as an equity instrument. These exceptions require, among other requirements, that such a financial instrument shall:

1. Entitle the instrument holder to a pro-rata share in the entity's net assets in case of dissolution; and
2. belong to a class of subordinated instruments.

3.2.3. Solvency II Approach

The Solvency II directive does not define the terms 'debt' or 'equity' explicitly. Instead, it defines the items that can be included in the company's own funds (for a definition and discussion of own funds, please see section 2 above).

As already discussed above, the own funds may also include subordinated liabilities, as long as they are (1) available to absorb losses on a going concern basis and in the case of winding up, and are (2) subordinated to all other obligations, including insurance and reinsurance obligations towards policyholders and beneficiaries.

The own funds will be classified into 3 tiers, where:

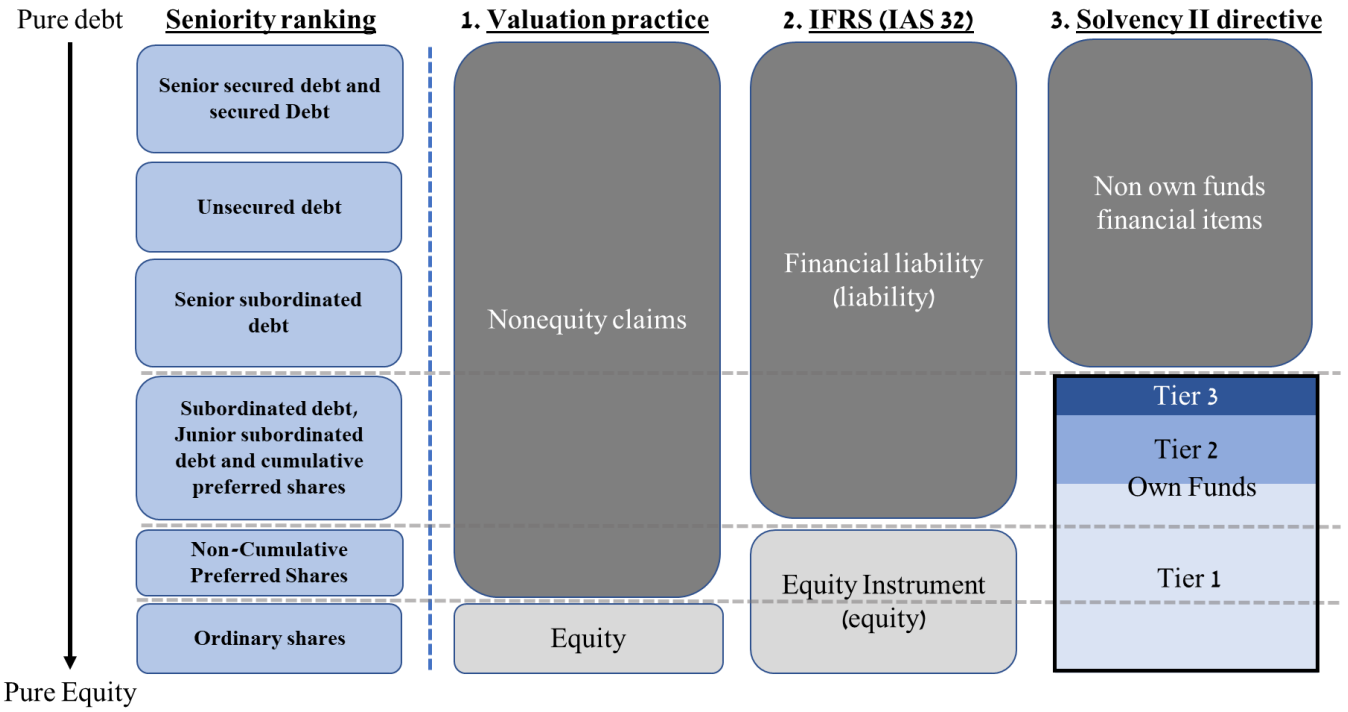
1. Tier 1 includes ordinary share capital, non-cumulative preferred shares and relevant subordinated liabilities. Preferred shares and subordinated debt will be subject to the loss absorption requirement;

2. Tier 2 is likely to include cumulative preferred shares and subordinated liabilities with relatively short duration;[11] and
3. Tier 3 is intended to encompass own funds which do not satisfy the tier 1 or tier 2 requirement.

3.2.4. Debt-Equity Range in the Different Approaches

The figure below illustrates the general classification of major groups of financial instruments according to the three approaches discussed above (finance/valuation, accounting and Solvency II):

Figure 2 – Debt-Equity Range in the Different Approaches



[11] As mentioned previously, article 93 in the Solvency II directive presents the criteria for the classification of an item into the different own funds tiers. Availability to absorb losses is one of these criteria. Obviously, a subordinated liability with a *short* duration has a more limited availability to absorb losses than a similar subordinated liability with a *long* duration (which is compatible with the duration of the company's obligations). Therefore, subordinated liabilities with a relatively short duration are classified into tier 2.

The left column describes a range of financial instruments according to their seniority ranking. The three right columns describe the classification of these financial instruments as equity/own funds and non-equity/non–own-fund items, according to the three approaches.

Figure 2 above emphasizes the different classification of subordinated debt in the various approaches. As shown, from the valuation practice and IFRS perspectives, subordinated debt is treated as a non-equity instrument, while it *does* qualify as own funds from the Solvency II perspective. This different classification is of interest, as subordinated debt is likely to play a major role in the Solvency II setting. Assuming an insurer is required to raise own funds in order to maintain or increase its SCR ratio, it can do so by issuing equity or subordinated debt (or both). According to the pecking order theory [(Myers (1984)], due to adverse selection, insurers will probably prefer external financing. In other words, debt will be preferable to equity due to lower information costs associated with debt issuance. Moreover, Shyam-Sunder and Myers (1999) found a dollar-for-dollar match between financing deficits and corporate debt, suggesting that these deficits are financed with external debts, and that equity is rarely issued. Therefore, in case it is necessary to raise own funds, one might expect these funds to be subordinated debts, rather than equity.

In conclusion, the tension that exists between the three approaches above is clear: while an insurer raises subordinated debt in order to enhance its own funds and to reduce the insolvency risk its policyholders are facing, from the valuation and IFRS perspectives, the insurer's financial leverage (i.e., the debt to equity ratio) increases, resulting in a higher risk imposed on the shareholders.

4. Research Questions and Motivation

My research will focus on the changes in the capital structure of European insurance companies that occurred over the period encompassing the effective date of the Solvency II directive. A company's capital structure relates to the overall composition of its financing sources (more specifically in this case – senior debt, subordinated debt and equity. These terms will be elaborated upon in chapter 5).

The main research question I will focus on is:

Q1: Did European insurance companies change their debt composition after the effective date of the Solvency II directive? Specifically, did European insurance companies substitute senior debt with subordinated debt?

I will also address a secondary research question, which is:

Q2: Did European insurance companies change their capital structure after the effective date of the Solvency II directive? Has the proportion of equity in the capital structure changed?

In my analysis I focus on subordinated debt changes. I do so as the combination of the fact that subordinated debt can be included in the own funds, together with the assumption (according to the pecking order theory) that insurers would prefer to raise subordinated debt rather than equity, suggests that the Solvency II directive might stimulate subordinated debt financing. I also inspect whether the equity proportion in the capital structure changed over these years (i.e., whether the financial leverage, which is defined as the ratio between debt and equity, has changed). According to MM's second proposition, a decrease in the financial

leverage translates to a decrease in the shareholders' risk,[12] and vice versa. Yet, my current analysis does not address this issue directly and no risk measures are being applied.

These research questions are of interest for several reasons. First, a substitution of senior debt with subordinated debt improves the position of policyholders in case of a financial distress or winding up. While subordinated debt is available to absorb losses and is subordinated to policyholders' claims, senior debt is not. Therefore, from the policyholders' perspective, subordinated debt is not materially different from equity, as both of these components are subordinated to their claims. The Solvency II directive states that "… *The main objective of insurance and reinsurance regulation and supervision is the adequate protection of policy holders and beneficiaries…*". Therefore, it is of interest to discover if an improvement in the policyholders' position—from the perspective of a substitution of senior debt with subordinated debt—indeed took place during the years encompassing the implementation of the Solvency II directive (yet, no causal inference is made in my study).

Second, capital structure changes (i.e., changes in the financing sources' composition) potentially influence many stakeholders. Intuitively, as financial leverage decreases (i.e., the ratio between debt to equity decreases), the position of policyholders further improves.

Although the current study does not address this issue, it should be noted that such a change in capital structure might also affect the shareholders in many potential ways. Among these potential effects, one can find a potential reduction in risk and expected return (according to MM's second proposition, as mentioned above), a potential loss of tax shields, a potential reduction in bankruptcy costs, etc. This issue can be addressed in future research, which will rely on the results of the current study.

[12] According to MM's second proposition, this risk reduction is completely offset by a decrease in the equity's expected return, such that the equity *value* remains unchanged.

5. Data and Methodology

5.1. Data

The construction of my sample is based on the European Insurance Coverage list of SNL Financial as of 2012,[13] which includes 118 listed companies. Nine Russian companies, 7 Turkish companies and 7 Swiss companies were eliminated, as the Solvency II directive does not apply to them. Seven additional companies were eliminated, as their financial reports indicated that they are mostly financial services companies. In addition, these companies did not sufficiently mention the Solvency II directive in their financial statements (unlike all other sample companies). At this stage I was left with 88 companies. Five more companies were eliminated since they were either subsidiaries or became subsidiaries of other companies in the sample during the sample period. Finally, companies that published their financial statements in a foreign language (such as Serb or Greek) and companies for which I did not find any data online were eliminated, resulting in a sample of 45 companies.[14]

For these 45 companies I manually collected, from their 2013 to 2018 financial statements, the items described below: [15]

- ***Equity (EQ)*** – Total equity reported in the consolidated statement of financial position of an insurance company as of December 31 in a specified year.
- ***Senior debt (SNRD)*** – All financial liabilities reported in the consolidated statement of financial position of a company as of December 31 in a specified year, that bear interest,

[13] www.SNLEurope.com

[14] A full list of the sample companies is in appendix A.

[15] In my sample there are three exceptions for these variables: (1) Saga plc. and Sampo's financial year ends on January 31. I assumed that there was no significant difference between values as of December 31 in year t, and values as of January 1 in year t+1. (2) The most updated financial statement of Vittoria Assicurazioni I could find was as of June 2018 (the rest of the financial statements of this company were as of December 31, 2013 to 2017). I used the June 2018 report as a December 2018 report, as it was the most updated available data.

are not subordinated, not classified as operational borrowings (but as core borrowings), and are either towards banks or other financial institutions, or in the form of issued notes.

- ***Subordinated debt (SUBD)*** – All financial liabilities in the consolidated statement of financial position of a certain company as of December 31 in a specified year, which are classified as either subordinated notes, subordinated liabilities, subordinated loans or subordinated debts.

Amounts of EQ, SNRD and SUBD that were not reported in Euro were translated according to the relevant exchange rate as of December 31 of the relevant year.

In the sub-sample analysis presented in section 7, I used the Capital IQ database in order to obtain the industry classification for each sample company and data about the equity and dividends distributed in the years 2010-2013.

5.2. Methodology

I examine the debt composition changes in two main manners. At first, I examine the cumulative changes in EQ, SNRD and SUBD of the sample companies. Afterwards, I examine the changes in the capital structure of the sample companies (i.e., the changes in (1) the ratio of EQ to the sum of EQ, SNRD and SUBD; (2) the ratio of SNRD to the sum of EQ, SNRD and SUBD; and (3) the ratio of SUBD to the sum of EQ, SNRD and SUBD).

In order to verify the statistical significance of an observed change (time trend), I use a test similar to the one performed by Dichev and Tang (2008), which is based on the following linear regression:

$$y_{i,t} = \alpha + \beta * t + \varepsilon$$

Where:

$\boldsymbol{y_{i,t}}$ – the level (or proportion in the capital structure) of EQ, SNRD or SUBD of company i in year t; and

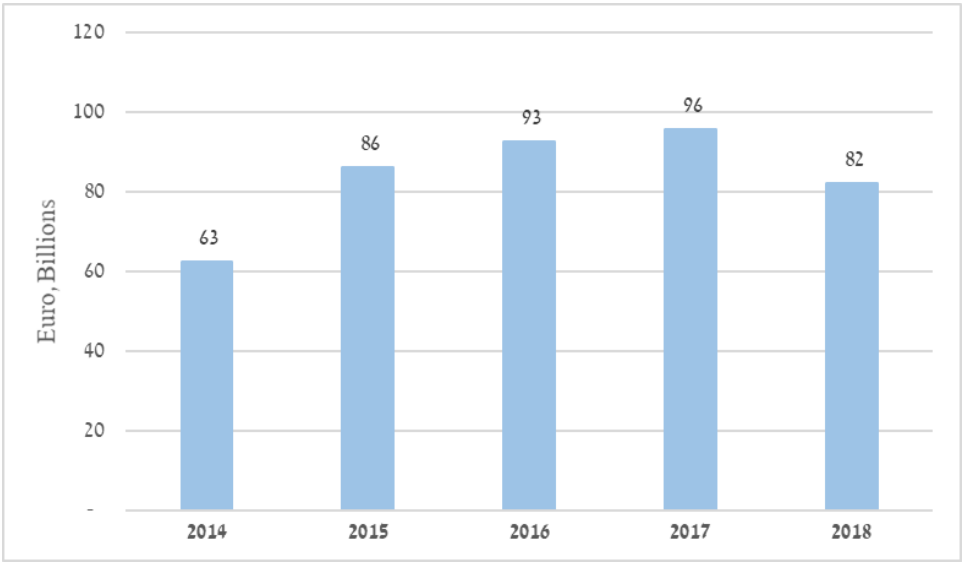
$\boldsymbol{t}$ – an ordinal time variable, where $2013 = 1$ and $2018 = 6$.

6. Main Results

6.1. Equity, Senior Debt and Subordinated Debt Analysis

As of December 31, 2013, aggregated EQ, SNRD and SUBD amounted to €361 billion, €80 billion and €68 billion, respectively. I begin my analysis by presenting the accumulated aggregated changes in EQ, SNRD and SUBD over the sample years, relative to 2013 levels. I first present the accumulated aggregated EQ changes, and then both the accumulated aggregated SNRD and SUBD changes together.

Figure 3 – Accumulated aggregated EQ changes, relative to 2013, of all sample companies



The aggregated EQ of all sample companies increased in 2014 and 2015, but stayed at a relatively constant level since then, until 2018.

The following figure presents the accumulated aggregated changes in SNRD and SUBD relative to 2013 levels, for all sample companies:

Figure 4 – Accumulated aggregated SNRD and SUBD changes for all sample companies

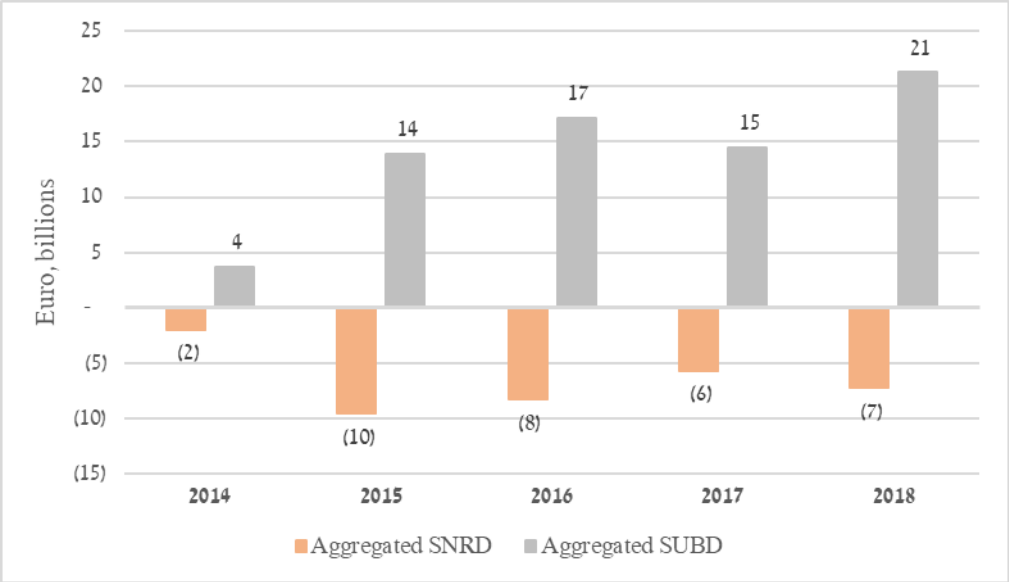


Figure 4 presents accumulated aggregated SNRD and SUBD changes for all sample companies, where 2013 serves as the base year. The results indicate a tradeoff between aggregated SNRD and aggregated SUBD. The aggregated SNRD level decreases by 10%, as it goes down from €80 billion in 2013 to a level of €72 billion in 2018. On the other hand, the aggregated SUBD level increases by 31%, as it goes up from €68 billion in 2013 to a level of €90 billion in 2018.

In order to examine whether the trends shown above are also statistically significant, I ran Dichev's and Tang's (2008) time trend regression three times, where the dependent variables were the companies' accumulated EQ changes, accumulated SNRD changes and accumulated SUBD changes. The results of the three panel-data linear regressions are presented in the following table:

Table 1 – Aggregated analysis: Time trend regression results

Reggression model #	Dependent Variable	α (Z-statistic)	β (Z-statistic)	Number of Observations
1	EQ	0.405 (0.83)	0.328*** (5.05)	270
2	SNRD	-0.019 (-0.13)	-0.029 (-1.19)	270
3	SUBD	-0.055 (-0.55)	0.090*** (5.19)	270

The regression equation is: $y_{i,t} = \alpha + \beta * t + \varepsilon$, where $y_{i,t}$ is equal to the aggregated change in EQ, SNRD or SUBD of company i as of year t, relative to 2013 levels, and t is an ordinal time variable

(*, **, ***) are significant at a (10%, 5%, 1%) level

As shown above, the slope coefficient of the SUBD regression is positive and significant at a 1% level, indicating that the time trend of rising SUBD is statistically significant.

The EQ time trend is also positive and significant at a 1% level. The SNRD time trend is statistically insignificant, suggesting that the companies did not change their SNRD level. Yet, combined with the non-significant change in SNRD level, the significant change in the SUBD level is sufficient for the existence of a debt tradeoff (i.e., the exchange of SNRD with SUBD, absolutely or relatively).

Looking at the overall results of this analysis, it is apparent that the EQ and SUBD levels increased over the sample years. Although the sample years were chosen such that they were around the effective date of the solvency II directive on January 1, 2016, no causal inference was made in this study. Nevertheless, the results indicate that after the Solvency II effective date, the level of SUBD held by the companies increased. Moreover, since no change in the SNRD level was observed, the results also indicate that companies changed their debt composition, such that the proportion of SUBD financing out of all debt financing increased.

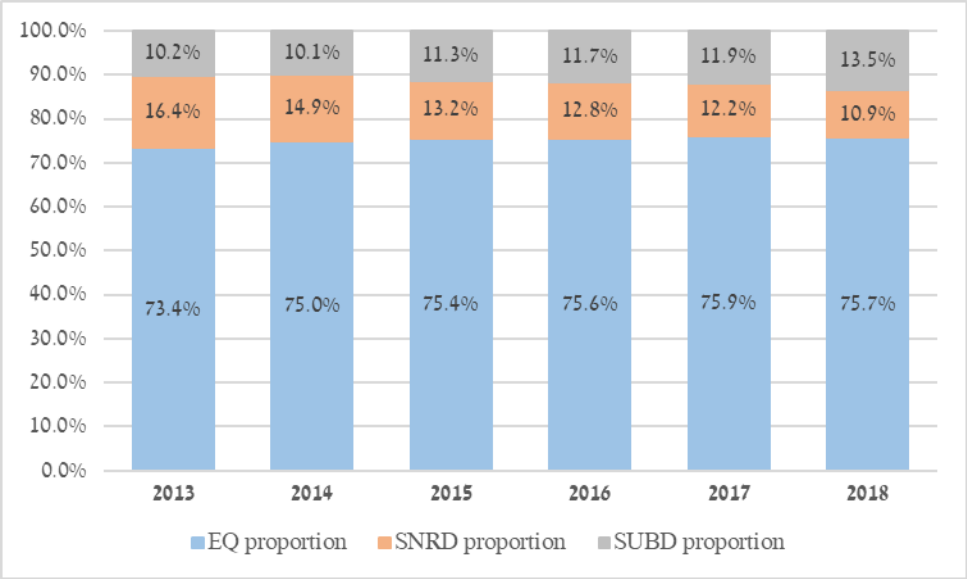
6.2. Capital Structure Analysis

After examining the accumulated changes in EQ, SNRD and SUBD levels, I will focus next on capital structure analysis. In this analysis, I first present the cross-sectional averages of

the relative proportions of the capital structure components (i.e., EQ, SNRD and SUBD). The main interest is the proportions of SNRD and SUBD, as we expect to see a tradeoff between these two components. In addition, by observing the changes in the EQ proportion, which indicate an inverse change in the overall debt (SNRD and SUBD) proportion, we can also infer changes in the average financial leverage.

I first present the cross-sectional average of the sample companies' capital structure composition from 2013 to 2018:

Figure 5 – Average capital structure of all sample companies, 2013-2018



As presented, the average SUBD proportion rose from 10.2% in 2013 to 13.5% in 2018. On the other hand, the average SNRD proportion went down continuously from 16.4% in 2013 to 10.9% in 2018. A less pronounced trend is observable in the average EQ proportion, which increased from 73.4% in 2013 to 75.7% in 2018.

In order to examine the statistical significance of these time trends, I ran the Dichev and Tang (2008) time trend regression, where the dependent variables were the EQ proportion, SNRD proportion and SUBD proportion (at the firm level). The results of these panel-data linear regressions are presented in the following table:

Table 2 – EQ proportion, SNRD proportion and SUBD proportion: Time trend regression results

Reggression model #	Dependent Variable	α (Z-statistic)	β (Z-statistic)	Number of Observations
1	EQ proportion	0.738*** (35.12)	0.004 (1.40)	270
2	SNRD proportion	0.170*** (7.49)	-0.010*** (-4.18)	270
3	SUBD proportion	0.092*** (6.99)	0.006*** (4.26)	270

The regression equation is: $y_{i,t} = \alpha + \beta * t + \varepsilon$, where $y_{i,t}$ = EQ proportion, SNRD proportion, SUBD proportion of company i as of year t, and t is an ordinal time variable.

(*, **, ***) are significant at a (10%, 5%, 1%) level

The results indicate that the SNRD and SUBD time trends are statistically significant, whereby the decrease in the SNRD proportion and the increase in the SUBD proportion are both significant at a 1% level. The meaning of these results is that the debt tradeoff phenomenon is statistically significant, and that sample companies increased the proportion of SUBD at the expense of the SNRD proportion. In other words, after the effective date of the Solvency II directive, the proportion of SUBD increased at the expense of the SNRD proportion, in comparison to the pre-effective date period of the Solvency II directive.

The EQ proportion time trend is not statistically significant. This result suggests that the financial leverage of the sample companies remained unchanged over the years 2013-2018, and that the capital structure change is concentrated in the debt composition change described above.

6.3. Robustness Checks

In the following sub-section, I run several robustness checks on the results presented in the previous two sub-sections.

6.3.1. Equity, Senior Debt and Subordinated Debt Analysis

In the robustness checks, I eliminated the top 3 and bottom 3 extreme observations for accumulated change in EQ levels from 2013 to 2018, and then I reran the time trend

regression, in order to confirm that the results I obtained in the main analysis are not due to a few extreme observations. I repeated this routine for SNRD and SUBD, such that altogether I ran 3 robustness checks (with three linear regressions within each check). The following 3 figures present the accumulated changes from 2013 to 2018 in EQ, SNRD and SUBD, for each sample company:

Figure 6 – Accumulated changes in EQ from 2013 to 2018

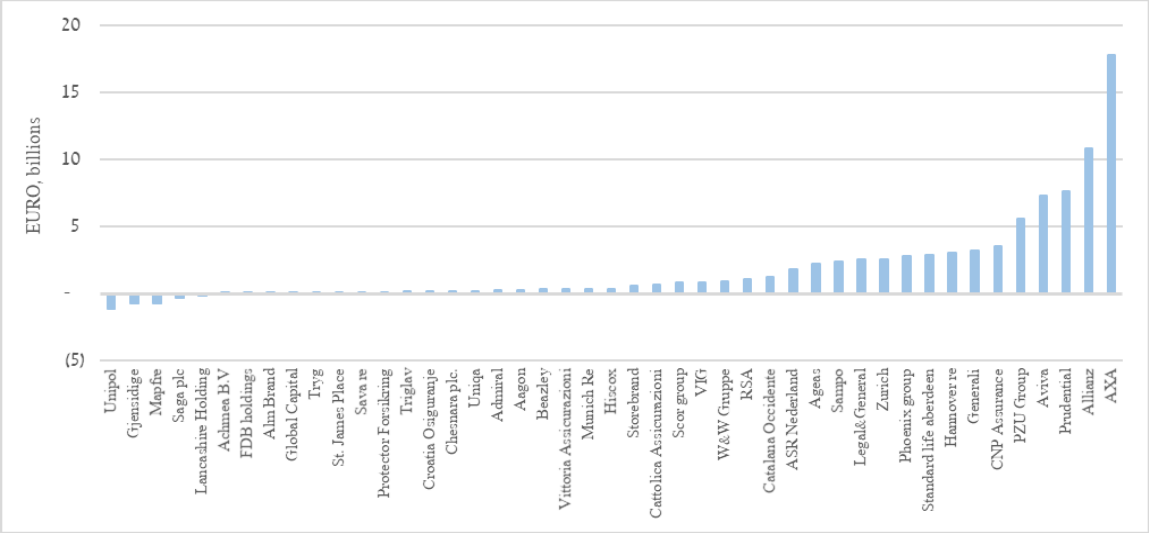


Figure 7 – Accumulated changes in SNRD from 2013 to 2018

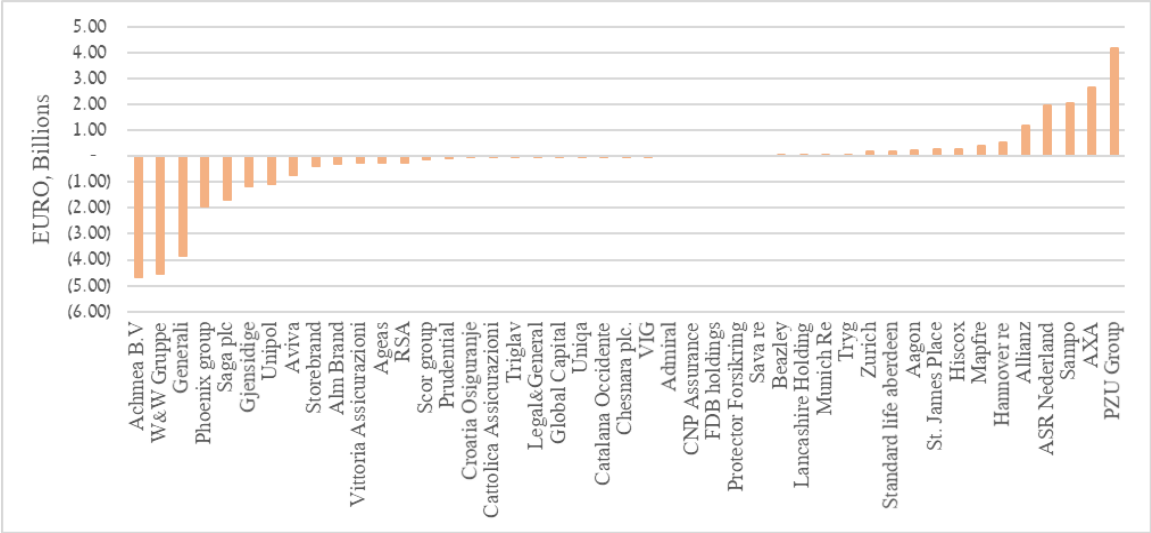


Figure 8 – Accumulated changes in SUBD from 2013 to 2018

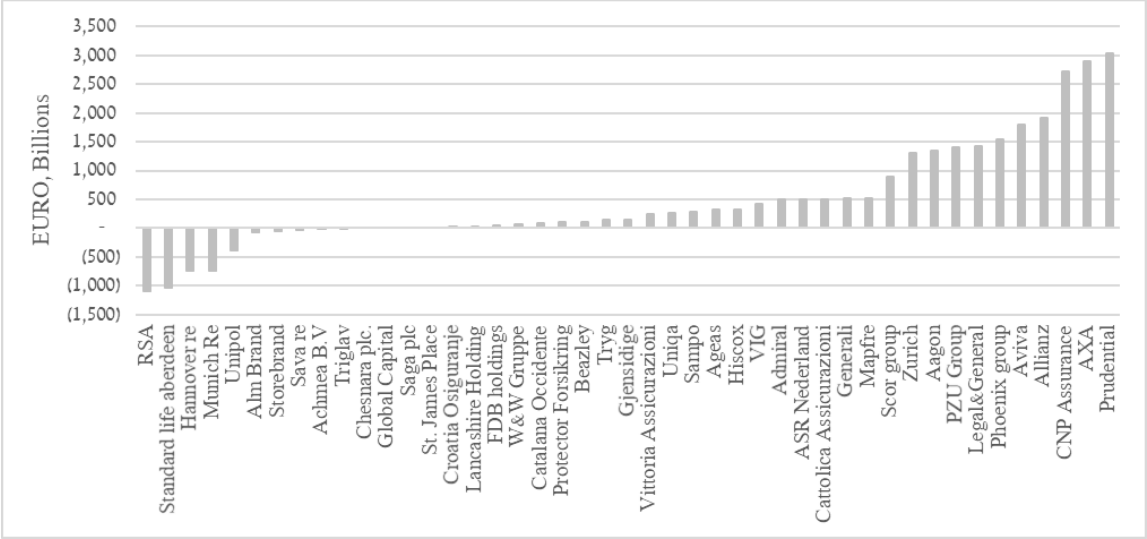


Figure 6 indicates that almost none of the companies decreased its EQ level from 2013 to 2018. Figure 7 indicates that the majority of the companies barely changed their SNRD level from 2013 to 2018, and that the number of companies which did *decrease* their SNRD level is (roughly) equal to the number of companies which *increased* it. Overall, figure 7 presents a somewhat balanced picture with regard to the companies' SNRD accumulated changes, which was also reflected in the regression results presented in table 1 above. Finally, Figure

8 indicates that except for 5 companies, all companies either increased their SUBD level or at least kept it stagnant from 2013 to 2018.

The positive SUBD time trend remains statistically significant at a 1% level in all 3 robustness checks. The negative SNRD time trend, which was not significant in the main analysis, becomes marginally significant in 2 out of 3 checks, at a 10% level. These outcomes confirm that the debt tradeoff phenomenon is robust.

In addition, the EQ time trend remains significant in all 3 robustness check, at a 1% level.

6.3.2. Capital Structure Analysis - Robustness Checks

I further continue with robustness checks for the capital structure composition. In the following robustness checks, I eliminated the top 3 and bottom 3 extreme observations for accumulated change in EQ proportion from 2013 to 2018, and then I reran the time trend regression. I repeated this routine for the SNRD proportion and the SUBD proportion, so that altogether I ran 3 robustness checks (with three linear regressions within each check). The following 3 figures present the accumulated changes from 2013 to 2018 in EQ proportion, SNRD proportion and SUBD proportion, for each sample company:

Figure 9 – Accumulated changes in EQ proportion from 2013 to 2018

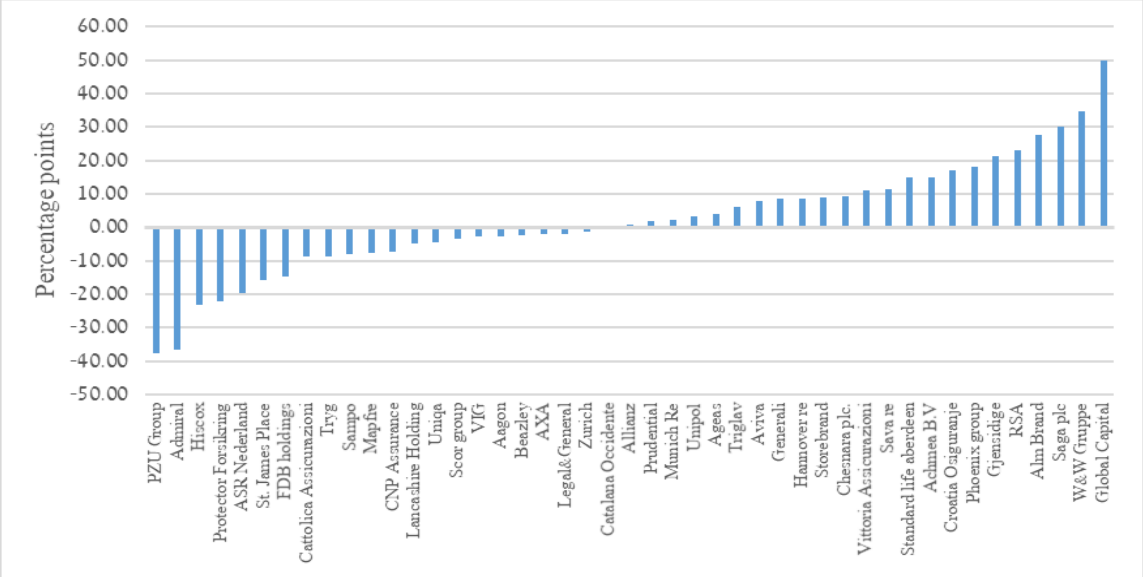


Figure 10 – Accumulated changes in SNRD proportion from 2013 to 2018

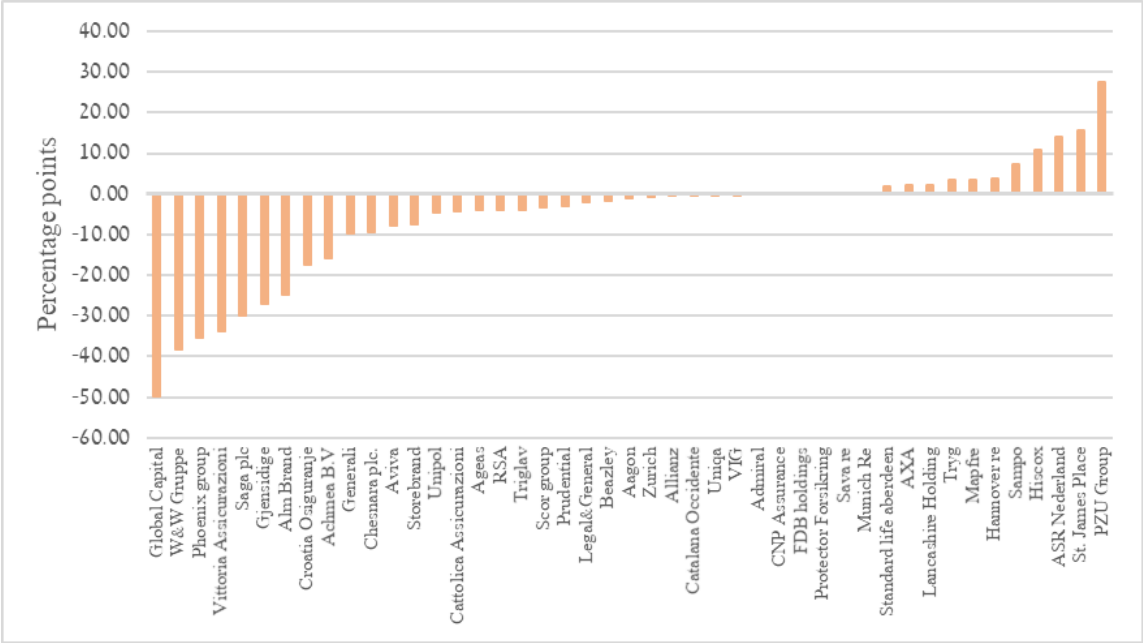


Figure 11 – Accumulated changes in SUBD proportion from 2013 to 2018

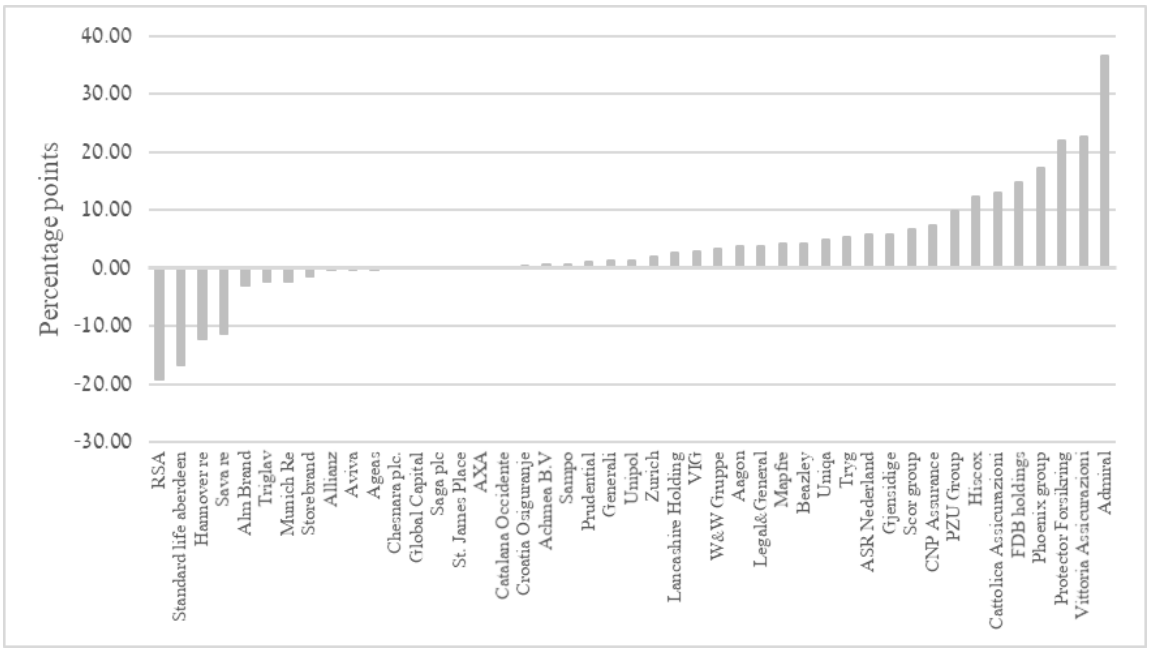


Figure 9 presents a fairly balanced picture, in which about half of the companies increased the EQ proportion and about half decreased it. This figure explains the non-significant result received in table 2 with regard to the EQ proportion in the capital structure. Figure 10 shows that the majority of the sample companies decreased the proportion of SNRD in their capital

structure from 2013 to 2018. Figure 11 presents an opposite picture to the one presented by figure 10, as we can see that the majority of the sample companies increased the proportion of SUBD in their capital structure.

The SUBD (SNRD) proportion increase (decrease) stays significant at a 1% level in all 3 robustness checks. These results indicate that the debt tradeoff between SNRD and SUBD is robust. In other words, during the years surrounding the effective date of the Solvency II directive, the sample companies substituted SNRD by SUBD.

In addition, the EQ proportion time trend is still insignificant in all 3 checks.

7. Sub-Sample Analysis

In this section, I perform 3 different sub-sample analyses in order to examine whether the statistically significant phenomena presented in the previous chapter are attributed to a specific sub-group of companies. In addition, there is also a possibility that different sub-groups act differently, and that those different behaviors cancel each other out in the overall sample. Thus, not performing a sub-sample analysis might cause us to miss some potentially important insights.

The first sub-sample analysis employed a dividend yield measure described below. This was followed by company size analysis, and finally, I perform an analysis by insurer type.

7.1. Analysis by Average Dividend Yield

In this sub-sample analysis, I divided the sample into two groups, according to their average dividend yield from 2011 to 2013. Dividend yield was defined as follows:

$$Dividend\ Yield_t = \frac{Total\ dividend\ paid_t}{Equity_{t-1}}$$

where:

- $Total\ dividend\ paid_t$ – the total dividend paid during year t; and
- $Equity_{t-1}$ – Equity as of December 31 of year $t-1$.

The top 20% companies with the highest average dividend yield comprise the first group, while the bottom 80% comprise the second group. This division is based on a principle introduced by Pareto (1896), according to which approximately 80% of the effects come from 20% of the causes. Therefore, one may assume that most of the phenomena observed in the main analysis derive from the top 20% dividend yield companies.

In this specific sub-sample analysis, one may expect to find that the top 20% dividend yield companies exploited the fact that EQ can be replaced by SUBD. Such an exploitation may

be in the form of raising SUBD and distributing the proceeds as dividends (increasing SUBD proportion at the expense of EQ proportion).

The top 20% companies with the highest average dividend yield between 2011-2013 present a highly significant (1% level) increase in EQ and SUBD, together with a significant (5% level) increase in SNRD over the sample years. The *aggregated* accumulated changes for these companies are presented below:

Figure 12 – Accumulated aggregated EQ changes for the top 20% dividend yield companies relative to 2013 levels

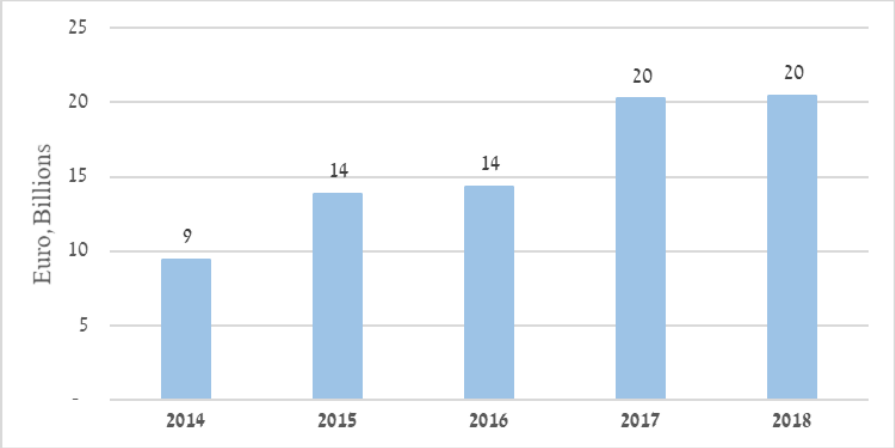
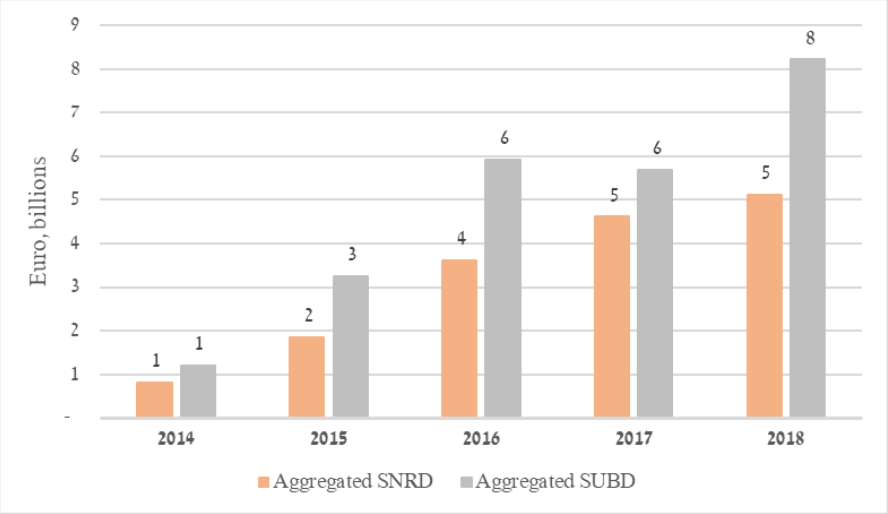


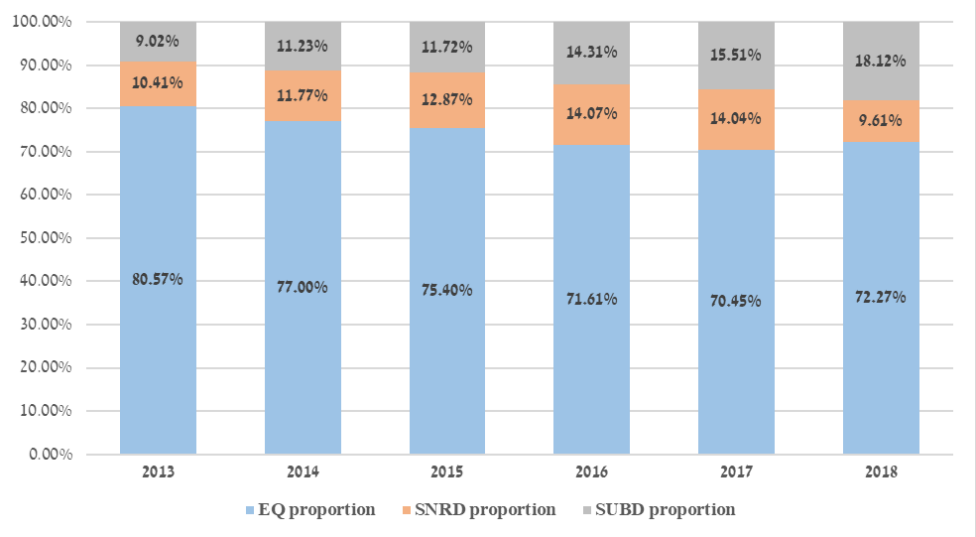
Figure 13 – Accumulated aggregated SNRD and SUBD changes for the top 20% dividend yield companies relative to 2013 levels



As for capital structure changes, the top 20% companies present a highly significant (1% level) increase (decrease) in the SUBD (EQ) proportion over the sample years. No significant change is observed in the SNRD proportion over the same period.

Below, the *average* capital structure of the top 20% companies from 2013 to 2018 is presented:

Figure 14 – Capital structure composition between 2013–2018: top 20% dividend yield companies



These results indicate that a debt tradeoff occurred over the sample years, such that the *average* proportion of the SUBD doubled after the effective date of the Solvency II directive. In addition, and unlike the outcome of the main analysis, the EQ proportion presents a statistically significant *decrease* over the sample years. These results suggest that the financial leverage of these top 20% companies has *increased* over the years surrounding the Solvency II effective date. These results suggest that these companies' equity became riskier over the sample years, as the financial leverage of these companies increased.

The bottom 80% average dividend yield companies present a highly significant (1% level) accumulated increase in EQ, together with a highly significant (1% level) accumulated increase in SUBD and a significant (5% level) accumulated decrease in SNRD. The *aggregated* accumulated changes for these companies are presented below:

Figure 15 – Accumulated aggregated EQ changes for the bottom 80% dividend yield companies relative to 2013 levels

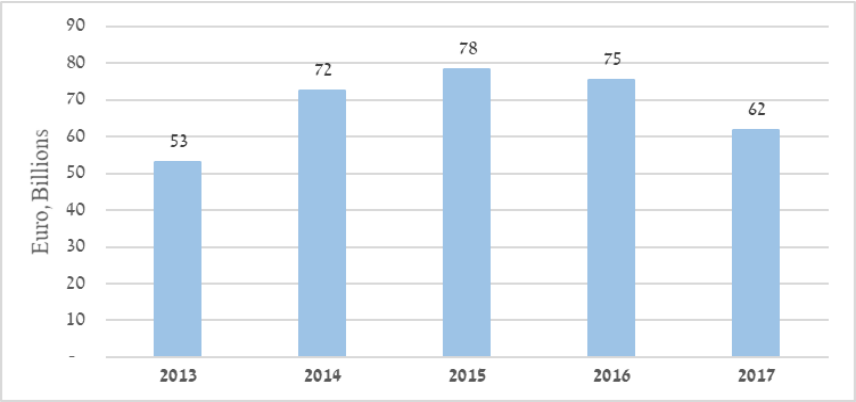
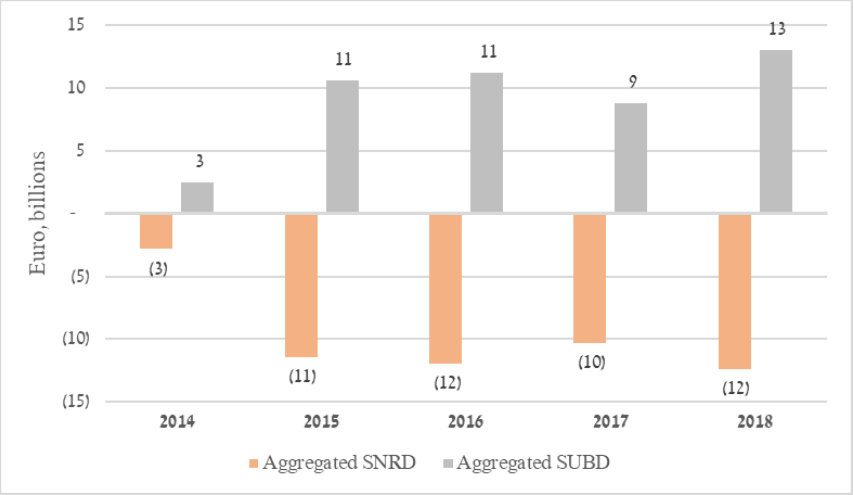
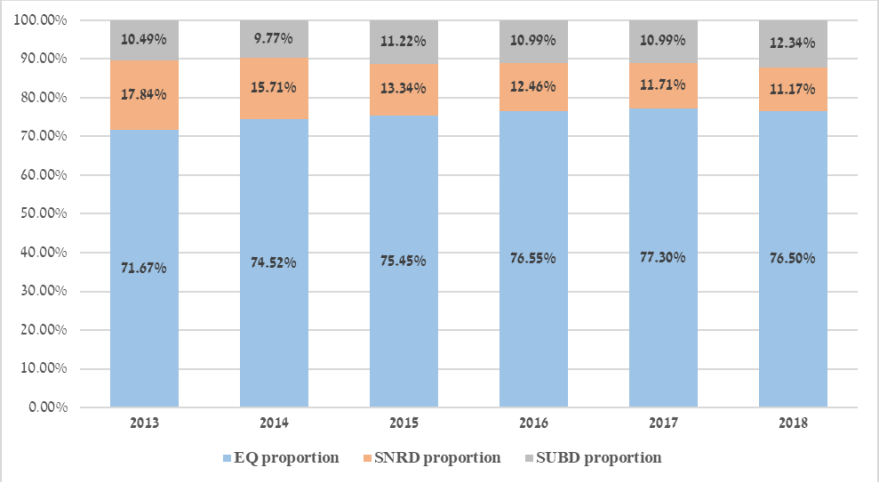


Figure 16 – Accumulated aggregated SNRD and SUBD changes for the bottom 80% dividend yield companies relative to 2013 levels



As for capital structure changes, the bottom 80% companies present a highly significant (1% level) increase (decrease) in EQ (SNRD) proportion over the sample years. In addition, a significant (5% level) increase in SUBD proportion is presented. Below, the *average* capital structure of the bottom 80% companies from 2013 to 2018 is presented:

Figure 17 – Capital structure composition between 2013–2018: bottom 80% dividend yield companies



A summary of this sub-sample analysis is presented in the following table:

Table 3 – Dividend-yield: sub-sample analysis summary

	All sample	Top 20% companies	Bottom 80% companies
EQ level change	Increase***	Increase***	Increase***
SNRD level change	Unchanged	Increase**	Decrease**
SUBD level change	Increase***	Increase***	Increase***
EQ proportion change	Unchanged	Decrease***	Increase***
SNRD proportion change	Decrease***	Unchanged	Decrease***
SUBD proportion change	Increase***	Increase***	Increase**

(**,***) are significant at a (5%, 1%) level

In conclusion, the results suggest that while the top 20% dividend yield companies present a significant debt tradeoff mainly due to an increase in SUBD proportion, the bottom 80% dividend yield companies present a significant debt tradeoff mainly due to a decrease in SNRD. In addition, while the bottom 80% dividend yield companies present a positive time trend in EQ proportion, the top 20% dividend yield companies present a somewhat surprising result of a *negative* time trend in the EQ proportion. One possible explanation of this result (but not the only one) is that these high dividend yield companies raised SUBD instead of some of their EQ, which was distributed as a dividend to their shareholders.

7.2. Analysis by Company Size

The following sub-section analysis was performed by focusing on company size, which was determined according to the company EQ as of December 2013. In the analysis, I separated the top 20% largest companies from the 80% smallest companies, and performed the analysis separately for these two groups.

The total EQ of the top 20% largest companies amounted to €245 billion, and constitutes 68% of the aggregated EQ of all the sample companies as of December 2013.

The largest 20% companies present a highly significant (1% level) increase in EQ and SUBD, while no significant change is observed in the SNRD. Below, the accumulated *aggregated* changes in EQ, SNRD and SUBD for these companies are presented:

Figure 18 – Accumulated aggregated EQ changes for the 20% largest companies relative to 2013 levels

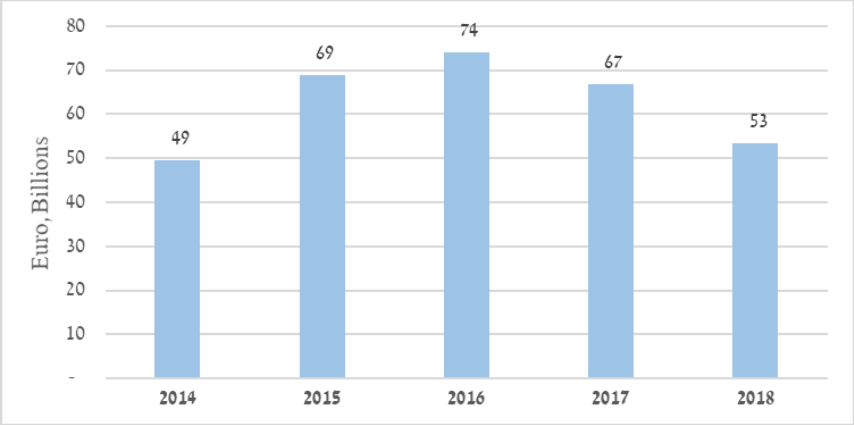
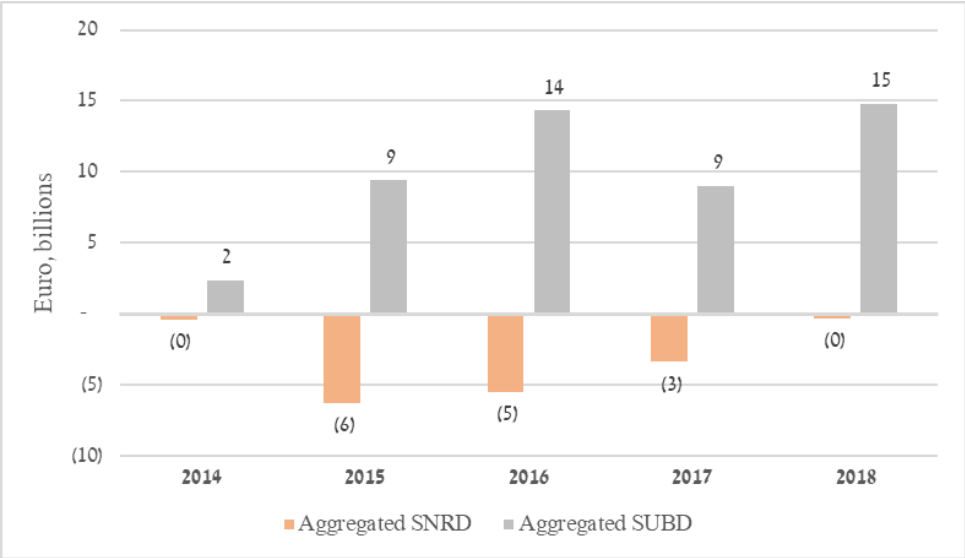


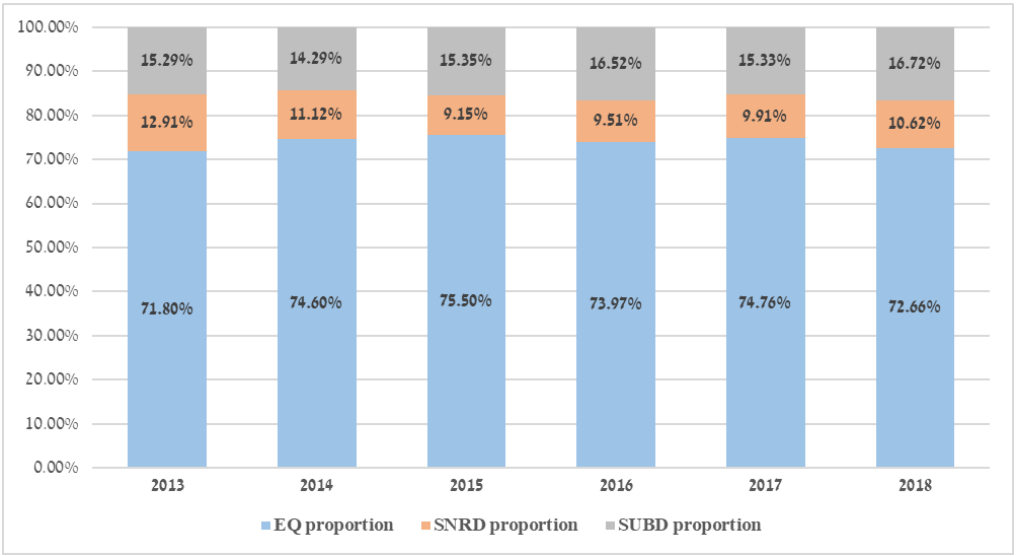
Figure 19 – Accumulated aggregated SNRD and SUBD changes for the 20% largest companies relative to 2013 levels



As for capital structure changes, the largest 20% companies present a significant (5% level) increase (decrease) in SUBD (SNRD) proportion over the sample years, with no significant change in the EQ proportion.

The *average* capital structure of these companies between 2013-2018 is presented below:

Figure 20 – Average capital structure composition between 2013–2018: 20% largest companies



The smallest 80% companies present identical trends to those of the largest 20% companies, both in absolute levels and proportions of EQ, SNRD and SUBD. The only difference is that

the SUBD (SNRD) proportion increase (decrease) in the sub-sample of the 80% smallest companies is significant at a 1% level (and not merely at a 5% level, as in the largest 20% companies sub-sample).

Below, the accumulated *aggregated* changes in EQ, SNRD and SUBD are presented:

Figure 21 – Accumulated aggregated EQ changes for the 80% smallest companies relative to 2013 levels

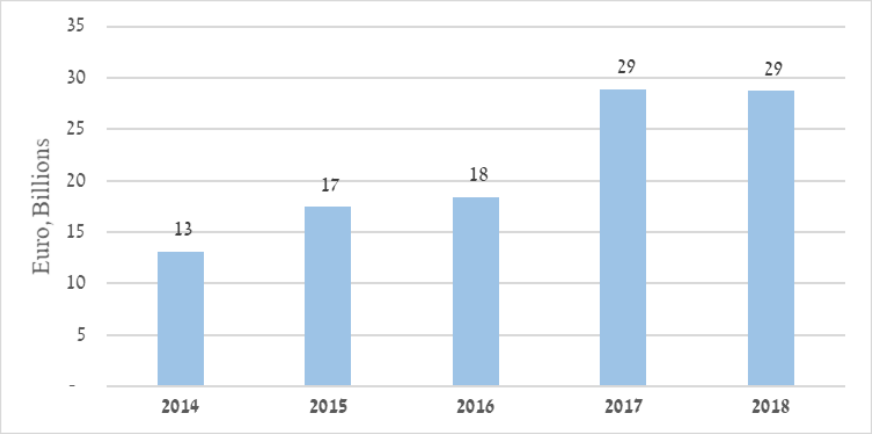
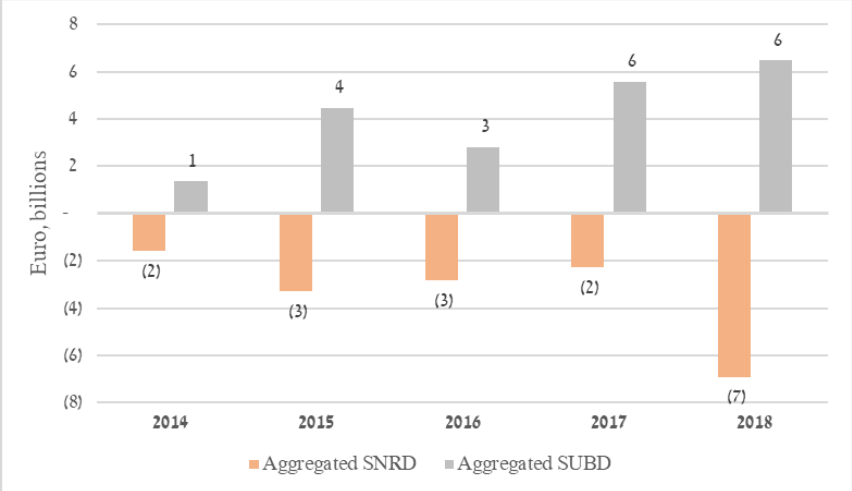
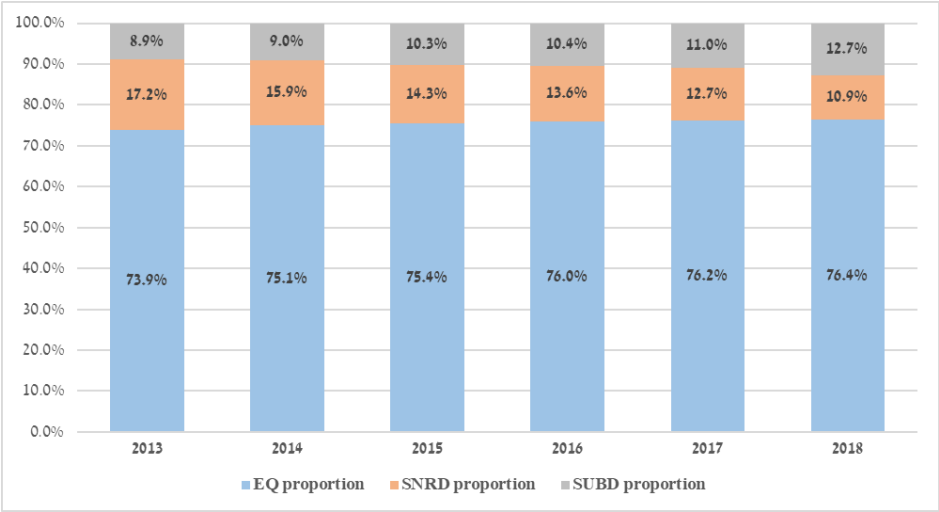


Figure 22 – Accumulated aggregated SNRD and SUBD changes for the 80% smallest companies relative to 2013 levels



The *average* capital structure of these companies between 2013-2018 is presented below:

Figure 23 – Average capital structure composition between 2013–2018: 80% smallest companies



In conclusion, it seems that the results obtained in the main analysis are not specifically attributed to large or small companies, as both sub-groups present the same time trends observed in the main analysis.

7.3. Analysis by Insurer Type

In the following sub-section, I present an analysis by insurer type. I used the Capital IQ database primary industry classification in order to determine the insurer type for each company in my sample. The four classification types were:

- Multi-line insurer (ML);
- Life and health insurer (LH);
- Property and casualty insurer (PC); and
- Reinsurers (RE)

The distribution of the different insurer types in the sample is presented below:

Table 4 – Insurer types: Sample statistics

Type	Number of companies	%	Average assets €, Bill	Average equity €, Bill
ML	22	48.9%	140	11
LH	13	28.9%	162	6
PC	7	15.6%	8	1
RE	3	6.7%	103	11
Total	**45**	**100.0%**		

ML and LH insurers constitute about 78% of the sample. Therefore, only in this sub-sample analysis, I present the accumulate aggregated changes in EQ, SNRD and SUBD in percentages (and not in Euro), as I find the presentation in Euro to be somewhat confusing.

I first present the accumulated *aggregated* EQ, SNRD and SUBD by insurer type:

Figure 24 – Accumulated aggregated EQ changes by insurer type, relative to 2013 levels (in percentages)

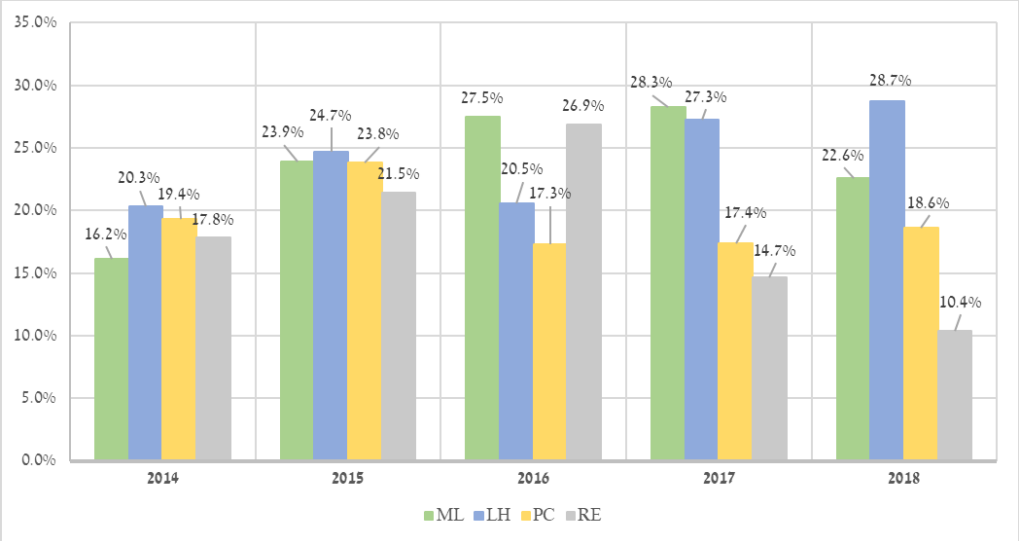


Figure 25 – Accumulated aggregated SNRD changes by insurer type, relative to 2013 levels (in percentages)

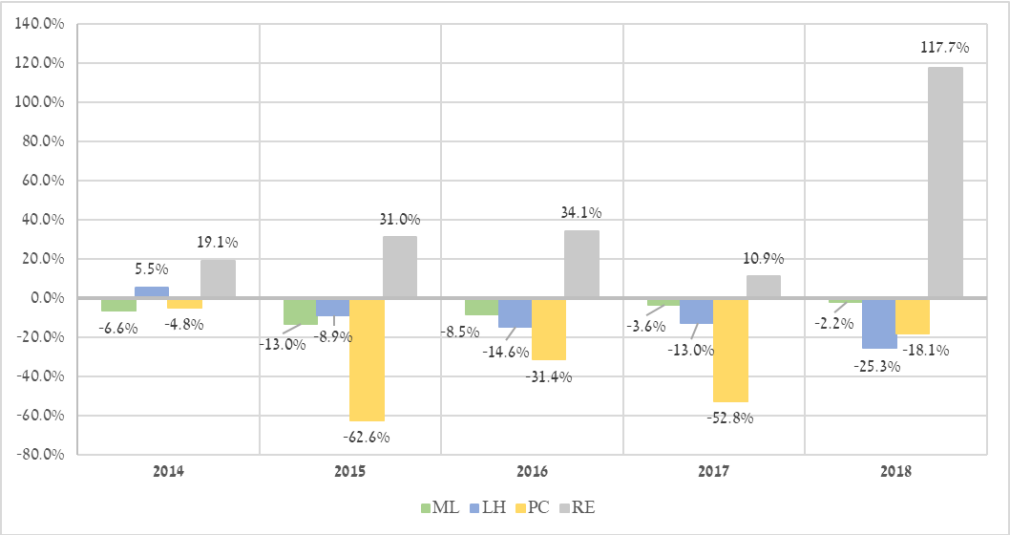
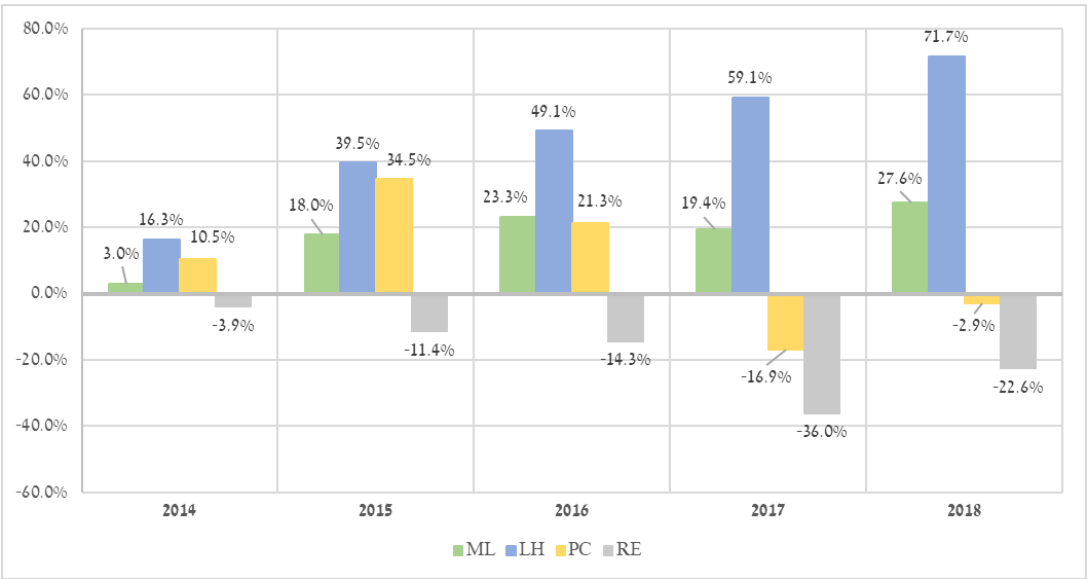


Figure 26 – Accumulated aggregated SUBD changes by insurer type, relative to 2013 levels (in percentages)



The reflection of these changes in the average capital structure is presented in page 49. The following table summarizes the observed time trends by insurer type:

Table 5 – Insurer type sub-sample analysis summary

	All sample	ML	LH	PC	RE
EQ level change	Increase***	Increase***	Increase***	Unchanged	Unchanged
SNRD level change	Unchanged	Unchanged	Decrease**	Unchanged	Increase*
SUBD level change	Increase***	Increase***	Increase***	Unchanged	Decrease***
EQ proportion change	Unchanged	Unchanged	Increase**	Unchanged	Increase***
SNRD proportion change	Decrease***	Decrease**	Decrease***	Unchanged	Unchanged
SUBD proportion change	Increase***	Increase***	Increase***	Increase*	Decrease***

(*, **, ***) are significant at a (10%, 5%, 1%) level

ML insurers present similar trends to those of the overall sample. As these insurers comprise about 49% of the overall sample, this outcome is not very surprising. LH insurers also present similar trends to those of the overall sample, with the exceptions of (1) a significant increase in the EQ proportion, suggesting that these insurers lowered their financial leverage, and (2) a significant decrease in the SNRD level. In fact, *all* time trends of the LH insurers are statistically significant – unlike other insurers. This result suggests that LH insurers performed the greatest number of material capital structure changes from 2013 to 2018. PC insurers do not present any trend except for a marginally significant increase in SUBD proportion. Finally, RE insurers present *opposite* trends to those observed in the overall sample, whereby SNRD (SUBD) level increases (decreases) with a significance level of 10% (1%), and the EQ (SUBD) proportion increases (decreases) with a significance level of 1%.

In conclusion, the results indicate that the trends observed in the main analysis are mainly due to ML and LH insurers, while PC insurers present only a marginally significant increase in SUBD proportion. RE insurers present a somewhat surprising result of a *negative* SUBD trend, both in its absolute level and its proportion. Moreover, it seems that the LH insurers present the most prominent trends in the overall sample.

Figure 27 – Average capital structure composition between 2013–2018: ML Insurers

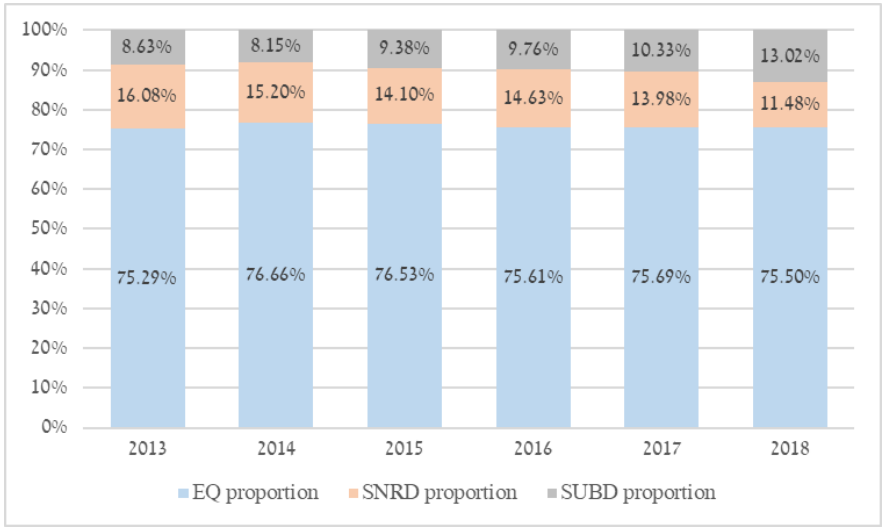


Figure 28 – Average capital structure composition between 2013–2018: LH Insurers

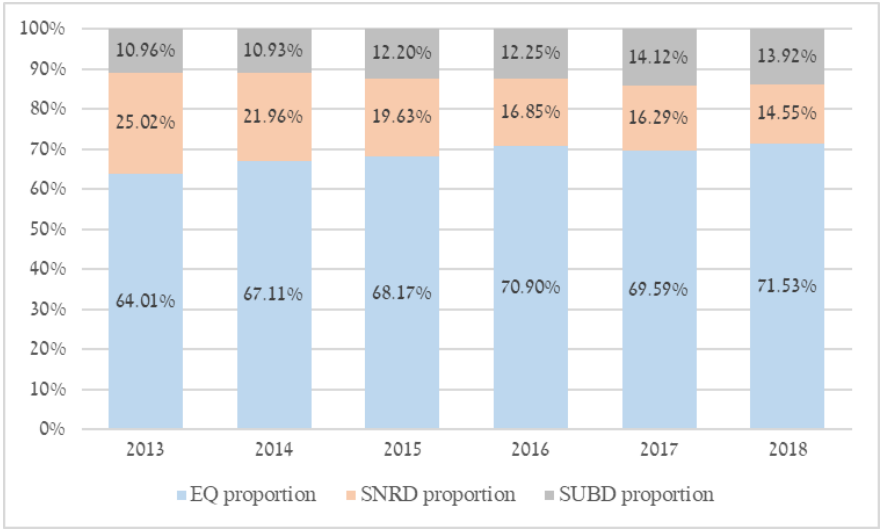


Figure 29 – Average capital structure composition between 2013–2018: PC Insurers

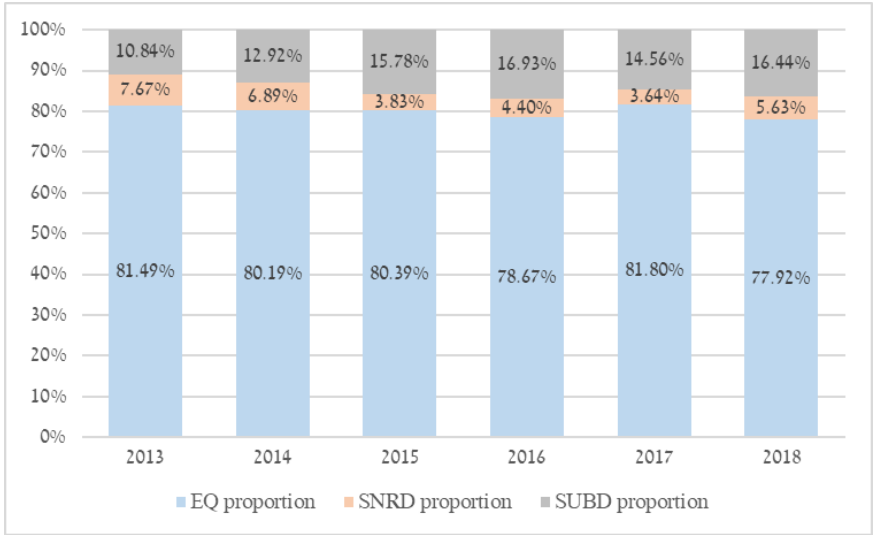
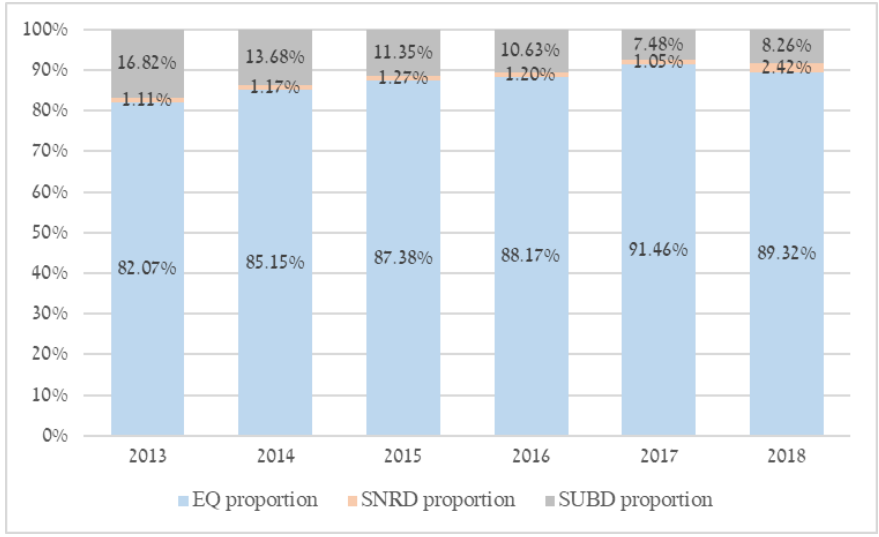


Figure 30 – Average capital structure composition between 2013–2018: RE Insurers



8. Future Research

This paper examined debt composition changes in a sample of 45 European insurance companies that occurred around the effective date of the Solvency II directive, without making any causal inferences. My analysis revealed an increase in subordinated debt, both in its absolute levels and in its proportion in the capital structure. This result, combined with a decrease in the proportion of senior debt which was observed, confirms that a debt composition change took place (increase in the subordinated debt proportion at the expense of senior debt proportion). This change improved the position of the policyholders as these new debts, unlike the previous non-subordinated debts, are subordinated to their claims. In addition, I found that the overall stagnation in the equity proportion observed in the overall sample breaks into two: the top 20% dividend yield companies present a *decrease* in their equity proportion, suggesting that these companies *increased* their financial leverage, while the bottom 80% companies present an increase in their equity proportion. Finally, I also found that the trends observed in the overall sample are attributed mainly to multiline and life and health insurers, and that they are not specifically attributed to either large or small companies.

I believe that the current research, combined with a sample extension, lays the foundation for future research, as its results raise several questions. Some possibilities are given below:

First, and under the assumption that a causal relation between the Solvency II directive and the capital structure changes will be established, the (potentially) exogenous shock can be exploited to study the financing decisions of each insurer. For instance: did ownership structure influence the financing decision? Barton and Gordon (1988) suggest that the managerial choice perspective may help to explain capital structure choice at the firm level. Past research also concentrated on the relation between managerial and external block holdings and capital structure. Most studies suggest that there exists a negative relation

between managerial holdings and levels of debt. Berger et al. (1997) study the association between managerial entrenchment and firm's capital structures, with results generally suggesting that entrenched CEOs seek to avoid debt. They find, among other things, that leverage levels are lower when CEOs do not face pressure from either ownership and compensation incentives or active monitoring. Friend and Lang (1988) test whether capital structure decisions are at least in part motivated by managerial self-interest. They show that debt levels are negatively related to management's shareholding. They also find that unless there is a nonmanagerial principal stockholder, no substantial increase of debt can be realized. Chaganti and Damanpour (1991) showed that the size of outside institutional stockholdings has a significant effect on the firm's capital structure. They have also found that family and inside institutional owners' shareholdings moderate the relationship between outside institutional shareholdings and capital structure. Finally, Brailsford et al. (2002) focus on the effects of managerial share ownership and external block ownership on capital structure. They find a non-linear, inverted U-shape relation between the level of managerial share ownership and leverage.

Second, the risk of the shareholders following the above capital structure changes, which was ignored in this paper, is of interest. The results indicate that the debt composition has changed, such that the proportion of subordinated debt has increased. While this change improves the position of the policyholders (as explained above), how does it affect the shareholders? In addition, an increase in the financial leverage was observed for high dividend yield companies. Is it possible that those companies allocated risk from policyholders to shareholders over the sample years? Obviously, such an analysis will require a reference to capital markets, as the companies' market caps and traditional risk measures, such as standard deviation and beta, will be at the heart of the study.

Third, the fact that subordinated debt can be accounted as own funds relieves some of the regulatory burden, as companies can strengthen their own funds through (subordinated) debt issuance, rather than equity instruments. This subordinated debt mitigation might have been

the result of a degree of pressure exerted on the regulator by some or all of the insurance companies. If so, are the companies which issued the greatest amount of subordinated debt also the ones that exerted the greatest pressure on the regulator? In such a case, the Solvency II directive implementation shock might not be as exogenous as expected.

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Appendix A: List of companies included in the sample

Presented below is a list of the companies that are included in the sample:

Table a6 – List of sample companies

#	Company name	#	Company name
1	Achmea B.V.	24	Mapfre, S.A.
2	Admiral Group plc	25	Münchener Rückversicherungs-Gesellschaft Aktiengesellschaft
3	Aegon N.V.	26	Phoenix Group Holdings plc
4	ageas SA/NV	27	Protector Forsikring ASA
5	Allianz SE	28	Prudential plc
6	Alm. Brand A/S	29	Powszechny Zaklad Ubezpieczen SA
7	ASR Nederland N.V.	30	RSA Insurance Group plc
8	Aviva plc	31	Saga plc
9	AXA SA	32	Sampo Oyj
10	Beazley plc	33	Pozavarovalnica Sava, d.d.
11	Grupo Catalana Occidente, S.A.	34	SCOR Global P&C Ireland Limited
12	Società Cattolica di Assicurazione - Società Cooperativa	35	St. James's Place UK plc
13	Chesnara plc	36	Standard Life Aberdeen
14	CNP Assurances SA	37	Storebrand ASA
15	Croatia osiguranje d.d.	38	Zavarovalnica Triglav, d.d.
16	FBD Holdings plc	39	Tryg A/S
17	Assicurazioni Generali S.p.A.	40	Unipol Gruppo S.p.A.
18	Gjensidige Forsikring ASA	41	UNIQA Insurance Group AG
19	GlobalCapital p.l.c.	42	Vienna Insurance Group AG
20	Hannover Rück SE	43	Vittoria Assicurazioni S.p.A.
21	Hiscox Ltd	44	Wüstenrot & Württembergische AG
22	Lancashire Insurance Company (UK) Limited	45	Zurich Insurance Group AG
23	Legal & General Group Plc		

הרכב החוב בעידן ה- Solvency II:
עדות מחברות ביטוח אירופאיות

תקציר:

בעבודה זו אני בוחן שינויים בהרכב החוב של חברות ביטוח אירופאיות במהלך השנים שלפני ואחרי כניסתה לתוקף של דירקטיבת ה- Solvency II. אני מתמקד בשינויים אבסולוטיים ויחסיים ברמות החוב נחות. אני עושה זאת כיוון שתחת תנאים מסוימים, דירקטיבת ה- Solvency II מתירה לחובות נחותים להיכלל ביתרות ההון הכשירות לצורך עמידה בדרישות ההון אותן הדירקטיבה מציבה (SCR). הניתוח שלי חושף שעל פני השנים 2013 עד 2018, הרמות האבסולוטיות של החוב הנחות עלו. בנוסף, אני מוצא שחלקו היחסי של החוב הנחות במבנה ההון של חברות המדגם עלה על חשבון חלקו היחסי של החוב הבכיר, אשר ירד. תוצאות אלו מצביעות על כך שמנקודת מבט של מבנה הון מצבם של המבוטחים (בעלי הפוליסות) השתפר – בהתאם לכוונתה של דירקטיבת ה- Solvency II. ניתוחים נוספים מגלים שהסטגנציה בחלקו היחסי של ההון העצמי במבנה ההון של החברות, אשר נצפה במדגם הכולל בין השנים 2013 ל-2018, מתפצלת לירידה (עלייה) המוצגת על ידי 20% (80%) החברת בעלות תשואת הדיבידנד הגבוהה (נמוכה) ביותר. עוד חושפים הניתוחים הנוספים כי התופעות הנצפות במדגם הכולל מיוחסות בעיקר למבטחים רב-תחומיים (Multiline insurers) ומבטחי חיים ובריאות (Life and health insurers), וכי הן מיוחסות הן לחברות גדולות והן לחברות קטנות.

מילות מפתח: סולבנסי 2, ביטוח, חוב, חוב נחות, מבנה הון.

ברצוני להודות למכון קסירר למחקר בחשבונאות על התמיכה במחקר זה.

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החוג לחשבונאות

הרכב החוב בעידן ה- Solvency II:
עדות מחברות ביטוח אירופאיות

שקיל תזה

מוגש על ידי: אודי אהוד לבקוביץ

מנחה עבודת השקיל: פרופ' דן וייס

יוני 2020